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This UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

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PREFACE

The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April, 1907, as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, reports from various sources, historical essays, notes and comments on topics of medical interest, and reviews or notices of the latest published medical books.

The bureau extends an invitation to all medical officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit and will recommend that copies of such letters be made a part of the official record of the officers concerned.

The bureau does not necessarily undertake to indorse all views or opinions which may be expressed in the pages of this publication.

E. R. STITT,
Surgeon General United States Navy.

NOTICE TO SERVICE CONTRIBUTORS

When contributions are typewritten, *double spacing* and wide margins are desirable. Fasteners which can not be removed without tearing the paper are an abomination. A large proportion of the articles submitted have an official form, such as letterheads, numbered paragraphs, and needless spacing between paragraphs, all of which require correction before going to press. The BULLETIN endeavors to follow a uniform style in headings and captions, and the editor can be spared much time and trouble and unnecessary errors can be obviated if authors will follow in the above particulars the practice of recent issues. This is not only important in special articles but still more so in reviews.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received two months prior to the date of the issue for which they are intended.

The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustrations, if not original, should be accompanied by a reference to the source and a statement as to whether or not reproduction has been authorized.

The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc. All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.*

U. S. NAVAL MEDICAL BULLETIN

VOL. XXII JANUARY, 1925 No. 1

SPECIAL ARTICLES

RENAL PATHOLOGY IN FILARIASIS BANCROFTI

By H. M. STENHOUSE, Lieutenant Commander, Medical Corps, United States Navy

In trying to establish or disprove the influence of filariasis on the development of elephantiasis, an important fact has been discovered, namely, that one of the early effects of *Filaria bancrofti* is nephritis. Not only has this a bearing on the etiology of elephantiasis but it also establishes without a doubt the fact that *Filaria bancrofti* is not a harmless parasite but one of the most damaging to human life in the tropical aggregate, by reason of its great prevalence, of the long life of the parasite, and the slow, persistent injury which it inflicts on the definitive host.

Our studies have been the more feasible for three reasons: First, because a large proportion of the population of St. Croix was, is, or will be at some time in the course of life, infected with *Filaria bancrofti;* secondly, elephantiasis is quite common—is found in about 6 per cent of the population; and, finally, the absence from the island of many other diseases which might tend to confuse the clinical signs, notably malaria.

TABLE 1.—*Communicable diseases reported, calendar year 1923, arranged according to frequency*

Disease	Cases reported	Disease	Cases reported
Trachoma	120	Chancroid	5
Filariasis	116	Uncinariasis	5
Chicken pox	76	Fish poisoning	5
Dysentery	42	Schistosomiasis	4
Gonococcus infection	20	Leprosy	2
Syphilis	17	Mumps	1
Dengue	12		
Tuberculosis	10	Total	435

Population (1917 census), 14,901.

Foundation of discussion.—We have approached the subject from a good many angles. In the beginning a review of the reports of communicable diseases was made. Since 1919 it has been routine practice at hospitals of the municipality to examine patients on admission for filariasis. This gives us a cross section of the population by which we can judge with a fair degree of accuracy the incidence of filariasis in the population as a whole. The notable findings from this review were briefly as follows:

(1) Ten per cent of the admissions in the Christiansted district were found filaria blood positive; 20 per cent of these in the Frederiksted district were positive.

(2) The disease is most prevalent in early adult life.

(3) Females are more prone to be infected in childhood or adolescence than males. In later life the greater part of the positive cases are in males. (Chart 1.)

(4) Prisoners at Richmond Penitentiary furnished 6.5 per cent of the reported cases.

Following the epidemiological review the patients showing filariasis, especially the younger ones, were investigated. Certain clinical features were noted. Specimens were followed to the laboratory and watched. Post-mortems were done on filarial and nonfilarial subjects. The pathology found was checked with clinical findings. Throughout our surgical experience the living pathology was studied. And finally, certain cases were operated upon to correct conditions, such as elephantiasis. On this foundation we have laid the deductions of the present discussion.

Pathological obscurity of human filariasis:—Human filariasis bancrofti is primarily a disease of superficial lymphatics. The embryo undergoes developmental changes in the mosquito. The immature worm enters through the skin, matures in the lymphatics, and sets out on its migratory existence. In many instances it is arrested in the femoral lymph glands.

Our interest has for so long been focused on the lymphatic aspect of the infection as to have diverted attention from other pathology. Contentions have given rise to doubts, some writers[1] having gone so far as to deny all the so-called signs of filarial disease and to infer that *Filaria bancrofti* is a harmless parasite in man.

Some sixty years ago Lewis,[2] who was the first to discover filarial embryos in the blood, noted that the kidney cortex and medulla abounded with filarial embryos. His report has apparently lain dormant since then, the studies of Manson having carried further

[1] Blacklock, B. Annals of Tropical Medicine and Parasitology. Liverpool, July 20, 1922, vol. 16, No. 2, p. 107.

[2] Flint, Austin. A treatise on the Principles and Practice of Medicine. Fifth edition, 1881. Henry C. Lea's Son & Co. p. 925.

and penetrated more deeply. Recently Jeanselme[2] and others have have reported a rhythm in the output and chemical composition of urine in two filarial cases.

High frequency of nephritis in St. Croix.—The frequency of disorders of the cardio-vasculo-renal system in St. Croix has been the subject of much comment among physicians who have practiced here. It is true not only of the black population but also of the Creole whites, the colored, and even the nonnative white population who remain here for any length of time.

To illustrate the prevalence of renal disease, an unselected group of 100 case histories were taken from the files. This group includes old and young, although none happened to be younger than 21 years of age. Ninety-three of the 100 showed albuminuria. Thirty-nine had casts. Thirty cases were filaria blood positive with abnormal urine. One filaria blood positive case showed neither casts nor albumin. (See Table 2.)

Forty boys from the high schools were examined to determine the frequency of such changes in adolescents. Six of them showed albuminuria, 2 casts, 3 red corpuscles, and 35 some other cellular sediment. (Table 3.)

We have likewise recorded, for the purpose of illustration, the blood-pressure findings of these same boys and of a small unselected group of patients. (Table 4.) The evidence of hypertension in these young boys as well as in the average run of hospital patients is shown by simply reading the diastolic blood pressure registered. Nineteen of the 40 supposedly healthy boys had a diastolic blood pressure of over 80 mm. Hg. (Table 3.)

In the evidence thus far presented the failure to find filarial embryos in 69 per cent of the cases in Table 2 will be noted. But we must remember that we are dealing here with a disease of which it can not be said, once filarial always filarial. The disease causes early damage to the kidneys and although the adult worm and its offspring may die and disappear from the host, the damage to the kidneys persists in some measure.

Repeated infections.—We have good ground for believing that persons living in a filarial district are subjected to repeated infections. Two reasons will be offered: (*a*) From 10 to 30 per cent of the population is infected at all times. The assumption, therefore, of some of the municipal physicians that eventually 100 per cent of the population is infected is not unreasonable. The carrier (Culicine mosquitoes) are present at all seasons. (*b*) Reference to case histories on file shows that many persons found filaria blood positive during one admission are discharged and subsequently found to be

[2] Jeanselme, E., and others. Presse Medicale. Paris, May 12, 1920. Vol. 28, No. 30, p. 293.

blood negative. On the other hand, many who were once negative are at a later date found positive.

The effect of climate.—It may be contended by some that climate plays a large part in this damage to the kidneys. In a measure this is true. And yet in our tropical experiences elsewhere (chiefly in the Philippines) we have never known of such an unusually high percentage of nephritis. The heat undoubtedly depletes the body fluids by increasing perspiration and the interchange of dry warm air for moist in respiration. This diminishes the amount of urine excreted and hence increases the concentration.

Frequency of nocturia.—Here we may offer a curious fact. On questioning patients in the routine examinations on admission almost invariably they will say that they get up two or three times at night to micturate. This is so usual among the Creoles, both white and black, young and old, as to have become commonplace. It is singular, at least not in keeping with a purpose to charge the damage to the climate. Supporting us is the finding of polyuria and urine of low specific gravity in both blood-positive and blood-negative patients.

The accompanying graphic record of urinary excretion in an elephantiasis case illustrates the persistence of nocturia in the absence of filaria positive blood:

Significance of the nocturia.—The amount of urine voided during the night may or may not exceed that eliminated during the day. But the strange phenomenon offers a striking suggestion. The presence of embryos in the peripheral vessels during the night and the corresponding absence therefrom during the day is the most widely known characteristic of human filariasis bancrofti. The presence of the parasites in the kidneys during the day in some way limits the physiologic function at that time. During the night when the embryos migrate to the periphery it is natural that a compensatory effort should be made to eliminate the accumulated products of katabolism.

Once established it seems that an originally pathological nocturia persists—becomes a habit—even after the first cause no longer exists. In a measure it becomes physiological.

A case of polyuria, frequent micturition, and filariasis.—The filaria blood positive cases sometimes show increased frequency and quantity of urine. One such case was extremely puzzling. Cystoscopic examination revealed nothing noteworthy. She voided about 6 times in 24 hours until tartar emetic treatment (for filariasis) was started by mouth (gr. .0032 tid). The following day she voided 16 times. The frequency increased to 39 a day, as shown in the ac-

companying record. The amount was also enormously increased. Intravenous tartar emetic was substituted for the oral administration and the frequency promptly fell to normal within 3 days. Excerpts from the history follow: Hospital No. 10242. Female. Age 34. Filaria blood positive on admission 2–29–24. Urinalysis showed albumen, a trace, no casts. History of two or three urinations during the day and an equal number during the night. Tartar emetic (per ora) started 31 March and continued until 14 April (gram .0032 tid).

Date	Number of urinations	Date	Number of urinations
29 Mar	6	*Tartar emetic, intravenous*	
30 Mar	6	15 Apr	28
Tartar emetic, oral		16 Apr	12
		17 Apr	12
31 Mar	6	18 Apr	3
1 Apr	16	19 Apr	5
2 Apr	19	20 Apr	7
3 Apr	39	21 Apr	8
9 Apr	33		
10 Apr	31		
11 Apr	22		
12 Apr	29		

	Intravenous tartar emetic				
	Apr. 15	Apr. 17	Apr. 19	Apr. 21	Apr. 23
Gram	0. 001	0. 002	0. 003	0. 004	0. 005

URINE

	Quantity (cc.)	Specific gravity
Apr. 6, 1924:		
10 a. m. to 12 noon	400	1. 005
12 noon to 2 p. m	400	1. 005
2 to 4 p. m	300	1. 005
4 to 6 p. m	325	1. 005
6 to 8 p. m	325	1. 004
8 to 10 p. m	375	1. 004
10 to 12 midnight	540	1. 004
Apr. 7, 1924:		
12 midnight to 2 a. m	225	1. 004
2 to 4 a. m	60	1. 008
4 to 6 a. m	320	1. 004
6 to 8 a. m	525	1. 004
8 to 10 a. m	475	1. 005
24 hours	4, 270	1. 004

URINE—Continued

	Quantity (cc.)	Specific gravity
Apr. 29, 1924:		
8 to 10 a. m.	600	1. 006
10 to 12 noon	175	1. 007
12 noon to 2 p. m.	100	1. 011
2 to 4 p. m.	175	1. 007
4 to 6 p. m.	75	1. 014
6 to 8 p. m.	75	1. 012
8 to 10 p. m.	175	1. 005
10 to 12 midnight	375	1. 004
Apr. 30, 1924:		
12 midnight to 2 a. m.	300	1. 004
2 to 4 a. m.	350	1. 004
4 to 6 a. m.	375	1. 006
6 to 8 a. m.	225	1. 006
24 hours	3, 000	1. 007

Eclampsia.—The unusual frequency of eclampsia in St. Croix is another interesting side light, showing the bearing of nephritis on the pregnant woman. In one year (1922) there were six deaths attributed to "puerperal albuminuria with convulsions." Eclampsia is more common here than appendicitis.

Fifteen cases of eclampsia treated at one hospital in St. Croix

No.	Age	Year	Case history
932	22	1919	Filaria blood positive 1919.
6866	22	1922	Filaria blood positive 1921. Positive 1922.
1024	35	1923	Filaria blood positive 1919. Negative 1921.
7877	17	1923	Filaria blood positive 1923. Negative 1924.
9859	29	Oct. 17, 1923	Filaria blood positive Oct. 6, 1923. Negative Oct. 18, 1923.
9630	30	1923	Filaria blood positive 1923.
2043	40	1924	No record; died day of admission.
3100	15	1920	No record; died day after admission.
2169	22	1920	Filaria blood negative 1920.
1185	20	1919	Filaria blood negative 1919.
1078	20	1920	Filaria blood negative 1920, 1921, 1922.
6633	23	1921	Filaria blood negative 1921.
6559	33	1921	Do.
6792	19	1921	No record; died day of admission.
9087	19	1923	Filaria blood negative 1923.

Renal pathology.—Rarely does there occur here any disorder of the kidneys demanding surgical intervention. Our observations are therefore limited to necroscopic appearances. Filarial embryos may or may not be found in the kidneys of known blood positives. This probably depends on the time of death. On the other hand, embryos are sometimes found in the kidneys when not previously demonstrated in blood smears.

Two pathological groups are discernible, depending on (1) the absence or (2) the presence of elephantiasis.

In the first group whether filaria blood positive or negative the appearance is the same. The tissue is found to be soft and pliable, to offer little resistance to the knife. There is a general pasty-brown appearance above which the congested, glistening pyramids stand out vividly. The capsule is not thickened. The number of pyramids appears to be reduced.

In the second group there is apparent gross fibrosis. On sectioning there is felt the resistance of dense fibrous tissue. Sometimes this amounts to almost the resistance of calcified tissue. The capsule is thickened and apt to be separated from the cortex.

Microscopical appearances.—In Group 1 casts are frequently seen in the tubules or in teased sections free. Filarial embryos are more readily found in fresh specimens. The formalin apparently alters the appearance because they are not easy to find after immersion in formalin. There is fibrous change throughout, associated with degeneration of the tubules. In the older cases the vessels show amyloid degeneration.

Group 2 is characterized by marked fibrosis with degeneration of the parenchyma in the necropsies seen. Clinically, however, in young elephantiasis subjects there is not always found evidence of much renal damage. This probably depends on the early development of the protective process.

TABLE 2

Case No.	Age	Casts	S. G.	Alb.	Fil.
787	24	+	1. 016	+++	----------
2491	21	+	1. 012	+	+
9767	22	−	1. 018	+	+
6034	41	−	1. 032	+	−
9497	56	+	1. 013	++	−
9690	60	+	1. 015	+	−
9425	74	+	1. 015	+	−
2416	28	−	1. 016	+	−
9510	32	−	1. 015	+	−
6528	34	+	1. 015	+	+
9519	35	+	1. 009	+	−
6686	36	−	1. 020	+	+
5316	45	−	1. 015	+	−
9183	61	−	1. 016	++	−
9501	24	+	1. 020	+	−
9398	24	−	1. 013	+	−
9707	28	−	1. 012	+	+
2250	29	−	1. 010	+	−
9346	63	−	1. 010	+	−
9648	33	+	1. 017	+	----------
9612	35	−	1. 010	+	−
917	35	+	----------	++	−
9033	36	−	1. 012	+	+
9241	37	−	1. 020	++	----------
6977	29	−	1. 015	+	+

TABLE 2—Continued

Case No.	Age	Casts	S. G.	Alb.	Fil.
9447	41	−	1. 010	+	−
9290	45	−	1. 012	−	−
9464	51	−	1. 012	+	−
5422	52	−	1. 020	+	+
6353	53	−	1. 020	+	+
7989	58	−	1. 017	+	+
966	72	+		+	+
7037	25	+	1. 020	+	+
9700	31	+	1. 006	+	+
9500	44	+	1. 025	+	−
9701	45	−	1. 012	+	−
3196	54	+	1. 010	+	−
9600	60	+		+	−
9532	63	+	1. 020	+ +	−
7885	64	+	1. 014	+	−
9341	33	+	1. 020	+	−
9480	34	−		+	+
2229	38	−	1. 014	+	−
7094	43	−	1. 020	+	−
9377	45	+	1. 012	+	−
6501	52	+	1. 020	+	−
9546	56	+	1. 006	+	+
9305	60	+	1. 014	+	−
9371	63	+	1. 012	+	−
9603	65	−	1. 012	+	−
9719	30	+	1. 020	+	−
5199	68	−	1. 027	+	−
9109	73	−	1. 016	+ +	−
1240	28	−	1. 013	+	+
701	28	−	1. 005	+	−
7884	44	+	1. 010	+	−
9269	45	−	1. 012	−	−
699	49			+	−
9538	53	+	1. 020	+	−
9445	53	−	1. 020	+	−
8003	53	−	1. 020	+	+
9344	63	+	1. 016	+	+
2424	68	−	1. 001	−	−
1169	27	−	1. 012	+	+
7631	28	−	1. 020	+	+
9552	37	+	1. 020	+	−
3076	38	−	1. 012	+	
9310	41	−	1. 005	+	+
2488	63	−	1. 020	+	−
6944	24	−	1. 014	+	−
3079	24	−	1. 012	+	+
7759	27	−	1. 015	+	−
2494	27	−	1. 014	+	−
9502	30	+	1. 020	+	−
7883	30	+	1. 014	+	−
9333	31	+	1. 036	+	−
7122	32	+	1. 025	+	−
5433	38	−	1. 008	+	−
961	39	+	1. 015	+	−
5486	48	−	1. 014	+	+
9495	49	−	1. 028	−	+
7089	50	−	1. 012	+	+
5471	55	+	1. 014	+	+
9326	65	−	1. 016	+	−
2166	66	−	1. 013	+	−
867	66	+	1. 010	+ +	+
3055	45	+	1. 020	+	−

TABLE 2—Continued.

Case No.	Age	Casts	S. G.	Alb.	Fil.
84	35	—	1. 024	—	
1262	41	—	1. 020	+	—
9104	41	—	1. 030	+	—
2219	41	+	1. 006	+	—
9615	44	—	1. 022	+	+
9453	44	—	1. 040	—	—
9549	53	+	1. 022	+	+
6692	62	+	1. 010	+	—
6630	71	—	1. 012	+	+
5490	73	—	1. 010	+	—
6791	24	—	1. 010	+	+
7691	26	—	1. 007	+	—
9492	40	+	1. 020	+	—

TABLE 3

Identification		Age	Pulse	S. B. P.	D. B. P.	Residence	Alb.	Microscopic
1	AL.	13	80	120	70	Town	+	Occasional epithelial cell.
2	BA.	14	84	126	78	do	—	Occasional leucocyte.
3	CL.	15	88	120	80	do	—	Epithelial cells and leucocytes.
4	DN.	13	78	100	62	do	—	Do.
5	HL.	13	92	100	72	do	—	Hyaline casts, epithelial cells, leucocytes.
6	JJ.	14	92	100	92	do	—	Epithelial cells.
7	PS.	14	81	114	70	do	—	Epithelial cells and leucocytes.
8	PD.	13	99	128	90	do	—	Do.
9	PB.	15	104	126	90	do	—	Do.
10	RA.	14	70	130	64	do	—	Epithelial cells and red blood corpuscles.
11	RI.	11	122	120	64	do	—	Epithelial cells and leucocytes.
12	RE.	15	94	126	86	do	—	Many pus cells, few red blood corpuscles.
13	SP.	12	106	112	92	do	—	Epithelial cells and leucocytes.
14	SL.	15	84	108	80	do	—	Do.
15	TB.	14	75	110	78	do	—	Do.
16	WA.	14	68	120	80	Country	—	Do.
17	YS.	14	98	128	98	Town	—	Do.
18	AW.	16	99	150	98	Country	—	Do.
19	CF.	15	82	130	90	do	—	Do.
20	CA.	16	88	116	80	Town	+	Do.
21	SW.	13	76	140	86	do	+	Do.
22	MA.	14	84	126	84	do	—	Do.
23	SI.	16	100	130	80	do	—	Epithelial cells.
24	PC.	15	82	130	80	Country	++	Granular casts, pus cells.
25	WJ.	16	80	124	86	do	—	Negative.
26	KA.	14	100	130	72	Town	—	Epithelial cells.
27	EE.	13	82	126	90	do	—	Few leucocytes.
28	FR.	15	63	118	78	do	—	Negative.
29	SA.	15	78	120	90	do	—	Epithelial cells.
30	BA.	15	87	112	88	do	—	Few leucocytes.

TABLE 3—Continued.

Identification		Age	Pulse	S. B. P.	D. B. P.	Residence	Alb.	Microscopic
31	BR.	13	120	120	82	Town	—	Few leucocytes.
32	AR.	14	90	112	90	do	—	Do.
33	LE.	16	102	116	70	do	—	Few epithelial cells.
34	RC.	16	78	138	78	do	—	Do.
35	EC.	16	75	114	84	do	—	Leucocytes and epithelial cells.
36	SG.	16	66	130	76	do	—	Negative.
37	WT.	16	63	140	86	Country	+	Epithelial cells.
38	EA.	15	96	118	76	Town	—	Leucocytes.
39	JL.	16	78	122	74	do	—	Negative.
40	RF.	16	99	120	82	do	+	Few leucocytes and epithelial cells.

TABLE 4.—*Albuminuria, filariasis, and blood pressures in a small unselected group of hospital patients*

No.	Sex	Age	Pulse	S. B. P.	D. B. P.	Fil.	Urine	
							Alb.	Casts
9979	M	28	74	130	70	—	—	
9582	F	55	88	170	140	—	+	
9638	F	55	78	200	115	+	++	+
6134	M	61	82	170	130	—	+	+
9595	M	73	84	120	70	+	+	+
9735	M	75	76	110	70	—	+	+
6053	M	60	80	174	110	—	—	
3034	M	70	80	120	60	—	+	+
9689	M	65	80	130	80	+	+	R. b. c.
3050	F	38	85	140	80	—	+	—
998	F	28	76	130	90	—	+	
2066	M	66	84	110	60	—	+	
8082	M	45	90	130	80	+	+	—
9975	M	35	110	130	80	—	—	R. b. c.
9288	M	35	80	130	85	—	+	+
9683	F	30	76	180	114	—	+	+
9675	F	67	92	190	112	—	+	+
7946	M	63	66	150	100	—	—	—
9741	F	46	80	180	105	—	+	+
6690	M	45	60	150	100	—	++	+
9885	F	42	80	160	100	—	+	R. b. c.
9876	M	35	94	140	80	—	+	
9420	M	25	84	134	100	—	—	
9577	M	23	120	150	90	—	—	—
9498	M	36	66	134	84	—	+	+
7983	F	40	140	260	190	+	++	R. b. c.
9805	M	60	78	120	80	+	+	—
9458	F	75	85	250	130	+	+	+
10165	M	12	86	116	82	+	+	+

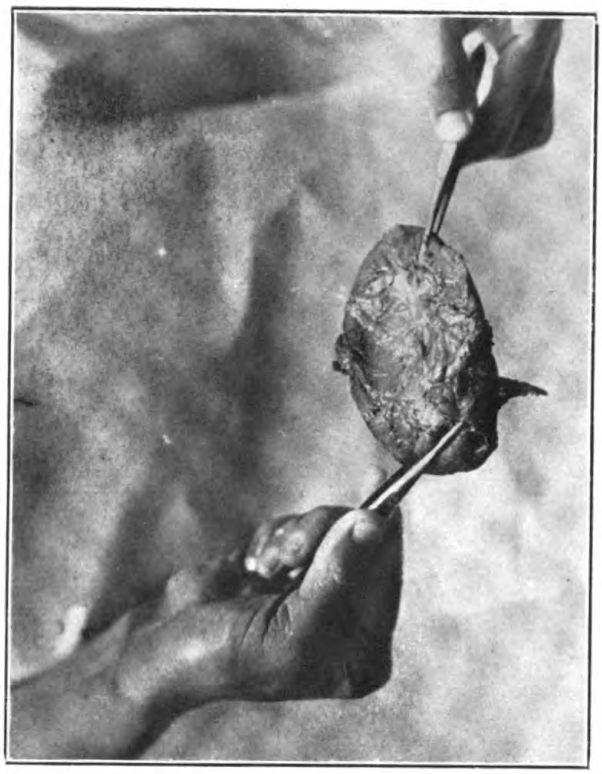
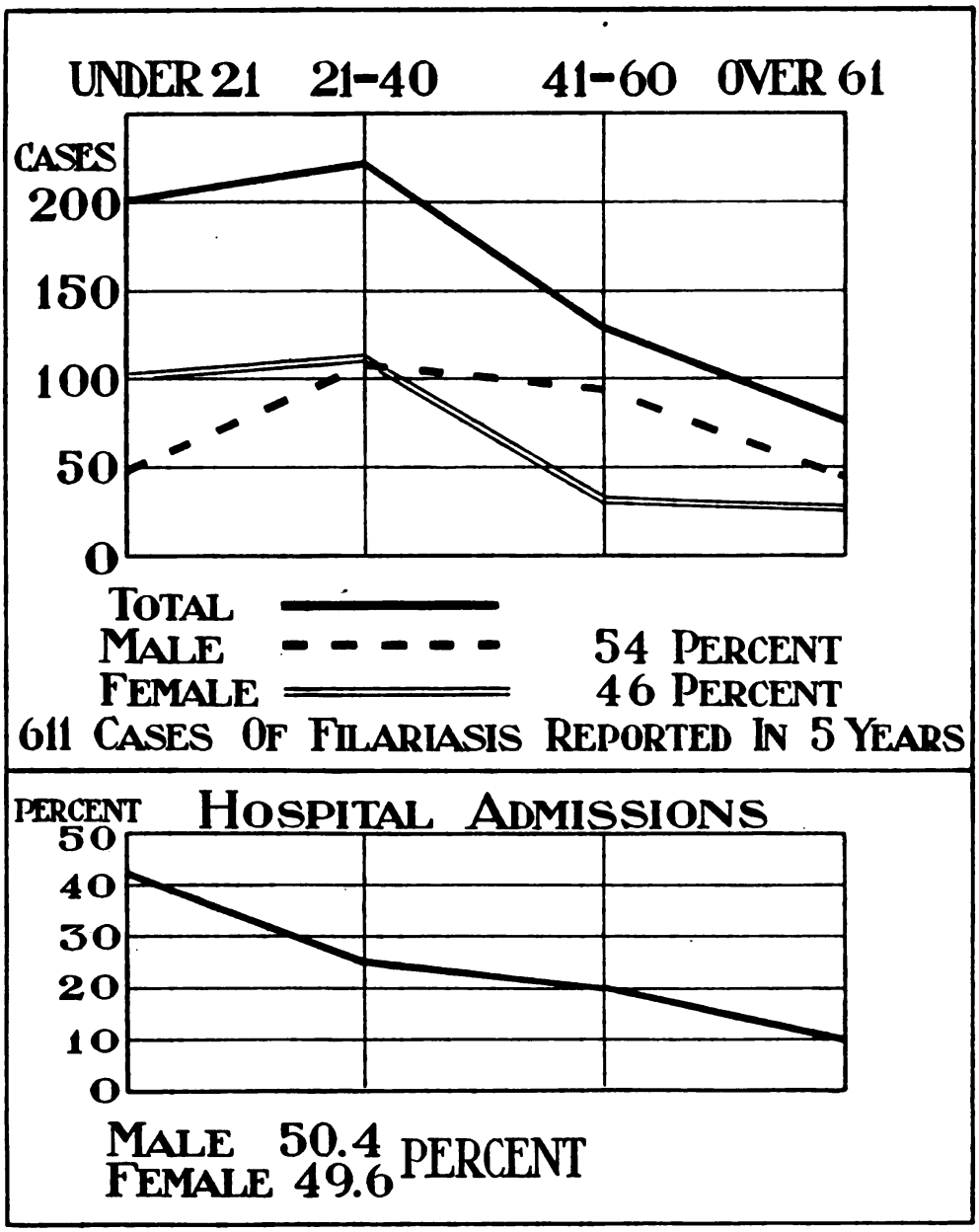
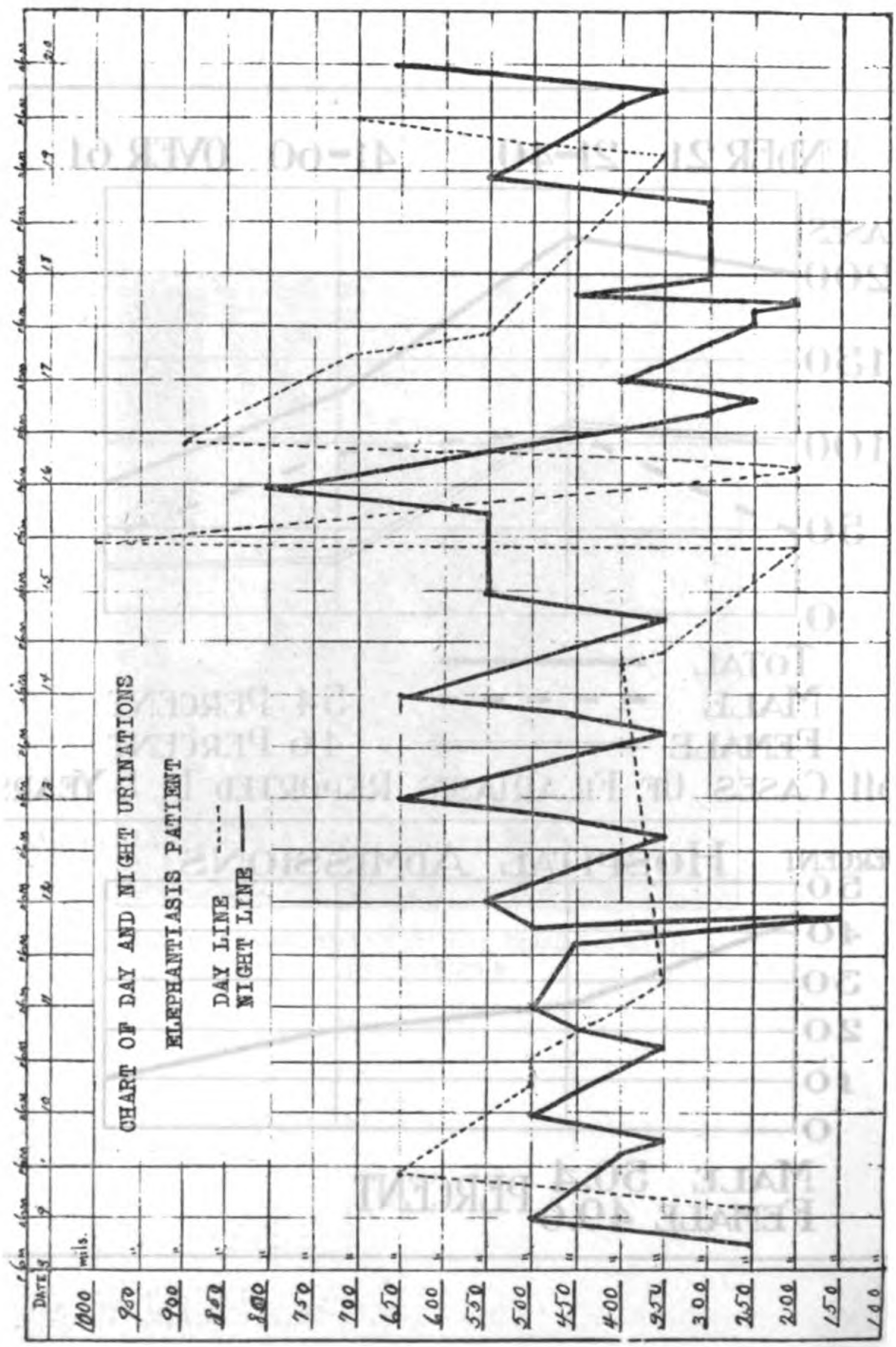


FIG. 1.—KIDNEY OF FILARIASIS. FRESH SPECIMEN. SOFT WITH PYRAMIDS PROMINENT

FIG. 2.—LARGE CYSTS OF THE KIDNEY ARE COMMON IN FILARIASIS

FIG. 3.—ENLARGEMENT OF THE FEMORAL GLANDS IN FILARIASIS





PYELITIS[1]

By ARTHUR B. CECIL, M. D., Los Angeles, Calif.

Having been a member of your corps, the problems with which you have to deal are familiar to me. I will therefore confine my remarks on the subject of this address to the practical consideration of the cause and treatment of pyelitis occurring in adult males. Before limiting the subject in this manner, it may be of general interest to call attention to one important observation. That is, while pyelitis is a common condition in children and in adults, it is not commonly seen in individuals around 10 to 16 years. Just why this is true is not clear. It has, however, an important bearing on the prognosis of pyelitis in infancy. Either these children must spontaneously recover or they must succumb to the infection. It is probable that the large majority of children with pyelitis spontaneously recover, and that only rarely does the child carry over into adult life a pyelitis contracted in infancy.

So-called pyelitis is probably always a pyelo-nephro-ureterocystitis to varying degrees. It is not conceivable that there could be an infection of the lining of the kidney without some invasion of that organ, and notwithstanding the remarkable relative resistance of the bladder the infection sooner or later becomes implanted in it. Practically every case of pyelitis is therefore associated with some degree of cystitis. The contrary, however, is not true, for there are a large number of cases of cystitis which persist over considerable periods of time without ascending infection taking place. These cases, however, are potentially cases of pyelitis, and in doing operative procedures for any cause whatsoever on an infected kidney which is constantly pouring bacteria into the bladder the danger of the other kidney becoming infected by an ascending process is a very definite possibility.

It is possibly true that in most cases of long-standing cystitis the kidney sooner or later becomes infected. As to whether this infection takes place by direct urinary regurgitation or along the lymphatics of the ureter is not known. Eisendrath thought that he demonstrated by observation of round-celled infiltration along the walls of the ureter that ascending infection might take place from the bladder, and that the infection ascended the ureter along the lymphatics. The recent work of Colgate Graves and Max Davidoff from the Harvard Medical School of Surgical Research showed that in rabbits at least, if the bladder were filled, regurgitation along the ureter into the kidney was not of infrequent occurrence.

[1] Read before the staff of U. S. Naval Hospital, San Diego, Calif., by request of the commanding officer, Capt. F. W. F. Wieber, Medical Corps, U. S. Navy.

That regurgitation may occur in man has long been known. This was first determined by making cystograms. The conclusions that we must draw, therefore, from a consideration of cystitis are that the kidney is in considerable danger of infection and that irrespective of what may have been the findings of the separate kidney urines, operative procedures upon a separate infected kidney secondarily infecting the bladder may be associated with ascending infection of the kidney on the opposite side, and that this should be guarded against in every instance by the forcing of large quantities of water, by treatment of the bladder infection, and by urinary antiseptics by mouth.

In the surgical work of the Navy you are not often called upon to deal with cases of prostatic obstruction. You are frequently called upon to deal with strictures of the urethra. In these cases the urine may be clear to begin with, but the overdistended bladder is a particularly susceptible organ to infection and an associated renal infection. Therefore, in dealing with your cases of stricture, whether infection of the urine is present or not, the possibility of infection of the bladder and of ascending renal infection must be borne in mind. I have laid particular stress on this point, for it has not been an uncommon belief that infection of the kidney was almost always hematogenous in origin and that the kidney was fairly safe from infection originating below.

Particular care should therefore be exercised in dealing with all cases of mechanical urinary obstruction if pyelonephritis is to be guarded against, for although one would feel that in the noninfected cases, if the urethral stricture is dilated or divided, the kidney should thereby be put in a more favorable condition for resisting infection, this is not true. Temporarily and immediately it becomes more susceptible to infection, as for years the bladder may remain tremendously distended and uninfected, and may immediately take on infection with the relief of the obstruction.

Before leaving the lower urinary tract, as a cause of pyelonephritis, one should consider the prostate and seminal vesicles as a cause. Anything that tends to produce cystitis has a tendency to produce pyelonephritis. Geraghty has called attention to infection of the prostate as a cause of persistent cystitis and therefore as a cause of pyelonephritis. Apparently organisms may invade the posterior urethra, later may invade the bladder, and still later may set up a pyelonephritis. The relation of ureteritis to pyelonephritis is a very important one. Hunner has long pointed out that inflammations frequently occur along the ureters, that they set up scar tissue formation with obstruction to the outflow of urine, and that as a result of this stasis the kidney becomes susceptible to infection.

He believes that ureteritis might be caused by distant foci of infection. However it is caused, there can be no question but that stricture of the ureter is a very real and important cause of infection of the kidney and also an important cause of persistence of this infection. Ureteritis is sometimes also caused by inflammatory processes in surrounding tissues such as pelvic inflammatory disease or appendicitis. The further consideration of the diagnosis of ureteritis will be taken up later.

I have rather chosen to trace backward, or from below upward, the causes of pyelonephritis, because it has long been considered that pyelonephritis was almost always a downward process. I would not, however, give the impression that either of these processes were more important. That the kidney, like other organs, may be without any inherent defect of itself or of its passages outward and that it may be the seat of frequent accidental infection goes without saying. This perhaps is the most common type of pyelonephritis. That for some reason the process begins directly in the kidney itself, more commonly if the kidney is the subject of insult either by injury or by foreign bodies, less commonly purely by accident, just as the appendix or any other organ may become infected.

I do not believe it is the function of the kidney to excrete bacteria. It does not seem likely that bacteria can become a part of the biochemical process of this organ as a normal process of excretion. A great deal of wasted time is taken up with the discussion of any medical subject by a large number of observations and well-known facts. I intend to dispense with these considerations and take it for granted that it is well understood that the determination that the patient has pyelonephritis at all is based upon this one fact—that the bladder urine, freshly voided, shows unquestionable bacterial infection. No diagnosis of pyelonephritis can be made without this as a starting point, and it has been my experience that this has been a very delayed starting point.

It is not uncommon to find extensive urological investigations and the determination of the urine from separate sides having been made when the composite urine is normal. Obviously, the separate urines must be normal, and therefore ureteral catheterization, so far as determination of infection is concerned, is useless. It is true that a beginning infection of the kidney for the first few days may show a perfectly sterile and clear urine, but these are cases in which it is necessary to wait for a diagnosis. No ureteral catheterization can help at this point. In this connection I would like to say something in regard to the study of the bladder urine. This I consider one of the most important parts of the examination, for without infection one is not dealing with pyelone-

phritis. With it pyelonephritis is yet to be demonstrated. The patient should be asked to void in three glasses. The second glass should be immediately centrifuged, the supernatant fluid poured off by turning the tube upside down, the sediment looped up with a platinum loop, the smear made on a perfectly clean glass slide, which must be so clean that no conglomeration of the urine be noted, otherwise the material will be washed off in staining. At the same time another specimen should be made for a cover-slip preparation. This procedure is far more valuable than simple inoculation of a culture tube with urine, for the danger of contamination is very great, and cultures, unless made by the plate method, are many times nothing more than the multiplication of contamination.

With cultures one will get varying reports. With direct slide smears one has undoubtedly a much more positive method of determining as to whether the urine is infected or not infected. The urine must be immediately examined, however, as the urine itself may multiply contamination to the point where it is worthless for study. No positive urology can be done by obtaining specimens and sending them to a laboratory where they may stand for a considerable period of time before being cultured, and as I have said before, the culture report may be an extremely erroneous one. Macroscopically the urine may be perfectly clear and yet show large numbers of bacteria which may be present without any considerable number of pus cells, and yet I believe these bacteria represent an inflammatory process and not physiological excretions from the kidney.

Having determined, therefore, that the bladder urine is infected, the next problem is to determine from whence this infection comes. A catheterized specimen of bladder urine should now be obtained and studied, and at this point a culture should be made to determine the infecting organism. The urethra should be examined for discharge; the epididymes for thickening or tuberculous nodules. The prostatic secretion should be expressed by massage and examined for pus.

X rays of the kidneys, ureters, and bladder should be made, A cystoscopic study is now either warranted or not. If the infection has been an acute one without previous bladder disturbances, it is possibly advisable to defer cystoscopy until further observation has been carried out with rest, forced water, and urinary antiseptics.

It seems to me doubtful as to whether cystoscopic examination or ureteral catheterization should be done except in the unusual case, in the presence of high temperature and acute symptoms. It is far preferable to defer instrumentation in the large majority of such cases. Should the patient's condition be no worse and should the infection persist after a period of some four or five weeks, where an acute onset has been observed, then it is advisable to do cystoscopic study and

separate urine determinations. At the time of cystoscopic study the patient should be told to void and be given a chance to empty his bladder. Upon introducing the cystoscope the presence or absence of residual urine should be determined. One should in the first place observe as to whether the bladder wall appears infected or not, and particularly as to whether it is trabeculated or not. It is also worthy of note that in certain young individuals in which there is obstruction at the vesical neck, a diverticulum of the bladder has not been uncommonly found. In these cases one oftentimes notes residual urine, but is astonished on observation of the bladder that the bladder wall does not show trabeculation. The diverticulum seems to act as a weak-walled safety valve, permitting dilatation at this point without thickening of the individual muscle bundles. Therefore in cases where there is residual urine without trabeculation of the bladder, one should very carefully search for diverticula. Posterior bar formation is a common condition in young people as well as in older men. Its presence is determined cystoscopically by finding an elevation running directly across the trigone at the region of the internal sphincter posteriorily. Normally one can observe the trigone from the interureteric band directly up to the internal sphincter without interruption. In contracture of the vesical neck the trigone is interrupted at the region of the internal sphincter.

Assuming that these studies have been carried out, ureteral catheterization is now done to determine as to whether the infection is unilateral or bilateral, or as to whether the kidney is infected at all, and at this time note should be made as to whether the ureteral catheters pass easily or meet with obstructions along the ureter. Urologists differ as to whether at this determination separate kidney function should be made. Personally I do not believe it is necessary or preferable to do all these studies at one time. Having determined that the kidney is the seat of infection, one must then determine why infection persists, but one should not be in such a hurry to make this determination that the persistence of infection has not been first demonstrated. In other words, that the man will not spontaneously recover without instrumental treatment. The persistence of kidney infections that are dependent upon the upper urinary tract are ureteral stricture or obstruction to the outflow of urine from the renal pelvis. These conditions must be determined by pyelogram.

I have not discussed the question of foci of infection as the cause of pyelitis, and in this category one must consider gastrointestinal disturbances. I have purposely avoided entering into detail or statistics. A very good collection of statistics on pyelonephritis was reported by Foote in the United States Naval Medical Bulletin about two years ago. Braasch, Kretschmer, and others have made valuable statistical reports.

I have reserved the treatment of this condition for the last. In acute pyelitis, or rather acute infections of the urine which are supposedly due to pyelitis, it is much better to work on the supposition that we are dealing with pyelitis than it actually is to make the determination. A great many of these cases will recover spontaneously and they should be allowed to do so. Rest in bed, urotropin, 15 grains freshly dissolved in a glass of water every three hours, codein if the bladder is causing severe pain. In chronic pyelitis dependent upon ureteral stricture, it is important that this be dilated. Any urinary obstructions below should be looked after. The prostate and seminal vesicles should be treated if they are diseased. The bladder should be treated by instillation of 1/500 silver nitrate, and the kidney should be treated by instillations of 1 to 2 per cent through a ureteral catheter.

Neither pelvic lavage nor bladder lavage in the sense of washings should be used. Instillations should be made as easily as possible; the solution simply put in and the instrument withdrawn without further procedure. In urological investigations of pyelitis, where one expects to carry out numerous instrumentations, it is most important that these be done without pain. In nervous, apprehensive individuals, at the first ureteral catheterization the patient should be given one-sixth grain morphine and one-two hundredth grain scopolamine one and a half hours before the contemplated examination is to be carried out. One hour later this dose should be repeated. At the time of examination a Keyes-Ultzemann syringe should be used to instill into the posterior urethra a few drops of 10 per cent cocaine solution, a drop or so at the external sphincter, another at the verumontanum, and another at the internal sphincter. I have found nothing else to produce this degree of ease of examination. It is rarely necessary to repeat the scopolamine and morphine at subsequent treatments or studies, because the patient is now sure that the instrumentation is neither dangerous nor painful, but the cocaine instillations are rather valuable. This amount of cocaine produces no toxic symptoms, but instrumentation must be done with sufficient skill to avoid trauma and thereby undue absorption.

In this connection I would like to add that the scopolamine and morphine injections are particularly useful in studying cases of tuberculosis of the genitourinary tract, where the bladder tends to spasm tremendously, making examination at times almost impossible. General anesthesia in these cases suppresses urine and thereby oftentimes renders the examination quite useless in that one is unable to collect specimen from the kidneys.

Before concluding this discussion I might mention that there are certain rare cases of persistent pyelonephritis with attacks of fever occurring over a period of many years, in which nephrectomy is

indicated, but in a great number of cases in which I have carried out the study of pyelonephritis I have seen but two in which I thought this was indicated. It was not done, and both recovered. I mention this only to restrain a certain tendency toward rapidity of cure.

RECENT OBSERVATIONS ON THE PHYSIOLOGY OF THE GALL BLADDER IN CONNECTION WITH CONDITIONS REQUIRING SURGICAL RELIEF

By J. A. Biello, Lieutenant Commander, Medical Corps, United States Navy

In a brief review of some of the important conditions of the gall bladder and biliary system requiring surgical relief it is the object of this short paper to incorporate a few of the more recently discovered facts concerning the function of the gall bladder in order that an understanding of the relations between the physiology of the organ and the pathology present may better enable the surgeon to determine the operation of choice in each instance. While it is frankly admitted that there are many cases in which the pathological condition present renders cholecystectomy the imperative procedure, there are many other cases in which some doubt exists as to whether cholecystectomy or cholecystostomy should be done, and it is to these cases that the subject matter of this paper is devoted.

The points of importance to be considered in such cases are: (*a*) What is the function of the gall bladder and (*b*) can it resume its functions after a cholecystostomy has been performed?

Heretofore the gall bladder has been regarded as an organ with no definite function to perform except to serve as a reservoir for bile. Most physiologists describe the gall bladder as nothing more than a distended cystic duct terminating in a pouch, or a diverticulum of the cystic duct which serves no other purpose than the storing of bile. In other words, the bile which is continuously formed by the hepatic cells is stored in the gall bladder and only delivered to the duodenum when the distention of the viscus reaches the point when a stimulus relaxes the sphincter of Oddi and the bile flows freely into the duodenum. This being brought about, according to Burton-Opitz (1) by the stimulus of the chyme in the duodenum, acting upon the celiac ganglion of the solar plexus, and the gastroduodenal plexus, causing the contraction of the gall bladder wall and the relaxation of the sphincter at the same time.

In recent experimental research at the University of Pennsylvania under the direction of Dr. J. E. Sweet, exhaustive study of the gall bladder has yielded a more comprehensive and detailed account of both the anatomy and physiology of this organ. The mere fact

that the gall bladder originates from the same source in the embryo as do the stomach, the liver, and the pancreas has given rise to a belief that the gall bladder is something more than a simple reservoir for bile. Studies along this line have resulted in a more detailed anatomical and physiological description of this organ. By its mere position, i. e., by its attachment to the liver surface, it is so arranged that in the upright position the fundus is at a lower level than its outlet and therefore mechanically it is practically impossible for it to empty itself completely by the mere contraction of its muscular walls. Furthermore, the S-shaped curve formed by the cystic duct renders the emptying of the organ quite difficult if not impossible, because this curve would become more marked whenever pressure is exerted from above. A study of the mucous membrane lining of the cystic duct shows it to be made up of spiral folds which, under pressure from above, would fold upon each other, causing a shutting off of the duct and thus prevent emptying of the viscus. This spiral formation of the lining of the cystic duct was described originally by Heister and is known as Heister's valve. Little attention was paid to it until recently, and the conclusion reached by Doctor Sweet in a recent paper read before the College of Physicians of Philadelphia as to the importance of this spiral valve which is funnel-shaped, i. e., wider at the gall bladder end and narrower at the cystic duct end, is that these spirals would, *per se*, hinder the emptying of the gall bladder whenever pressure was exerted upon it.

As to the structure of the gall bladder proper, little need be said of the two layers down to the muscularis, viz, the peritoneal and the connective tissue coats. The third (muscular) and the fourth (mucous membrane) layers, however, deserve special consideration. The muscular coat consists of long circular and diagonal fibers, and it is by the contraction of this muscular coat that the inner or mucous layer is thrown into numerous folds, which when viewed under the binocular microscope resemble inclosed spaces, (2) so to speak, which are continuously being changed in size and shape. It is by the muscular contractions of the wall of the gall bladder that the entire surface of the mucosa is brought in contact with the bile, thus facilitating the flow of lymph within the walls of the organ. The rich and delicate blood supply of the wall of the gall bladder is also quite important when one considers that each arterial twig carries with it two accompanying veins. In the crypts of the folds of the mucous membrane one finds a very rich plexus of lymph channels, with solitary lymph follicles distributed along their course. This structure is analogous to that found in the lining membrane of the common and hepatic ducts, which also contain all along their walls little saccules or pouches situated within the fibro-muscular coat

of the ducts, which have been called by Beale "supplementary little gall bladders." It is natural to suppose that a viscus provided with such a delicate and rich supply of blood vessels and lymphatics, and provided with a valvelike device in the cystic duct, which is probably intended for the purpose of preventing outflow, has a greater duty to perform than to serve merely as an ordinary reservoir for bile, particularly when one considers that the capacity of a normal gall bladder is about 30 cc. while the daily output of bile from the liver is about 120 cc.

Interesting experiments were carried out by Diamond (3) of New York. He injected a stated amount of a carmine solution into the gall bladder of an animal, and made a duodenostomy opposite the ampulla of Vater into which a metal canula was inserted, secured, and brought out through the abdominal wall. After the animal had recovered from the anesthetic, magnesium sulphate was introduced into the duodenum in accordance with the Lyon technique, but the duodenal contents collected through the canula at stated intervals failed to show the presence of carmine. This is almost conclusive evidence showing that while bile flowed down into the duodenum and out through the canula the bile did not come from the gall bladder.

Doctor Sweet's experiments have justified the assumption that inasmuch as the gall bladder wall contains such a rich supply of lymphatics and blood vessels, and as the bile is directly concerned with the absorption of fats the products of which pass from the intestinal wall into the lymphatics, it is reasonable to expect that the gall bladder has something to do with fat metabolism, probably by "taking fat from the bile and restoring it to the circulation" (4). This idea is substantiated by the fact that cholecystectomized patients often put on weight, or are incapable of properly caring for fat diets.

The absorption of cholesterol in the gall bladder is also proven by the experiments of Doctor Sweet, which consisted of feeding to a normal dog a known amount of fat and taking the cholesterol content of the blood at stated intervals. The gall bladder was then removed. The same fat meal was then given and the cholesterol tests repeated; the result showed that the blood cholesterol rose very noticeably immediately after the removal of the gall bladder, slowly rising until it reached double the normal and was followed by a gradual decline to the normal level 40 days after the operation. Another interesting fact drawn from this experiment is that the saccule appendages found along the inner walls of the bile ducts, both within and without the liver, called by Beale minute or supplementary gall bladders, were found hypertrophied; this hypertrophy being a slow process and coincident with the fall of the choles-

terol curve as above described; i. e., when the cholesterol curve reached normal a general hypertrophy of these supplementary gall bladders along the ducts was found (5), thus proving that these supplementary gall bladders hypertrophy and take up the function of the main gall bladder when the latter is removed.

So one naturally concludes from the above experiments that the gall bladder performs a definite function *per se*. In other words, the bile which enters the gall bladder has a definite function to perform *within* the gall bladder itself; and since removal of the organ is followed by a disturbance of the fat and cholesterol metabolism, it is reasonable to assume that the principal function of this viscus is to aid in maintaining the fat and cholesterol balance in the system, especially when one considers that it is extremely doubtful if the bile which enters the gall bladder ever leaves it again through the cystic duct; in fact, Doctor Sweet definitely states that it does not (6).

In view of the above facts, then, and of the structure of the biliary system and its physiology, the question naturally arises, What shall the surgeon do with conditions affecting the gall bladder?

Obviously, in case of a gall bladder seriously damaged by disease, benign or malignant, and hopelessly incapable of ever being able again to perform its function, cholecystectomy is the operation of necessity. However, in cases in which the function of the organ can be restored wholly or in part, drainage is the operation of choice, particularly in cases of disease which involves not only the gall bladder but the common and hepatic ducts, with their millions of supplementary gall bladders. In these cases the drainage operation would seem not only safer but the gall bladder can be utilized as a general avenue of drainage from the diseased area, which would otherwise be left closed and undrained in case the cholecystectomy was performed. In this connection it may be said that a cholecystostomy properly and carefully done should not be followed by the troublesome fistulæ and adhesions, which many give as reasons in favor of the cholecystectomy.

There are many cases on record in which the return of symptoms following a cholecystostomy have been attributed to the retained gall bladder, while the actual cause has been found to be elsewhere, such as in the pancreas, duodenum, appendix, and so forth; in the same way, the return of symptoms following the removal of stones through a cholecystostomy has been attributed to the retention of the gall bladder while the symptoms actually were due to the formation of a new stone or a stone overlooked at the time of the primary operation.

It is now generally believed that infections of the biliary tracts begin in the liver, and this being the case it seems fallacious to re-

move a gall bladder that could be utilized as a point of vantage in draining off the diseased area in the common and hepatic ducts.

While so much may be said in favor of one or the other of the operations upon the gall bladder, the primary reason for the operation of choice should be based upon the extent of the pathology present, and a conviction on the part of the surgeon of the fact that the gall bladder has a definite function to perform; that like other organs in the body it can resume its function when properly treated. When a gall bladder is found that is not hopelessly diseased, an attempt to save it for the future performance of its function should be made.

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THE KAHN PRECIPITIN TEST AS PERFORMED ABOARD THE U. S. S. "HENDERSON"

By J. C. Parham, Lieutenant Commander, and C. F. Behrens, Lieutenant, Medical Corps, United States Navy

Every medical officer who has performed sea duty will recall without difficulty occasions when he has wished that he could gain access to laboratory facilities requisite for the performance of the complement fixation test for syphilis. Such occasions arising with more than ordinary frequency on the *Henderson*, while engaged in transport duty in the West Indies, caused us to equip the ship's laboratory with the necessary paraphernalia and laboratory animals for the performance of the standard modified Noguchi technique as employed in most of the naval laboratories ashore.

The results obtained justified the added difficulty encountered in performing such tests aboard ship, but it was soon realized that a simpler technique, if equally reliable, would be highly advantageous. At the suggestion of the Surgeon General we undertook the performance of the recently developed rapid precipitation phase of the Kahn test for syphilis, with the idea in view of determining first its reliability, and secondly, its applicability to ships of the Navy. So far 209 tests using the Kahn technique have been done. Of this number 158 were checked with the Noguchi test with the results as shown below. For purposes of comparison the results are tabulated in a somewhat similar manner to that employed by Doctor Kahn in his article in the Journal of the American Medical Association, July 14, 1923.

TABLE No. 1

Total tests	158
Positive reaction with Noguchi and Kahn	38
Negative reactions with Noguchi and Kahn	115
Total agreement	153
Or 96.8 per cent.	
Negative Noguchi and positive Kahn	5
Positive Noguchi and negative Kahn	0
Total disagreement	5
Or 3.2 per cent.	

Doctor Kahn's table of comparison between his test and Wassermann reactions is given below. Our findings, as will be seen, agree substantially with his.

TABLE No. 2

Positive reactions in Wassermann and Kahn precipitin test	405
Weak positive reactions in Wassermann and Kahn precipitin test	50
Negative reactions in Wassermann and Kahn precipitin test	1,544
Total agreement	1,999
97.04 per cent.	
Weak positive with Wassermann and negative with Kahn test	18
Negative with Wassermann and weakly positive with Kahn test	43
Total disagreement	61
2.96 per cent.	

In our series, the five patients in whose cases disagreement occurred (negative Noguchi and positive Kahn) were all treated syphilitics. Accordingly we have at once an indication that these positive precipitin tests were in all probability not false, and a further indication that the test is of relatively high sensitivity. No tendency toward false positive reactions has been observed with the Kahn test. Thus, although the number of tests we have performed is extremely small to base definite conclusions upon, nevertheless, in view of the fact that our results parallel so closely those of Doctor Kahn in his series of over 2,000 tests, we feel justified in the conclusion that the precipitin test is both reliable and delicate.

The practicability of the test aboard ship will be best brought out by a brief account of the reagents and apparatus required and the technique employed. Aside from the serums to be tested and psysiological salt solution, the only reagent employed is antigen. This is a cholesternized alcoholic extract of powdered beef heart which has been previously extracted with ether, the etheral extract being discarded. The requisite glassware consists of small glass vials for mixing antigen and salt solution 1.5×5.5 cm., test tubes.

preferably 1.0×7.5 cm. 10 c. c. pipettes graduated to 0.1 c. c., 1 c. c. pipettes graduated to 0.01 c. c., and 0.2 c. c. pipettes graduated to 0.001 c. c. In addition we have found it convenient to make small pipettes for the test terums corresponding in number to the usual number of serums to be tested at one time. These are made of ordinary glass tubing and graduated to deliver 0.15 c. c. The remaining apparatus needed consists of test-tube racks of appropriate design and a water bath. A centrifuge is also highly desirable in order to hasten and facilitate the separation of serum from clot. It might be noted here that our racks and a water bath heated by steam coils were made for us in the ship's machine shop without difficulty.

The actual performance of the test is a fairly simple procedure. Serums are separated from the clotted blood by centrifugalization in the usual manner and are then inactivated by heating for 30 minutes in a water bath at 56° C. Antigen dilution is prepared by the rapid mixing of approximately equal amounts of stock antigen solution and salt solution, the exact amount of salt solution being determined for each lot of antigen by titration. The antigen dilution is allowed to stand for 10 minutes, after which the tests are run at once, since it is not stable for more than about 30 minutes. In performing the tests three tubes are used for each serum. In these tubes varying amounts of the antigen dilution are pipetted to the bottom, followed by serums, as indicated in Table No. 3.

TABLE No. 3

	Tube No. 1	Tube No. 2	Tube No. 3
Antigen dilution, cc	0. 05	0. 025	0. 0125
Serum, cc	0. 15	0. 15	0. 15

This results in the following antigen mixture-serum dilution: Tube No. 1, dilution 1–3; tube No. 2, dilution 1–6; tube No. 3, dilution 1–12. The tubes are next shaken vigorously for 2 minutes and then incubated for 15 minutes in a water bath at 37° C. After this 0.5 cc. of salt solution is added to each tube and the tests are ready to be read. Positive tests are indicated by the presence of precipitate, abundant in strongly positive cases and grading down to the slight precipitates of weak positives. In negative cases nothing but opalescense is observed.

From this outline we think it is evident that the technique is neither difficult nor cumbersome. A very reasonable amount of laboratory experience combined with the habit of careful, painstaking work, should prove basis enough for undertaking the performance of this test.

For the full details of the test the interested worker is referred to Doctor Kahn's very clear discussion of the subject in his articles.

In conclusion we wish to express our appreciation of Doctor Kahn's interest and very material aid in supplying us with antigen, glassware, and literature. We further gratefully acknowledge the willing help and cooperation of Lieut. R. F. Sledge, Medical Corps, United States Navy.

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A FURTHER STUDY OF PRISONERS AT THE NAVAL PRISON, PORTSMOUTH, N. H.

By A. W. Stearns, Lieutenant, Medical Corps, United States Naval Reserve Force

For over 10 years the Bureau of Medicine and Surgery has been interested in the study of mentality of the naval delinquent, and several very thorough and interesting reports have been made. By the bureau's direction the writer recently made a further study of prisoners at the naval prison, Portsmouth, N. H., and it is considered advisable to publish the brief abstract of each case with a summary of the findings for the further information of the medical officers of the service. The memoranda of cases was prepared by Lieut. P. T. Crosbie, Medical Corps, United States Navy, and it is desired to make acknowledgment of his helpful cooperation in conducting this investigation. It is appreciated that no new evidence has been found, but this study confirms the previous opinion expressed by the author in an article that appeared in the Naval Medical Bulletin, July, 1918, concerning the importance of investigation of social history and the personality study of the recruit. Although the intelligence test has its place for group classification at training stations, especially for candidates for the various service schools, it is not considered advisable to use it at the recruiting station for the reasons stated in an article in the United States Naval Medical Bulletin, February, 1924. The excellent reports made by Lieut. G. E. Thomas (United States Naval Medical Bulletin, April, 1915), Lieut. A. L. Jacoby (United States Naval Medical Bulletin, July, 1918), and Lieut. R. P. Parsons (Annual Report of the Surgeon General, 1919), also confirm the belief that the social history and personality study are of greatest value in eliminating the mental defective at the recruiting stations. All of these studies of naval prisoners agree that 50 per cent of the cases should have been eliminated on enlistment.

In view of the fact that special attention is now being paid to the mental conditions of the recruit, these abstracts are given in order that medical officers may become familiar not with diagnosis particularly, but with the kind of information that should be obtained at the recruiting office. It will be seen that these cases are not particularly feeble-minded, neurasthenic, or insane, though they are some of each, but that they are all social problems, which should be easy to detect and excluded regardless of diagnosis. It will be noted that there are 23 per cent with over three years' service and over 50 per cent with more than a year's service. In a larger percentage desertion was merely secondary to a more serious crime.

ABSTRACT OF CASES EXAMINED AT UNITED STATES NAVAL PRISON, PORTSMOUTH, N. H.

13307. Nervous since childhood. Could not stand heights. Faints at the sight of blood. Seventh grade. Wanted to get away from New York for health. In Navy. Apparently had neurasthenia. Hospital for survey, but returned to duty and ran. Diagnosis: Nervous instability.

12884. Would not go to school. Repeated truancy. At 16 sent to reform school for 30 months. Two arrests for gambling. Bummed around, working off and on. Joined Navy. In three months A. W. O. L. Returned and ran again. Diagnosis: Social problem.

13292. United States Navy during war. Out two years. Arrested for drunkenness and disorderly conduct. Fifty-two days in house of correction, Detroit. Trouble with wife. Reenlisted and deserted. Social problem.

13240. Fifth grade. Irregular in school. Enlisted 1920 at 16. Deserted in three months. Roamed about country. Constitutional inferiority and social problem.

13147. Eighth grade. Trouble at home. Father and mother quarreled. Left in rage and joined Navy. Returned to continued quarreling. Diagnosis: Emotional upset.

13277. School for feeble-minded from 10 to 18 years. Ten months in reform school for breaking and entering. Joined Navy. Diagnosis: Low-grade imbecile.

13295. Fifth grade. Spasms for 10 years. Always nervous and sick. Married. Wife trying to get divorce. Enlisted to escape her. Deserted to avoid allotment. Constitutional inferiority. Psychotic episode.

13124. Born in Russia. Worked as motorman in Chicago. United States Army two years during war. Left job to go to country for health. Symptoms suggest neurasthenia. In Navy wished

to have operation. Could not get it, so deserted. Diagnosis: Neurasthenia.

13252. Eighth grade. United States Army 1918–19. Deserted. Vagrant. Many arrests. Six months in Stockton, Calif., jail for breaking and entering. Joined circus and went traveling about country. Social problem.

13234. Sixth grade at 14. Canadian Army 1914–1916. Medical discharge. Gas and mental. Roamed about country. Enlisted in America. Went to Newport. Two months later in Bellevue Hospital in New York for drug addiction. Diagnosis: Drug addiction and unqualified mental disease.

13250. Fifth grade. Convulsions till 1921. Inmate of poor farm in New Hampshire prior to enlistment. 1917, United States Navy. Undesirable discharge. 1919–1921, United States Navy. Deserted 1923. United States Army, 57 days. Deserted. Reenlisted United States Army, Governors Island. Turned over to Navy. Diagnosis: Epileptic dementia.

13099. Fourth grade in school. Held back. Roamed about country. Several arrests for drunkenness. Enlisted. Indicted for murder in New Jersey. Held 12 months. Tried and acquitted, though companion convicted. Social problem.

13286. Sixth grade. Repeated fifth. Several arrests for truancy. Drifted about New York. Arrested two or three times for vagrancy. Enlisted. Deserted in two months. Social problem. Border line feeble-minded.

13175. Upon admission to prison depressed. Auditory hallucinations. Self-accusatory. Perhaps prison psychosis or old case of dementia precox.

13205. A drunkard for many years.

13218. Repeated two grades. Odd jobs. Two arrests for drunkenness. Inferior intelligence.

13201. Fourth grade at 17. United States Army five years. Marine Corps two years. Feeble-minded.

13212. Fifth grade. Repeated several times. United States Army six years. Down and out. Border line of feeble-mindedness.

13207. Eighth grade. Repeated several. Reform school 18 months for stealing. Enlisted at 15, United States Navy. Dishonorable discharge. Then 13 months in Indiana Penitentiary for stealing auto. Many other arrests. Several aliases. Diagnosis: Defective delinquent.

13222. About two years prior to enlistment began to notice bad odor on body. People made bad remarks about him. Went from place to place to escape. Diagnosis: Dementia precox.

13215. Industrial school at 14. Arrested for stealing auto. Nine months' probation. Syphilis at 16. Arrested again for stealing auto; three years. Diagnosis: Social problem.

13212. Sixth grade. Fainting spells. Suggests epilepsy. Dull and sterotyped manner. Marked memory defect. Probably epileptic dementia.

13203. Trouble at home. Enlisted. Discharged. Under age. No money. No work. Discouraged. Reenlisted. Dementia precox or personality disorder.

13204. Nervous. Hypererosis. Out of work. Diagnosis: Constitutional inferiority.

13198. Broken home. Seventh grade. Repeated fourth. Arrested at 11. In juvenile court. Irregular work. None for two months when enlisted. Social problem.

13170. Broken home. Boarded out. Truancy. Fourth grade in seven years. Reform school two months. Discharged from army after one year. On way home down and out in St. Louis. Broke. Feeble-minded.

13159. Expelled from school for truancy. One arrest for drunkeness. Traveled about country with gang. Social problem.

13160. Sixth grade. Two years in third and fourth. A roamer. Inferiority. Social problem.

13176. Repeated third and seventh grades. Home broken. Juvenile court record. Thirty days Blackwell Island. Defective. Social problem.

13182. Seventh grade at 19. Unconscious attacks till four years ago, in which he bit and voided. Epilepsy.

13089. Fifteen months in reform shool. Roamed about. Many jobs. Social problem.

13032. Peculiar stereotyped manner. Looseness of thought. Enlisted four times under different names. Deserted after nine months. Probably has psychosis. Striking personality disorder.

13062. Eighth grade. One arrest for destroying property. Bummed way from New York to San Francisco on freight train. No work. No money. Enlisted in Navy. Homesick in four months. Social problem.

13025. Eight years of roaming about country, bumming most of time. Deserted twice. Second time because he did not get medical attention. Diagnosis: Social problem.

13116. Now admits abnormal sex prior to admission.

13057. Seventh grade two years. Vagrant, roaming about country. Drinking. No work. United States Navy because down and out. Social problem.

12774. Seventh grade. Forged birth certificate to enlist at 16 years. One arrest for stealing. Under age and social problem.

Salvan. Seventh grade. United States Army. Deserted. Claims five enlistments in United States Navy under different names. Can not give connected life history. Probable diagnosis: Dementia precox.

13255. Seventh grade. Held back. Roaming from coast to coast. Deserted three weeks after enlistment. Diagnosis: Border line of feeble-mindedness.

13263. Seventh grade. Held back once. On second cruise got drunk and deserted. Diagnosis: Inferiority.

12789. Seventh grade. Irregular work. Down and out for three years. Enlisted. Social problem.

13065. Eighth grade. Arrested for robbery. Two years Randalls Island. Social problem.

13074. Broken home. Orphanage. Reform school three years. Enlisted under age. Diagnosis: Social problem.

12780. School for 14 years. Two years each in second, third, and fifth grades. In Navy five years. Feeble-minded.

13192. Fifth grade at 14. Repeated third and fifth. Odd jobs. Irregular employment. Feeble-minded.

12754. Eighth grade. Three years in reformatory for stealing. United States Army three years. Put in charge of canteen. Stole $600 and ran. Social problem.

13233. Second grade. One arrest for vagrancy, one for robbery; six months Fort Riley. Deserted from Army. Feeble-minded.

13228. Broken home. Eighteen months reform school at 14. Then a vagrant. Nine months at another reform school. Social problem.

13209. Second grade at school. Held back several times. Ran away at 16. Roamed about country. Down and out. Enlisted. Feeble-minded.

TABLE 1.—*Length of service at time of desertion*

Under 3 months	
3 to 6 months	1
6 to 9 months	
9 months to a year	
1 year to 18 months	1
18 months to 2 years	
Over 2 years	2
During second or later enlistment	

TABLE 2.—*Social and family history prior to enlistment*

Broken home. Loss of one parent. Brought up by relatives	
Broken home. Loss of both parents. Brought up in orphan home or institution	
Broken home. Loss of one parent. Brought up by other	

Arrests for truancy, thefts, misdemeanors, drunkenness, assault and battery	9
History of commitment to correctional institution before enlistment	7
Broke and out of work at time of enlistment	17
Home happy	9
Quit work to enlist. Not broke	43
Truancy or vagabond	12
Home unhappy. Parents disagreeing	8

TABLE 3.—*Educational acquirement*

Less than eighth grade	35
Eighth grade	21
1 year high school	9
2 years high school	8
3 years high school	
Finished high school	2
College less than 2 years	
College more than 2 years	
Business college	
Other acquirements after schooling: 2 years at West Point	1

TABLE 4.—*Intelligence test (modified Binet-Simon)*

Inadequate	16
Adequate	50
Border line	12
Possible dementia	1

TABLE 5.—*Reason for desertion, own statement*

Family trouble or sickness at home	13
Unhappy on present ship or station	11
Could not get leave	1
Could not get medical treatment	5
Homesick.	
Over leave because of "love affair"	1
Persecuted by superior officer	5
Wanted transfer but could not get it or not granted	5
While on leave afraid to come back because of fear of punishment or no money	1
Seasickness or gunfire or both	2
Recruiting officers told wrong story of Navy	5
Fraudulent enlistment	10
Desertion while prisoner at large or breaking arrest	9
Desertion while drunk on "spree"	14
Desertion complicated with other offenses, as theft, disorderly conduct, etc.	2
Desertion of others or persuaded by others	2

TABLE 6.—*How returned to service*

Picked up	31
Turned self in	32

TABLE 7.—*Age at enlistment*

17	3	22	8	27	1
18	16	23	4	29	1
19	9	24	3	30	1
20	12	25	1	35	1
21	11	26	1	36	1

THE RECTUM AND DISEASES OF THE GENITOURINARY TRACT

By L. H. WILLIAMS, Lieutenant, Medical Corps, United States Navy

Except in works devoted to the rectum and anus, slight notice is paid to the close association and relationship of diseases of the rectoanal region and diseases common to the genitourinary tract.

The close embryological connection between the anorectal region and the bladder, prostate, and seminal vescicles, developed as they are from the common anlage, the cloaca, should of itself cause more attention to be given to the study of diseases of the genitourinary tract as they affect the rectum.

The rapid advance in the study of genitourinary diseases, their prevention and treatment, has been phenomenal in the past generation. The genitourinary specialist to-day is enabled, with the aid of the cystoscope, ureteral catheters, X-ray, and kidney function tests to ferret out and successfully treat conditions which the past generation could at best only guess at or diagnose by a keen clinical sense and exhaustive urine examination.

The anorectal region was speedily used as an avenue of approach in the treatment and diagnosis of diseases of the prostate and seminal vesicles. The anorectal region as a guidepost and as a habitat of the common infections of the genitourinary tract was spurned by the specialist in genitourinary diseases and left to the true rectal specialists, of whom there have been entirely too few, since scientific medicine came into its own.

Chronic prostatitis and chronic seminal vesiculitis—two potent causes of inefficiency, chronic ill health, and melancholic view of life—often are first complained of and located by the sufferer in the rectum. Pain at intercourse and stool is referred to the rectoanal region very frequently in these patients and the individual very naturally seeks aid for some rectal condition. The general order of things is to go to the doctor, who may or may not examine him for rectal pathology, substituting usually a salve for a thorough rectal examination. Frequently hemorrhoids are found and operated upon with little or no relief of symptoms. The patient may finally fall into the hands of a genitourinary specialist who by proper treatment may greatly alleviate the condition or effect a cure.

When a patient comes with a complaint referable to the rectum, he should by all means be closely questioned as to his venereal history and his health record referred to. If married and middle-aged on a long cruise, or a widower, a distended prostate is often at the seat of his complaint. Prostatic massage and dilatation of the posterior urethra is indicated and usually is very effective in relieving the complaint.

Syphilis, that protean disease, commonly attributed to the genitourinary tract in origin, because of the frequency with which it gains entrance there, is a more frequent invader of the rectoanal region than is commonly supposed.

It attacks in the form of ulceration or chancre. Syphilitic ulceration of the rectum is insidious in its onset and may never be complained of until stricture of the rectum occurs. It is comparatively easily distinguished from the two other common ulcerations of the lower bowel, namely, tuberculosis and amoebeic dysentery by history, lesions elsewhere, Wassermann reaction, and the tendency to stricture. The Wassermann reaction is frequently negative by the time the stricture develops.

Stricture of the rectum, other than traumatic or malignant, is believed by many writers to be almost entirely due to syphilis. Primary innoculation of the anus, the chancre, is rare, but more common than is generally believed, and is almost always evidence of sodomy. It is the criminal element which tends to hold its incidence of report so low.

The writer has recently received a communication from a medical officer who has treated two cases of primary chancre of the rectum to successful negative Wassermann within the past year.

Primary chancre of the anus differs from ordinary chancre of the penis or lip in not being hard. It is soft and more like a fissure or a protuberance of the mucous membrane than anything else. Spirochaeta pallida can usually be found in the lesion, if untreated.

The condylomata due to syphilis, so frequently seen about the anus are mentioned only in passing, yet they serve in numerous instances to start the sufferer, through the complaint of rectal troubles, on the road to proper treatment and recovery of health. Chancroidal ulceration of the anorectal region is not so rare. It is usually found in people of low intelligence and standard of living. Chancroidal infection as a rule can be found elsewhere. It is usually seen as an ulcer about the anus, clean-cut and undermined, the base uneven and covered with a grayish membrane. It is foul smelling. Small ulcers may coalesce. In the mucous membrane they occur as yellowish gray fissures. The pain is intense and like that of fissure. The patients come to the proctologist for treatment of fissure, prob-

ably on advice of a friend. The best treatment is cauterization and cleanliness with mild antiseptics.

Gonococcus infection of the rectum and anus up to a few years ago was unsuspected. Yet it is frequent in women and not rare in men. The method of inoculation is usually by hand or sodomy.

The first symptom is one of fulness in the rectum with desire to strain. Severe burning pain with aching follows with a discharge of mucus and pus. Blood may be in the discharge if the condition is severe. Bowel movements cause great pain when the condition is well developed. The ulceration about the anus, due to discharge of the secretion, causes severe distress, pain and sleepiness with loss of weight and strength. The diagnosis is assured by finding the gonococcus infection with characteristic symptoms and signs.

The gonorrheal vegetations or condyloma acuminata grow to a large size and form excrescences of a pale reddish appearance and do not resemble the flat, grayish condylomata of syphilis.

The rectum and anus enter prominently into the realm of sex perversions. The anal mucous membrane is capable of imparting pleasurable sensation in certain individuals who attempt to increase their pleasure by rubbing, with blunt instruments, the anus and rectal walls. The number of bottles, candles and such objects which have been recovered from the rectum are very numerous in medical literature.

Cancer of the prostate, in every sense the province of the specialist in genitourinary diseases, is often discovered by the examining finger of the doctor seeking to discover the reason for a rectal complaint.

The patient may come to the proctologist with the complaint of pain in rectum, hemorrhoids, or any of the common rectal diseases and be found to have in addition a hard, boardlike prostate, often nodular, not much enlarged. When age is considered, it is comparatively easy to surmise the trouble and refer him to the right man. Such cases are usually seen early by rectal men. As the condition is a very serious one with low expectancy of life, the earliest possible discovery is the object to be attained.

Inflamatory conditions of the bladder, which have caused it to become adherent to the rectal wall, will give rise to pain at each movement of the bowels, though the bladder itself will give few or no symptoms unless the trigone is involved.

The prevalence of both genitourinary disease and rectal disease in the somewhat specialized type of patients falling to the lot of naval medical officers affords excellent opportunity to discover and relieve conditions which will be allowed to drag on, adding sick days and loss of valuable time for cure unless the close association of the rectum and the genitourinary tract is constantly borne in mind.

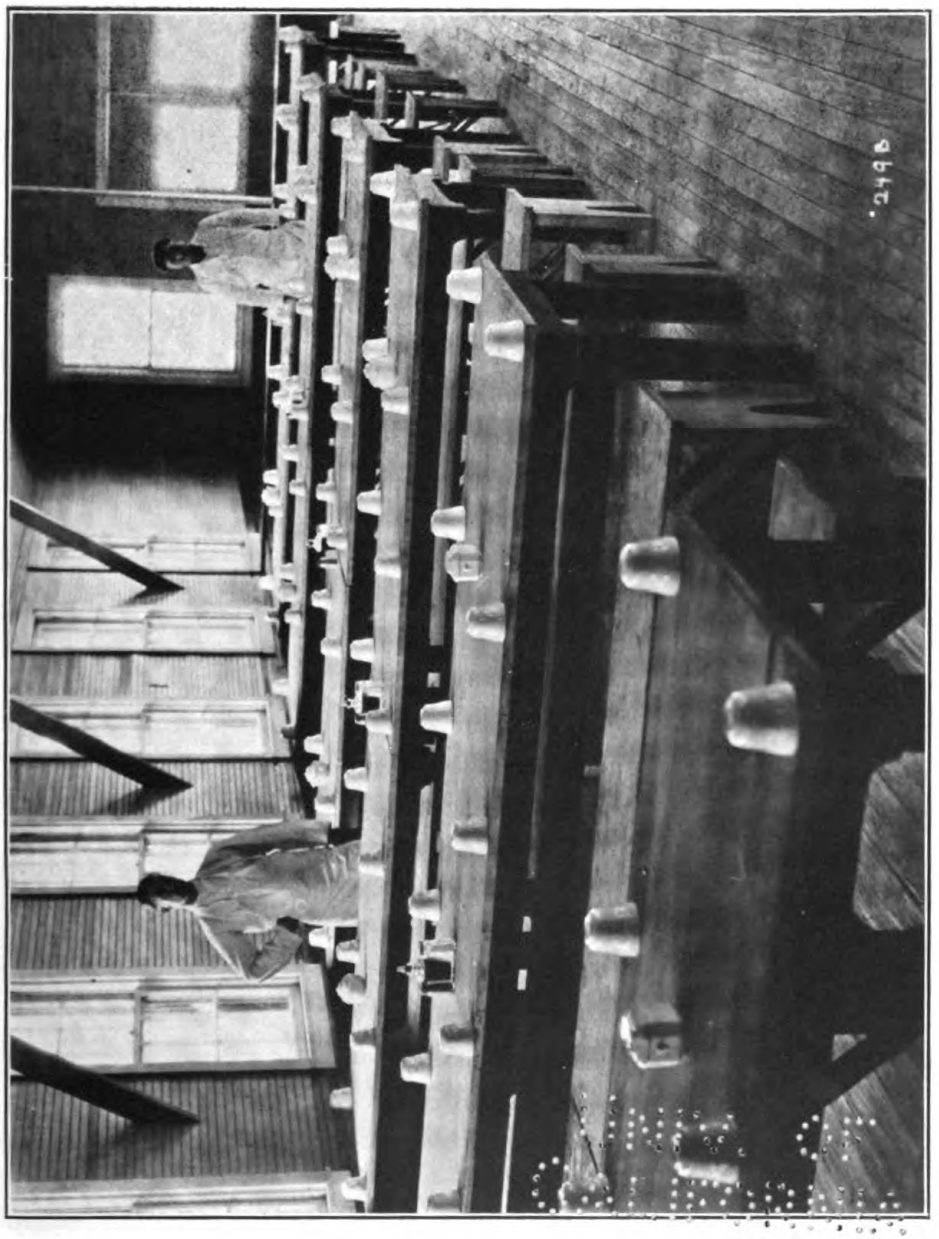

FIG. 1.—MESS HALL BEFORE DECORATION

FIG. 2.—MESS HALL AFTER DECORATION

The examining finger in the rectum is too little used even to-day; the proctoscope, though capable in ordinary hands of great usefulness, lies, too often, upon the shelf of the instrument cabinet, through lack of initiative.

INEXPENSIVE DECORATION OF MESS HALLS AT UNITED STATES NAVAL HOSPITAL, GREAT LAKES, ILL.

By B. W. CLAGGETT, Chief Pharmacist, United States Navy

The two mess halls at this hospital are part of a wooden war-time structure. When this building was erected the thought undoubtedly at that time was simply to have a place where the patients and personnel at the hospital could eat, and very little attention was given to homelike or aesthetic appearances. The floor, sidewall, and ceiling are of common tongue-and-groove pine, and the electrical and heating fixtures are of the plainest. The tables are constructed entirely of pine, with seats attached to the table proper by means of supporting arms and braces. No covering of any kind was originally used on the tables. The illustration, Figure 1, will give a general idea as to the looks of the mess halls during this period.

The fact remains that this building is still being used unchanged for the subsistence of all ambulatory patients and hospital personnel, and none of the former equipment has been replaced. As a result, the following notation regarding the mess halls was made on the inspecting officer's report for the year 1922: "Clean but unattractive."

An earnest effort was then made on the part of all concerned to correct this defect as much as possible, at the same time keeping in mind a minimum expenditure of money. Figure 2 presents for view the result of these efforts.

In the first place, white table oilcloth is used on the top of all tables. The cloth is cut and the toppiece is tacked to the undersurface of the table top around the entire table. A 7-inch strip of cloth (skirt) is then cut and this is tacked independently to a narrow piece of wood. The strip of wood containing the skirt is finally placed against the overlapping edge of the toppiece and secured as illustrated. We find by experience that this method presents a neater appearance and the cloth lasts much longer than by simply laying the cloth over the table in the form of a tablecloth. It is believed that white oilcloth is the best covering for this type of table because it is economical, sanitary, easy to clean, and gives the entire mess hall a pleasing effect. The cost of glass tops for these tables would be exorbitant, and also great breakage would ensue due to their length (12 feet). Battleship linoleum as a

covering for the tables is not favored because this does not break the appearance of the ungainly and unattractive underconstruction which is hidden by the oilcloth skirt.

As a routine we renew the oilcloth every three months. Of course, the cloth could stay on four to five months, but considering everything we feel justified in replacing the cloth while it still looks good rather than to wait until it becomes stained or the edges cracked. By close cutting it requires 124 yards of 72-inch wide cloth to renew both mess halls, and the total cost of this has averaged $50. This means an expenditure of $17 per month, and with 52 tables in use slightly over 1 cent per day per table. We subsist almost 400 persons each meal in both mess halls.

The next matter was the windows. The white curtain drops were made by the hospital seamstresses from Navy crash toweling. They have now been in use two years and, although laundered every month, will last for some time to come. The valance at the top of each window is made from cheap cretonne of a bright and cheery color. Cretonne 36 inches wide is split in half and this makes each valance the proper width of approximately 18 inches. The valance is piped with blue sateen and the whole is treated with three coats of clear shellac. The shellac renders the material sun fast and gives the fabric a rich effect. All work on the valances was accomplished by the arts and crafts department under the supervision of the American Red Cross.

The flowerpots are of ordinary red clay, painted in various brilliant colors. The pottery wall vases were made by the occupational therapy department and contain growing vines. All flowers, ferns, and vines from hanging baskets are, of course, furnished by the hospital greenhouse as required.

On the walls between every second or third window are pictures which were drawn, painted, or colored entirely by Veterans' Bureau patients attached to the hospital. These pictures are framed by a narrow, stained strip of wood and mounted on beaver board.

CLINICAL NOTES

STREPTOCOCCUS SEPTICEMIA

By J. E. MILLER, Lieutenant, Medical Corps, United States Navy

In presenting this case of streptococcus hemolyticus septicemia the writer desires to call attention to the value of mercurochrome as employed in the treatment of septicemia. Septicemia due to the presence of the *Streptococcus hemolyticus* is one of the most rapid and fatal causes of death, for when once in the blood stream this bacterium finds ideal environment for growth and multiplication, causing destruction of the eythyrocytes and the leucocytes by its powerful toxin.

Streptococcus hemolyticus septicemia is usually the terminal infection from which many patients with angina, scarlet fever, erysipelas, measles, small pox, influenza, and child bed fever die. It is, of course, understood that any case in which a wound becomes infected with this organism, when the patient's resistence is lowered, may share the same fatal termination.

The present case of sepsis is secondary in origin, and followed a case of streptococcus hemolyticus angina. The patient, a male, middle-age, was admitted into the hospital August 24, 1924. He complained of severe headache, general myalgia, extreme sore throat, dysphagia, and moderate difficulty in breathing. The voice was of nasal character, thick and muffled, and attempts at speaking elicited evidence of pain, as revealed by the patient's facial expression. The patient's health had been very good until about 10 days before admission when he noted that his throat had became sore. This soreness was accompanied by slight malaise. These mild symptoms persisted and became aggravated as the patient stood watch over his child who was critically ill with angina; the baby died five days later. After the funeral services the patient collapsed and was admitted to the hospital in a critical state.

Upon admission his temperature was 104° F., pulse 120, and respiration 30 per minute. He was greatly prostrated. His throat was acutely inflamed. The tonsils were swollen and covered with false and adherent membranes. The supratonsillar tissue was markedly inflamed and edematous; likewise, the uvula was swollen, elongated, and edematous. The whole oral pharynx was narrowed

to such an extent by the inflammatory swelling that inspiration and expiration were noisy and labored. Physical examination was otherwise negative. Smears from the throat were negative for the diphtheria bacillus and Vincent's organism. Smears revealed a short chain streptococcus. Cultures were made for diphtheria. The patient was given one ounce of magnesium sulphate and a cleansing enema. Ten grains of aspirin, 10 grains of Dover's powder, and 10 grains of sodium bicarbonate were given for the headache and myalgia. An ice cap was applied because of the severe headache. The patient spent a miserable night and was not improved the following morning. He had a satisfactory bowel movement, and the temperature dropped to 100° F., pulse 110, and respiration 26. Prostration had increased, and the throat symptoms were all aggravated. He was very septic.

The urine was acid. Specific gravity, 1.020. Albumen, 1 plus. Sugar negative and a rare hyaline cast present. The Wassermann reaction was negative. The report of throat culture was negative for the diphtheria bacillus. White-blood count revealed 12,700 leucocytes, 71 per cent polynuclears, 22 per cent lymphocytes, 5 per cent large mononuclears, 1 per cent transitionals, and 1 per cent mast cells.

The patient's throat condition was rapidly becoming worse. The swelling and edema of the throat were interfering with respiration, and dyspnea was marked. The nose, in addition, had become involved; the nasal mucosa was swollen and a serous discharge issued from the nasal orifices, while about the exit were many herpetic vesicles. There was more or less nasal obstruction. The combination of the oral and nasal inflammatory swelling and edema resulted in severe dyspnea with cyanosis of finger nails and lips. Cultures for diphtheria were again made. The edematous uvula received multiple scarifications and a free incision was made in the left superior tonsillar region. Hemostats were introduced but a careful search failed to reveal pus. The membranes were extending over the swollen areas. After the patient was found nonsensitive to horse serum, 20,000 units of diphtheria antitoxin were given intramuscularly and 10,000 units were given intravenously. The serum was heated to blood heat and no immediate reaction followed its use. Hot antiseptic gargles were employed and morphine was required to relieve the severe pain. The patient suffered from delirium, associated with delusions prior to the use of the serum. He spent a restless night.

August 26: His temperature was 103 in the morning. The patient was very septic and in a state of toxic psychosis. The swelling in the throat after incision remained stationary. Previous cultures from the throat were reported negative for the diphtheria bacillus.

Smears negative for the Vincent's organism. An additional 20,000 units of diphtheria antitoxin were given in spite of the negative cultures. No reaction occurred. Temperature at 8 p. m. 104° F., pulse 120, and respiration 30. Swelling in the throat subsided and swelling in the nose progressed. Cultures were made from the nose and throat, and blood cultures taken. The patient was delirious and using much effort at breathing. Morphine was required for pain, and no atropin was used on account of delirium. The patient spent a sleepless night and was constantly under observation for edema of the larynx. Cracked ice was given the patient throughout the entire night.

August 27: The morning temperature was 102° F., pulse 120, and respiration 30. The patient was delirious but was breathing easier. Throat condition improved. Edema subsided, but considerable inflammation and adherent membranes remained. Report of cultures from nose and throat were negative for the diphtheria bacillus. Blood culture revealed a short chain streptococcus. While the throat condition appeared improved the patient's general condition was markedly aggravated, and he was extremely septic. He was given 10 c. c. of a 1 per cent solution of soluble mercurochrome 220 intravenously. The solution was warmed to body temperature before being given, extra blankets and hot water bottles were placed about the patient, and no reaction followed the use of the drug. The temperature prior to the use of the drug at noon was 102.5° F., pulse 120, and respiration 30. At 8 p. m. temperature was 100° F., pulse 100, and respiration 20. During the night the patient was very noisy, and again spent a restless night. The urine and feces upon examination revealed the presence of the drug. Subcultures from the blood culture revealed the presence of *Streptococcus hemolyticus*.

August 28: The temperature was 100° F., pulse 120, and respiration 20. Ten c. c. of the mercurochrome solution were again injected intravenously, the same precaution being taken to prevent a reaction, as the patient's condition was very critical. The temperature at 1.30 p. m. dropped to normal and the pulse to 80. The respirations were increased in depth and frequency. They were 36 per minute and of the type found in severe acidosis. This type of respiration may have been the result of the rapid death of the bacteria in the blood stream, the rapid elimination of the endotoxins overwhelming the patient and resulting in an acidosis.

August 29: The temperature was 99 F., pulse 90, and respiration 20. Blood cultures positive for the streptococcus. The patient remained delirious. He was in semicoma at frequent intervals. Lumbar puncture performed. Fluid clear and not under pressure.

No abnormal findings reported by the laboratory. At 10 a. m. and 3 p. m. 20 cc. of a 1 per cent solution of mercurochrome were given intravenously. No reaction followed. The patient during the afternoon was more comfortable. Blood cultures were taken. He had a very comfortable night.

August 30: The patient was entirely rational. Swelling in nose and throat had subsided. Membranous areas were gangrenous, yet many were healing nicely. The evening temperature, pulse, and respiration was normal. The patient spent a restful night. Slight soreness of throat remained.

August 31: The patient was convalescing nicely. Blood cultures were negative. Rest in bed continued, as the patient was very weak. Placed on tonic treatment.

September 3: Patient up and about. He had no complaint to offer.

In reference to the use of mercurochrome in the treatment of septicemia the reader is referred to the Journal of the American Medical Association for the technique of the preparaton and manner in which the drug is used by Hugh Young, of Baltimore. It will be found in the issue of August 16, 1924; 1 gram of the drug is dissolved in 100 c. c. of distilled water. This represents 1,000 mg. per 100 c. c. of water. Each 10 c. c. of the 1 per cent solution equals 100 mg. of the drug. Young states that 5 mg. of the drug should be used for every kilogram of the patient's weight. In severe cases 7.5 mg. may be employed. If the patient is to receive 5 mg. per kilogram of weight, 34 c. c. of 1 per cent solution must be used for every hundred pounds of the patient's weight. Young recommends this amount at a single injection. The dose is not to be repeated for several days. Diarrhea and salivation contraindicate further treatment.

The present case received 60 c. c. of a 1 per cent solution, which is equal to 600 mg. or 0.6 gram of the drug, his weight being 190 pounds. No salivation or diarrhea was noted following the use of the drug.

TREATMENT OF GONORRHEAL OPHTHALMIA BY INJECTIONS OF MILK

By J. T. Hooker, Lieutenant, Medical Corps, United States Navy

Upon reporting for duty at the Haitian General Hospital at Port au Prince, Haiti, the writer found, among many interesting eye, ear, nose, and throat conditions, a number of cases of gonorrheal ophthalmia. He began the care of these cases in the usual manner, but within a few months he realized that he was confronted by a very perplexing problem. Gonorrheal ophthalmia is very prevalent among the native population, a people of low intelligence who are

usually unwilling to remain sufficiently long in the hospital to receive the usual treatment for this condition. In the majority of cases the native patient will not cooperate with his medical adviser if such cooperation entails any inconvenience. The writer soon found that a shield placed over an uninfected eye would be removed merely because it was uncomfortable. Infection in both eyes was common.

So discouraging was the treatment of gonorrheal ophthalmia in Haiti that any innovation tending to improve our usual method of treatment was welcome. In 1915 Schmidt of Prague had advocated the use of foreign protein injections for ocular disease, using cow's milk for this purpose. Since Schmidt's first report on the use of milk injections it has been used by many ophthalmologists, often with striking benefit, especially in iritis, iridocyclitis, and gonorrheal conjunctivitis.

The usual method of procedure has been to inject intramuscularly from 3 to 15 c. c. of fresh cow's milk previously sterilized by boiling. In most cases the injection was followed by a rise of body temperature with general malaise, which usually subsided within eight hours. The course of the milk fever shows but little variation except in its intensity and the degree of temperature. Either no fever at all followed the injection, or the temperature rose to 100, 101, and 102° F. Following the injection, marked subjective and clinical improvement could be noted in cases showing reaction.

In a study of the active agents in milk Barkan and Nelson of San Francisco found that the variation in reaction following milk injection was due to the bacterial content of the milk used. Their report which appeared in the Journal of the American Medical Association of January 19, 1924, offered an incentive for trying this treatment on the cases of gonorrheal ophthalmia in Haiti.

Ten cases treated in the hospital with iced compresses, instillations of a silver salt, boric acid solution irrigations every 15 minutes or as indicated required on the average 10 days to become free of the gonococcus and 16 days for recovery.

Ten other cases, in addition to the above treatment, were given according to age, from 3 to 10 c. c. of whole cow's milk boiled for 30 minutes. Ten c. c. were used as the standard adult dose. The injections were given deeply into the gluteal region at 11 a. m. The temperature in each case began to rise on an average in 2 hours, and reached its maximum height in 4 hours, and would still be present after 10 hours. About 6 hours after the injection the patient would complain of slight malaise and headache and the ocular and palpebral conjunctiva would show marked congestion. The average rise of temperature was to 101° F.

The morning following the injection the temperature would be normal, the patient without discomfort, and the conjunctiva would appear dry and crusty. Injections were repeated every second day until all eye symptoms had subsided.

Negative smears were invariably obtained on the fourth day. Usually by this time the conjunctiva showed only a slight injection, which soon disappeared.

The cases treated in the hospital in this manner improved so rapidly that it was decided to employ it in the out-patient department, using the milk injections alone.

At the time of the first injection the infected eye was washed out with warm boric acid solution. No attempt was made to prevent infection of the other eye. Each patient reported for another injection every other day. Usually on the morning following the second injection the smears from the infected eye would be negative for the gonococcus.

The following comments on the results obtained by this method of treatment may be of interest:

1. Ten cases treated by routine hospital method with special nursing, and no milk injections gave a negative smear for the gonococcus on an average of 10 days. Able to leave hospital for work in 16 days.

2. Ten cases treated in routine way, but with milk injections in addition, gave a negative smear in four days and were able to perform their usual work in six days.

3. Thirty-two cases treated by milk injections, and no other care, gave negative smear on an average of four days. Recovery on an average of six days.

4. The time for recovery is the same as for the cases treated in the ward, with special nursing and extra care.

5. A most remarkable observation is that not a case of cross infection occurred from the diseased eye to the clean eye. The writer has seen cases wipe the pus from one eye, and then wipe the normal eye with the same cloth. Most of our cases, however, have both eyes infected before they come for treatment.

6. The youngest case was a child of 2 years. Children respond to the milk injections far better than adults, as the local symptoms are more severe, but usually subside following the first injection.

The excellent results which came from the milk injections at first led us to believe that the gonococcus of Haiti was not of a very virulent strain; but on further observation that opinion was changed, because when a white man becomes infected with the gonococcus in Haiti the result is as severe as any infection which we meet within the States.

Barkan and Nelson have shown that only milk of high bacterial count will give results, and to quote from Dr. B. W. Key's discussion

of their paper: "In Vienna there has been an undercurrent of feeling for some time that the dirtier the milk the more efficacious its influence." That is undoubtedly why we have met with such success in the treatment here, for the writer knows of no country in the world where the milk is handled with such carelessness as in Haiti. It is just teeming with bacteria when it comes to us; usually an examination shows 3,500,000 bacteria to the cubic centimeter.

THROMBO-ANGIITIS OBLITERANS

By G. C. MAIN, Lieutenant (Junior Grade), Medical Corps, United States Navy

The name thrombo-angiitis obliterans was given to this disease by Dr. Leo Buerger, whose valuable original work revealed the true nature of the existing pathology. The condition was formerly known and is now frequently spoken of as presenile spontaneous gangrene. We also hear it called "Buerger's disease"; all three terms are synonymous and indicate the same condition.

Thrombo-angiitis obliterans is a disease of more or less chronic progressive course, characterized clinically by vascular disturbances (in the affected extremity) in the earlier stages, and later by pain, swelling, and discoloration, and finally by dry gangrene; and pathologically by an occluding thrombosis of the arteries and veins with abundant fibrous tissue formation, gangrene, and death.

The disease occurs almost wholly in males; Keen gives the ratio of 120 to 7, and 90 per cent of these are between the ages of 20 and 40 years. The disease has never been seen in old men. It is more prevalent among Poles, Jews, and Galacians in our larger cities, though recently many cases have been reported in Japan where the condition is known as "gangrene of the young." No race, however, appears to enjoy complete immunity, and neither of the two cases we report have ever lived in large cities under crowded, unhygienic surroundings.

The etiological factor is not known. Writers have in the past attempted to show an increased incidence among cigarette smokers, users of alcohol, etc., without conclusive results.

Probably the most important work that has been done in the search for the causative agent is that of H. M. Rabinowitz, reported in 1923; working on the theory that the vascular changes are of infectious origin as suggested by Buerger, and by his own careful observation, he has isolated an organism which appears to be specific. His excellent and interesting article is too lengthy to be adequately reviewed in this paper, hence we will quote only his more significant conclusions.

"1. The bacillus isolated produced the same lesions in the ears and feet of the rabbits as that which was present in the calf of the leg of the human being.

"2. The lesions were similar in their gross and microscopical pathology to that produced in the disease known as thrombo-angiitis obliterans.

"3. The organism is distinctly hemoglobinophilic.

"4. The appearance of the lesions on the palmar surface and toes of three rabbits five weeks after the inoculation showed conclusively the entrance of this organism into the blood stream, and furthermore a specific tissue predilection."

The gross pathological changes are those seen in any type of vascular disturbance in which the arterial blood supply is cut off. The final result is always dry gangrene.

The microscopical findings are, however, peculiar to this disease. Friedlander and Von Winiwater describe a closure of the arteries due to a proliferation of the intima.

Doctor Buerger more recently has described a type of arteriosclerosis in which the desquamation of the endothelium in the popliteal arteries leads to a thrombotic clot and occlusion of the arteries which progresses by peripheral extension. He has shown that the veins as well as the arteries are affected, hence the term thrombo-angiitis obliterans.

To quote Buerger, "Inflammation arises, clots form. The clots become canalized and vascularized. Connective tissue forms and is largely devoid of elastic fibers. Eventually fibrous tissue forms in large quantities." And again: "Most of the larger arteries and veins were found obliterated over a large extent of their course. The obliterative process can be studied at any stage in its development if enough vessels are examined. All stages in the occlusive changes may occur in the various vessels of an extremity or at times in the same vessel in different parts of its course. The occlusion of vessels is effected by red obturating thrombi. There is moderate thickening of the intima. The media and adventitia show cellular infiltration and vascularization wherever thrombosis has occurred. Changes in the media never extend into the walls of vacant portions of the vessels, usually they terminate before the end of the obliterating tissue or thrombosis is reached; indeed, the dependence of the media changes upon the organization of the thrombi can be demonstrated in many places."

The disease begins in the majority of cases in the left foot, but may begin in any one of the extremities.

The early manifestations are attacks of pain in the toes and feet, swelling and intermittent claudication. The member feels cold and is bloodless and no pulse is felt in the larger arteries supplying it.

The attacks of pain increase in frequency and severity; all other symptoms become marked, and gangrene of the dry type follows. The attacks seem to be brought on at first by exposure to cold, later they appear spontaneously. The following vivid description of a typical case is quoted from Da Costa: "We present a man, born in Galicia, 32 years old, a storekeeper by occupation. About one year ago this man began to suffer from severe pain in right foot and calf of leg when tired or exposed to cold. Soon after he began to exhibit the same phenomena in the left foot. Every now and then on arising from a chair, getting out of bed or walking he would have such very violent pain that he was forced to sit down immediately, even if he were on the street. This condition was intermittent claudication. He then noticed that when he hung his feet over the edge of the bed that the toes and dorsum of each foot became swollen and looked purplish red, a condition the neurologist calls erythromelalgia. * * *

"There is no pulse in the dorsalis pedis or the posterior tibial arteries of either extremity. In fact I can not feel a pulse in either extremity until examining finger reaches the popliteal."

The characteristic symptoms are violent pain with an absence of pulse in the dorsalis pedis and posterior tibial arteries.

The symptoms are almost always confined to the extremity affected The disease is generally seen in otherwise healthy, normal young men. There are no typical systemic symptoms, and all clinical and laboratory findings are essentially negative except as concerns the site of the disease. For this reason this condition is not easily confused with other types of vascular disease, and gangrene from other causes.

The prognosis is without exception very grave. Loss of the extremity by amputation, the later occurrence of the disease in the other extremity and its subsequent loss, is the rule.

The disease may and often does end fatally when the renal arteries or some larger visceral artery is attacked.

The treatment of this most distressing condition has been directed toward the establishment of an adequate collateral circulation to the starving tissue. The success of these efforts has been far from gratifying. High amputation of the extremity, generally above the knee, is usually the end result. Of all the various methods of treatment the one reported by Doctor Steele seems to have met with the most success and to have the most promise. In 1915 Mayesima discovered that in thrombo-angiitis obliterans there is an increased viscosity of the blood (as well as in some other forms of vascular diseases). Steele's treatment is based on this fact. It consists of injecting a 2 per cent solution of sodium citrate into the blood stream.

For one month the patient receives 250 c. c. every other day. The second month he receives a like amount every three or four days.

During the course of treatment the extremity is kept heated to 110° F. by electric bulbs. Potassium iodide, grains X t. i. d. is given throughout the two months. His conclusions are as follows: "One can not hope for a purely functional result in such badly damaged members. But suffering can be relieved, progress of an otherwise fatal disease can be checked, amputation can be avoided, and a certain percentage can be returned to civil life."

As a palliative measure for the relief of the pain, Silbert advocates the injection of absolute alcohol into the nerve supplying the affected parts. His results have been very gratifying.

In order to bring out more clearly the findings in this disease and its typical course, we present herewith two cases of Buerger's disease now under our observation and treatment.

Case No. 1. S. B. C. Born in America of Anglo-Saxon parentage; 46 years of age; a farmer by occupation; was admitted to this hospital on August 14, 1924, complaining of shooting pains in both hands and forearms, especially after walking and at night. These pains were first noticed in the early spring of 1924, and have been growing steadily more severe. The family history was negative.

Past and personal history.—The patient had the usual diseases of childhood. Pneumonia at the age of 19 with subsequent empyema. Typhoid at 19. The patient has had five operations for gangrene of the lower extremity. The history of these operations and their cause is well described by the patient:

After being discharged from the United States Marine Corps in 1916 the first I noticed of trouble with my feet was that it was impossible for me to keep them warm after the weather became cold. In the summer of 1917 they gave me trouble in walking on account of both feet being swollen and tender. In the early fall of 1917 I had an infection in the great toe of the right foot. The nail was removed and the toe lanced in three places. The wounds healed, but the toe continued to give me pain at intervals. It became necessary for me to warm my feet over a kerosene lamp, even during the summer. The spring of 1921 the pain became so severe in my feet that I could not stand it and my doctor removed the nail of the great toe on my left foot. But the pain became worse and the toe was amputated. In May that year I was taken to the hospital and left leg was taken off below the knee; 10 days later it was found necessary to take it off above the knee. I left the hospital in June, but with blisters on the ball of all the toes on my right foot but one. In August I again returned to the hospital and had the right leg taken off below the knee, and in 23 days it was found necessary to

amputate again above the knee to get ahead of the gangrene. The pains I now have in my hands are exactly like the pain I had in my feet before the gangrene set in."

This patient's general health has always been good and he has lived a life of regular habits and hard work. There is no luetic history. Physical examination shows a well-developed white male, 46 years of age. The entire physical examination is essentially negative except the extremities.

The right leg has been amputated about 8 inches below the hip, left leg 10 inches below the hip. The scars are pliable and the stumps are in excellent condition.

The skin of both arms is dry and scaly. There is a slight amount of atrophy of the right hand, marked about the hypothenar eminence. The right fifth finger has been amputated. The terminal phalanx of the index finger of the right hand shows atrophic disorder; the skin is peeling off and the finger is shrunken. At times the finger becomes very sensitive. The entire right hand looks bloodless and is markedly colder than the left. There is no radial pulse on this side. The superficial veins of the right forearm are small and are not visibly increased in size by the application of tourniquet. The left hand and forearm are objectively normal, but the patient complained of some pain in the left hand when he entered this hospital. Blood pressure is systolic 120, diastolic 80. The blood picture is normal. Urine normal. Wassermann (blood) negative.

Under physiotherapy consisting of massage and radiant heat there has been a marked lessening of the pain in left hand, but no change whatever in the right. The treatment advised by Steele in cases of this sort has been started, and its results will be watched with interest.

Case No. 2. E. T. Canadian; 37 years of age. Entered hospital on June 7, 1924, complaining of pain, discoloration, and swelling in left foot. These symptoms were first noticed in 1918, when the foot was frostbitten.

Soon after the symptoms left, to return again in 1919 and again in 1920. Since 1920 the patient has been bothered with pain in this foot and frequent swelling up to twice its normal size. The foot gets cold easily and even on warm days the patient is forced to wear two pairs of socks on it. The pain is more severe after he has been on his feet for some time and at night. On walking for any considerable distance the patient has typical symptoms of intermittent claudication. The past, personal, and family history is entirely negative. The man is a lumberman by occupation and has lived an outdoor life of vigorous work and regular habits. He is well developed and well nourished. Careful physical examination fails to

reveal any pathology whatever except in the affected extremity. This, the left foot, is swollen about 30 per cent and pits on pressure. Foot is cold and of a dusky-red color. The coldness and discoloration extend to just above the ankle; the line of demarcation is sharp and definite. There is marked tenderness of the entire great toe and of the fifth toe—more marked on the plantar surface. The pulse of the dorsalis pedis and posterior tibial arteries is not palpable. Reflexes are present, but sluggish. There is no active movement of the great and fifth toe, and the movement of the other toes is markedly limited. The Wassermann is negative. Blood and urine are normal. X ray of the foot shows no evidence of arteriosclerosis.

The condition did not improve with physiotherapy, and the patient became weak and nervous from the almost constant pain and loss of sleep.

On July 22, 1924, the great toe was amputated at the metatarsophalangeal joint. There was some venous bleeding, but no arterial bleeding. Prognosis for cure not considered good. Pathological report of amputated toe as follows: Gross; great toe with longitudinal incision on the plantar surface. Immediately under the nail there is a discolored area, apparently necrotic about 2 by 2 cm. Microscopic: "The walls of the smaller arteries and veins are greatly thickened. There is especially a proliferation of the intima. In some places cells of an embryonal type completely occlude the lumen."

Following operation the pain was less for several days. The wounds did not heal, however, the pain returned, and on August 7, 1924, the extremity was amputated about 1 inch above the middle of the tibia. Healing after the operation was delayed due to a low-grade staphylococcus infection. But now, eight weeks after the operation, the wound is almost entirely healed, the stump looks healthy, there is no pain, and the patient is gaining weight and strength in a very satisfactory manner. There is no evidence of the disease in any of the other extremities.

OCCLUSION OF THE LEFT COMMON CAROTID ARTERY—REPORT OF A CASE

By A. L. Aldrich, Lieutenant (Junior Grade), Medical Corps, United States Navy

O. J., a white male, Danish descent, age 35, entered the hospital September 16, 1924, an emergency case for observation and treatment, complaining of constant dull substernal pain which was increased by coughing or exertion, soreness in the chest, shortness of breath, productive cough and choking in the throat which he described as feeling like "something in the throat which should come up."

His present illness began, about three weeks previous to his entrance, as a mild attack of the above symptoms which had become severe only two days before admittance. He traced his complaints back to 1919 when he was exposed for a considerable length of time to bad weather conditions in the Argonne and to a cold which followed. He was discharged apparently well in June, 1919, and in December of the same year had another attack of substernal pain and shortness of breath similar to the present but less severe. Since that time he had repeated mild attacks occurring every few months and lasting a week or two with a few mild symptoms between.

The past history was negative except for rheumatic fever in 1910, in St. Thomas, Virgin Islands, at which time he was in bed for six months. He was single and had spent several years in St. Thomas as an enlisted man in the Army. Venereal disease was denied.

Physical examination revealed a fairly well-nourished individual, weight 161 pounds, face somewhat emaciated and apparently greatly distressed by dyspnea. The tongue was coated, teeth in very poor condition and tonsils enlarged, cryptic, and caseous. His temperature was normal. The chest showed slight bulging over the left upper sternum and adjacent costal cartilages, resonance was slightly increased throughout, breath sounds were loud and harsh, and both lungs showed scattered mucous râles.

The cardiovascular phenomena were most interesting. The heart was slightly enlarged downward and to the left with a corresponding apex beat. Rate was 120. The tones were somewhat masked by laborious breathing, but a blowing systolic murmur was present over the apex and was slightly transmitted to the axilla. There was a diastolic murmur heard at the third left intercostal space at the margin of the sternum, transmitted downward and to the left. There was a marked pulsation of the right subclavian artery which was visible above the clavicle as is commonly present in aneurysms of the ascending aorta or arch. On palpation the pulsation and dilation were found to extend down below the clavicle. A thrill was also present over the pulsation and a blowing systolic murmur, which, however, was not characteristic of aneurysm. The right radial pulse was quite characteristic of aortic insufficiency and the blood pressure in the right arm was systolic 170 and diastolic 50 mm. of mercury. The right temporal artery showed increased pulsation over normal.

The left side presented strangely different findings. The temporal artery was not palpable, and the subclavian and radial were only occasionally felt to pulsate. The blood pressure in the left arm did not register consistently as only occasionally did pulsations come through, and then only around 70 mm. of mercury.

With the exception of the deep reflexes, which were slightly increased, the remainder of the physical examination was negative. Apparently both femoral arteries were equal and regular in pulsations.

The blood examination showed 3,900,000 erythrocytes and 80 per cent hb. The urine contained a trace of albumin, a few finely granular casts, a few leucocytes and scant squamous epithelium. A Wassermann was not secured because of the early death of the patient.

Floroscopic examination showed the heart to be enlarged in the transverse diameter with a straight left border, suggestive of a mitral lesion, apices lighted up well, heavy hilus shadows and grayness of both bases. Chest plate showed the same condition of the heart, a negative arch and essentially the same chest findings. There was still no explanation for the absence of pulsation of the left carotid and diminished left pulse.

The patient became more restless and noisy, expectorated some bloody sputum, went into convulsions, and died September 19, three days after admittance.

At autopsy the right pleural cavity contained 600 c. c. of a semi-sanguinous fluid. The left was normal. Many adhesions were present anterior and posterior between the parietal and visceral pleura at the base posterior and also between the pleura and mediastinum. The pericardial cavity contained the normal amount of fluid and the heart was somewhat enlarged. A large mass of glands surrounded the aortic arch and the adjacent structures. There were two grayish-white, so-called "soldier spots" on the right ventricle. The aortic ring admitted two and one-half fingers, and the leaflets contained numerous calcified plaques, one leaflet being much more uniformly thickened and calcified than the others. The mitral orifice admitted three fingers and also contained numerous calcified plaques. The entire picture was of a luetic aortitis. The lumen of the left common carotid artery was completely obliterated and failed to admit a probe at its origin from the arch. The lumen of the left subclavian artery was much reduced and the walls considerably thickened. The innominate artery was slightly enlarged and the right subclavian dilated.

Aside from the above findings the autopsy was irrelevant; the thyroid was slightly enlarged, as was the spleen, while both kidneys were dumb-bell shaped and somewhat longer than normal, and the pelves contained a small amount of fat. The lungs were extremely anthracotic, but no tubercles were found, there being some congestion of both lower lobes.

Microscopically the only significant finding was the condition of the left common carotid artery, which contained an apparent organized thrombus completely occluding the lumen. The contents consisted of vascular connective tissue, and there were no channels to denote an attempt to reestablish the circulation.

From the standpoint of diagnosis this case is extremely interesting as well as from the relation to cerebral blood supply. The absence of more marked symptoms is significant but not unusual in cases of occlusion of one of the carotids and demonstrates the efficiency of the collateral circulation. In this case it may be accounted for by the slow development of the condition. Osler states that the effect of occlusion of the carotid and consequent disturbance of cerebral circulation is usually slight, not infrequently entirely negative, as has been adequately proved by ligature of the vessel during operations on the neck, the collateral circulation being the branches of the external carotid of the other side and the vertebral artery and the circle of Willis. The patient complained of no symptoms whatever referable to an insufficiency of blood supply to the brain except for indefinite previous attacks of shortness of breath. Upon entrance his heart rate was 120 and respiration 40. It would appear that the large mass of glands surrounding the aortic arch along with the aortitis were the cause of his coughing, choking, substernal pain, etc.

DaCosta states that in 20 to 25 per cent of cases after ligation of the common carotid artery there is cerebral softening or some other intracranial complication, and Crile states that of the cases which develop cerebral softening one-half die.

NOTES AND COMMENTS

THE SURGICAL TREATMENT OF ANGINA PECTORIS

During the last 20 years excision of the cervical sympathetic has been advocated for a number of diverse diseases. Although the results in a large proportion of the conditions for which the operation has been performed have proved useless or disappointing, the work of Jonnesco and others has demanded increasing attention. The many important publications of Jonnesco and a recent lecture delivered by Professor Wenckebach have introduced the profession to the possibilities of surgical relief for the distressing symptoms of angina pectoris. The appearance in current medical literature of a number of important contributions to our knowledge regarding the structure and function of the sympathetic nervous system and the publication of many articles upon the surgical technic of sympathectomy indicates the wide interest which has been awakened.

In the British Medical Journal of September 27, 1924, there is a contribution by Professor Daniélopolu of Bucharest in which he discusses the physiology and pathology of the production of anginal symptoms. He sets forth arguments in favor of the surgical section of the sympathetic chain and opposes cervical sympathectomy.

Commenting on this question, an editorial writer in the same issue of the Journal says: "Recently, however, A. E. Halstead and F. Christopher, of the University of Illinois Medical School, have reported a case of angina pectoris relieved by partial cervical sympathectomy, and have placed on record a modification of the approach recommended by Jonnesco. In order to reach the cervical sympathetic they prefer to make an incision along the anterior instead of the posterior border of the sterno-mastoid, and then retract the muscle and the carotid sheath with its contents posteriorly rather than anteriorly. On anatomical grounds this procedure appears to present distinct advantages, because the approach to the cervico-thoracic ganglion is rendered more direct and greater freedom for manipulation is permitted. As it is this stage of the operation which offers the most formidable difficulties, any advantage at this point is of the greatest value. Apart from this modification, Halstead and Christopher performed a partial cervical sympathec-

tomy, the middle ganglion alone being removed by avulsion. Although a number of surgeons have now reported successful results after excision of one ganglion or even division of the sympathetic cord, Jonnesco in a recent monograph expresses disapproval of the limited procedures and states that total resection of the cervico-thoracic sympathetic is the only intervention really indicated. This decision was probably arrived at owing to the complex arrangement of the branches of the sympathetic and to our incomplete knowledge of the nervous pathways involved in the manifestations of angina pectoris.

"In addition to indicating some of the difficulties at present confronting us with regard to the surgical treatment of angina pectoris, the question must also be raised of the serious sequelæ which may follow such an extensive excision. Several deaths have followed complete sympathectomy, and it is clear that a more conservative operation is to be preferred. To make sure of interrupting a sufficient number of afferent aortico-cardiac fibers by total removal of the cervical sympathetic very widespread and profound consequences must be risked, and Wenckebach has stated that the ideal operation would be to divide the afferent fibers from the heart and aorta and leave the efferent intact. With this end in view, what is thought to be the depressor nerve in man has been divided on several occasions with beneficial results. Unfortunately, further experience has proved that this nerve is extremely variable in man, and quite frequently recognition of it has been impossible.

"The irregularity and inconstancy of this nerve render impracticable what theoretically appears to be the ideal operation, and until anatomical and physiological researches are more advanced we are forced back, at any rate temporarily, to a consideration of the more drastic procedure of cervico-thoracic sympathectomy. In this operation, after retraction of the sterno-mastoid and carotid sheath, Jonnesco exposes the large superior cervical ganglion resting on the deep aponeurosis, and, when its connections have been divided, turns it down and traces the sympathetic cord to the mdidle ganglion, which is much smaller and less easily located. The prominent anterior tubercle of the sixth cervical vertebra and the inferior thyroid artery offer useful landmarks for finding the middle ganglion. When this has been freed, the sympathetic cord is fol'owed to the cervico-throacic ganglion, which is to be discovered between the transverse process of the seventh cervical vertebra and the neck of the first rib, on the inner side of the superior intercostal branch of the subclavian artery. The inaccessible position of the inferior cervical ganglion and the variations in its connections and extent of fusion with the first dorsal ganglion render this part of the operation extremely difficult.

"The publication of cases relieved from the most urgent symptoms of angina pectoris by excision of the cervical sympathetic is likely to tempt many surgeons to consider the operation, and this temptation is likely to be increased by the impression created by some of the advocates of the operation that it is quite a simple procedure. Reference to a dissection of the neck is sufficient to convince most that the later stages of the operation are exceedingly complicated and delicate, and a study of the variations in the distribution and connections of the cervical sympathetic will at least indicate some of the difficulties to be surmounted in addition to those obtaining in the mode of approach. It is clear from the writings of the pioneers in this important field of surgery that considerable research upon the structure and function of the cervical sympathetic and the nervous pathways to and from the heart and aorta has yet to be completed before a surgical treatment of angina pectoris can be devised which may be practiced widely with any degree of certain success. It is to be hoped that the inspiring work already done will not be discredited by impatience. Contributions such as the recent one by Halstead and Christopher help to demonstrate and simplify some of the difficulties of surgical technique, but the anatomist, physiologist, and pathologist have urgent duties to perform toward the solution of the fundamental problems which have been raised by the pioneers in this branch of surgery."

Sir James Mackenzie presents a critique of the surgical treatment of angina pectoris in the Lancet of October 4, 1924. In this paper he calls attention to the fact that the pain of angina pectoris is a danger signal and he questions the advisability of its removal. "Study of the morbid changes in the hearts of patients who have suffered from angina pectoris," says Mackenzie, "brings clearly before the mind what the condition is that the surgeon is to treat when he proposes to operate. No one would claim that he can cure angina pectoris by operation or any other procedure. All the surgeon could hope to do would be to cut the nerves that convey the impulses which give rise to pain, from the damaged heart to the center of consciousness.

"Is such a procedure wise and for the best interest of the patient? Putting aside the question of what damage may be done by the cutting of such important structures as the sympathetic and vagus nerves—nerves whose functions, be it noted, are, even yet, scarcely understood—and apart from the danger of the operation and the possible damage which may result from the mutilation that accompanies such an operation, the question arises, Is it to the best interest of the patient that he should be deprived of a signal, it may be, of great value?

"Great as the distress is which pain produces, pain itself is in no sense a dangerous symptom. It may be associated with conditions which are dangerous, but such dangers are not rendered less dangerous by easing the pain. Indeed, it often is a beneficent agent, in directing attention to the presence of a morbid condition, and more especially in warning that the persistence of a particular condition is harmful. It is in this latter sense that pain is beneficent, and used in conditions like angina pectoris it forms one of the most helpful indications for preserving the efficiency of the heart. It is manifest that the amount of work the damaged heart can perform is limited, and the indications for treatment are to save the heart muscle from overexertion. The measure of the amount of work is found in what can be done without distress. It is well recognized that, before pain arises, there are faint signs experienced which indicate that with persistence pain will be induced, so that taken as a signal to desist, the individual then knows what amount of effort it is safe for him to undertake. In this way many people are able to pursue even laborious occupations with no discomfort and no danger." To remove this valuable indicator in the present state of our knowledge is, according to Sir James Mackenzie, extremely hazardous and bad practice.

PROGRESS AND PROSPECTS IN CHEMOTHERAPY

Dr. Henry Hallett Dale, president of the section of physiology of the British Association for the Advancement of Science, discussed the progress and prospects in chemotherapy at a meeting of the association held in Toronto, Canada, August, 1924. This subject presents points of general physiological and biochemical interest, as well as its importance from the standpoint of the treatment of the disease. The following excerpt of Doctor Dale's address is reprinted for the readers of the BULLETIN from the issue of Science for August 29, 1924.

THE THEORETICAL ORIGIN OF CHEMOTHERAPY

Chemotherapy may be defined as the specific treatment of infections by artificial remedies. The object of those who study it is to find new remedies which will cure or arrest diseases due to infections, not by alleviating the symptoms or invigorating the patient, but by directly and specifically suppressing the infection. Chemotherapy, in this wide sense, is not entirely of recent growth. When the natives of Peru discovered the value in fevers of the cinchona bark, which the Jesuits brought to Europe in the seventeenth century,

they had found a specific remedy for malaria, which is still the best available. Similarly the natives of Brazil had found in ipecacuanha, which reached Europe shortly after cinchona, a remedy for amoebic dysentery better than any other which our modern systematic and scientific efforts have produced. Modern chemistry, indeed, has separated the alkaloids from these drugs, and has made it possible to identify among them the actively therapeutic constituents; protozoology has revealed the nature of the infections. We know now that cinchona owes its curative action chiefly to quinine and quinidine, and that they act as specific exterminators of the malaria parasites, and not simply as remedies for fevers in general; and we know that ipecacuanha owes its action to emetine and cepheline, and that these act as exterminators of the entamoeba causing tropical dysentery, and not simply as symptomatic remedies for dysenteries of any kind. But chemistry has produced no better remedy for malaria than quinine, or for amoebic dysentery than emetine; and the method by which either of these alkaloids cuts short the infection by a particular parasite, the nature of its specific action, remains a fascinating problem.

The modern development of chemotherapy, as a new department in therapeutic science, claiming the cooperation of parasitologists, microbiologists, and synthetic chemists, did not take origin, however, simply from the study of these traditional remedies. It may be regarded rather as an outcome of the study of the natural antibodies. The investigation of these natural antagonists to infection produced a new therapeutic ideal. Not only had they shown themselves to have an intensely specific affinity for the infecting organism of the toxin which caused their production; they were also perfectly harmless to the patient, behaving, in relation to his organism, as normal constituents of his body fluids and tissues. Ehrlich aptly compared them to magic bullets, constrained by a charm to fly straight to their specific objective, and to turn aside from anything else in their path.

Of the artificial remedies, on the other hand, which man had empirically discovered, even of drugs like those just mentioned as being specific for certain infections, the best that could be hoped was that they would eliminate the parasite before they poisoned the patient. And thus, when the limitations of natural immunity were becoming clearer—when it was realized that to certain forms of infection, several of which had proved to be infections by protozoa, the body was unable to produce antibodies of sufficient potency to eliminate the infection and leave the patient immune—the question arose whether, with the new and growing powers afforded by synthetic chemistry, man could not so far rival nature's

achievements as to produce in the laboratory substances specifically adapted to unite with and kill the protoplasm of these parasites, as the natural antibodies united with that of others, and to leave the tissues of the patient similarly unaffected. The ideal of this new and systematic chemotherapy, as the imaginative genius of Paul Ehrlich conceived it, was to be the production by synthesis of substances with a powerful specific affinity for and a consequent toxic action on the protoplasm of the parasites, and none for that of the host—of substances, to use Ehrlich's own terminology, which should be maximally parasitotropic and minimally organotropic.

I want to invite your attention to-day to the results which during the last 20 years have been produced under the stimulus of this bold conception; not, indeed, to attempt a survey or summary of all that has been done, but, in the light of a few of the suggestive facts which have emerged, to consider how far this hypothesis has justified itself and whether it can be accepted as a safe guide to future progress, as it has undoubtedly provided the initiative and working basis for much of what has been accomplished hitherto. Before we deal with some of the actual results obtained it may be well to consider a little more closely what Ehrlich's working hypothesis involved. The problem was to discover, by chemical synthesis, a compound which, in virtue of its chemical structure, should have a maximal affinity for the protoplasm of a microscopic parasite, such as a trypanosome, and a minimal affinity for that of the host's body cells. These affinities were pictured by Ehrlich, in the terms of his side-chain theory, as determined by certain side chains of the complex protein molecule, or chemoreceptors, which endowed the protoplasm with specific combining properties. When it is remembered that knowledge of the chemistry of the protoplasm of a trypanosome is almost nil and that what little we do know suggests that it is very similar to that of our own cells it will be admitted that the enterprise was one calling for scientific courage and imagination in the highest degree. Complete failure would not have been surprising; the matter for surprise, and for admiration, is that so large a measure of practical success should at the end of two decades already claim record.

Trypanosomes and Spirochetes

The action of dyes and analogous compounds.—The investigations leading in the last few years to a clear promise at last of the successful treatment of the diseases in man and animals due to infections with trypanosomes, had at least two different starting points, the action of dyes and the action of arsenic. Ehrlich's early interest in the synthetic dyes and his observations of the curiously selective distribution which they often exhibited among the cells and tissues of the body naturally suggested the possibility of finding in this

group a substance which would selectively fix itself to the parasite and poison its protoplasm without injuring that of the host. The technique developed by Laveran and Mesnil, by which a particular strain of trypanosomes could be passed through a series of mice or rats and produce an infection of standardized type and virulence, enabled the effect of a large selection of dyes to be investigated with the view of finding one which would favorably influence the infection. A starting point having been obtained, the resources of synthetic dye production were available to produce an indefinitely long series of derivatives and modifications of the active compound, each to be tested in its turn. In this way Ehrlich and Shiga arrived at a substance which gave experimental promise of curative value, a benzidine dye to which the name "Trypan red" was given.

Two years later, Mesnil and Nicolle, proceeding further along the same path, described an even more favorably active blue toluidine dye, "Trypan blue." This is the only one of the dyes which has hitherto had a genuine practical success in the treatment of a protozoal infection, not indeed by a trypanosome, but by an intracorpuscular parasite of the genus Piroplasma, which infects dogs and cattle. This successful application of Trypan blue to an animal disease has a special interest for us to-day, in that it resulted from the joint labors of last year's president of this section, Professor Nuttall, with a Canadian collaborator, Doctor Hadwen.

We may turn aside at this point to inquire how far the results even of these earlier investigations corresponded with the theory which gave them their impetus. Did these dyes really act by selectively staining and killing the parasites, and leaving the host's cells untouched? The evidence was certainly not in favor of such a view, Ehrlich and Shiga themselves observed that Trypan red, even in relatively high concentrations, was practically innocuous to the trypanosomes outside the body. The trypanosomes, like other cells, were not stained by the dye until they died, and there was no clear evidence that they died sooner in the trypan-red solution than in ordinary saline. Again, Trypan red cured an infection by the trypanosome of "Mal de Caderas" (*T. equinum*) in the mouse, but not the same infection transferred to the guinea pig, rat, or dog; nor did it cure an infection with the trypanosome of Nagana (*T. brucei*) in mice. Now, to explain such a difference by stating that the affinity of Trypan red for *Trypanosoma equinum* was much higher than its affinity for the tissues of the mouse, but not than its affinity for those of the rat, would be merely to restate, in terms of the theory, the observed fact that the mouse was cured while the rat was not; and the lack of direct affinity for the dye shown by trypanosomes outside the body made such an interpretation in any

case unsatisfactory. One point, however, appeared very significant, and it is met repeatedly in studying the action of effectively chemotherapeutic substances, namely, that the trypanosomes treated with the dye *in vitro*, though neither obviously stained nor visibly harmed, had lost their power of infection, and died out promptly if introduced into the body of a mouse. Under such conditions only minimal traces of the dye are introduced into the animal, and we are left with a series of alternative possibilities. It is possible that sufficient dye has been taken up by the trypanosomes to kill them eventually, the period of survival *in vitro* being inadequate to display its action; or that Trypan red is converted by the influence of the body fluids and tissues into something which is effectively lethal for the parasite; or, again, that the effect of the drug is not directly to kill the trypanosomes, but, leaving their individual vitality and motility unimpaired, so to modify them that they have lost the power of rapidly reproducing themselves and invading the fluids and tissues of the mouse's body—in other words, have lost that complex of adjustments to the various factors of the host's natural resistance which we crudely summarize as "virulence." Such possibilities involve either storage or modification of the dye by the host's tissues or their essential cooperation in its curative effect.

One other active dye must be mentioned as providing the link with a recent most important advance. Mesnil and Nicolle in 1906 made some promising experiments with a dye, Afridol violet, which differed from any previously tested in that its central nucleus was diamino-diphenyl-urea. From this time onward there was no further public indication of progress along these lines until 1920, when Händel and Joetten published the results obtained with a remarkable substance which, as the result of some 15 years of continuous work by their scientific staff, had been introduced by the great dye and chemical firm of Bayer. This substance, which is not a dye but the colorless, water-soluble salt of a complex sulphonic acid, has hitherto been known as Bayer "205," and, for reasons which need not concern us, the firm decided not to publish its formula. To students of their patent specifications, however, it seemed pretty certain that it would prove to be one of a long series of compounds formed of chains of aminobenzoyl radicles, united by amide linkages, with a central urea linkage, like the dye last mentioned, and terminal naphthylamine sulphonic acid groupings. A number of these substances, having no diazo-linkages, were not dyes, but there was no indication as to which constitution out of an immense number possible would prove to be that of the remarkable substance numbered "205." There is a reasonable probability that its identity has now been settled by the recent work of Fourneau and his coworkers in the Pasteur Institute, who made and investigated an extensive series of

compounds of this general type and found one, which they numbered "309," which conspicuously excelled all others, even those closely related to it, in the favorable ratio which it displayed between a just toxic dose and that which caused a trypanosome infection in mice to disappear. As in the case of "205," the ratio, the "chemotherapeutic index" of Ehrlich, was found by Fourneau in some experiments with his compounds to be well over 100. At least it may be said that if M. Fourneau has not identified Bayer "205," he has discovered another compound having very similar and probably as valuable properties.

The most remarkable property of "205" is the long persistence of its effect. A dose injected into a mouse, a rabbit, or a rat will not only free the animal, if already infected, from trypanosomes in a few days, but will also render it resistant to such infection for a period of weeks or even months. During that period its serum, or extracts from certain of its organs, exhibit a curative action if injected into another animal infected with trypanosomes.

Though there seems no reason to doubt that this substance has cured a number of cases of African sleeping sickness in man, even some in which the disease was well advanced and in which all previously known remedies had failed, the mode of its action still presents a number of attractive obscurities. Like many other remedies which are experimentally efficient when injected into the infected animal, it has little or no obvious action when directly applied to trypanosomes *in vitro*. The paradox is, perhaps, less than usually significant in this case, since the action in the animal is delayed, a period of a few days elapsing before the trypanosomes begin to disappear from the blood. We might suppose that the action is too slow to be recognized during the period of survival of the parasites outside the body, or that it affects not the individual vitality of the trypanosomes, but their power of reproducing themselves. The latter idea is supported, as in other cases, by the fact that trypanosomes treated with the drug *in vitro*, or taken from an injected animal before the curative effect has become manifest, fail to infect another animal. It is contradicted, however, by the observation that the trypanosomes, just before the curative action begins, show not a depression, but a stimulation of reproductive activity, division forms becoming abnormally common. Is it that during or immediately after division the parasites become specially liable to the action of the drug? It may be so; but one thing seems perfectly clear, namely, that the action is a very complex one, involving the cooperation, in some way, of the host. For here again it is found that the curative action, on infections by the same strain of trypanosomes, varies enormously with the species infected, a mouse being cured with ease, an ox or a horse with difficulty or not at all. A curious fact is

that the rapidly progressive and fatal infections produced in mice by certain pathogenic trypanosomes are easily and certainly cured, while the apparently harmless natural infection, seen in many wild rats, by *T. lewisi* is not affected at all. Then there are some curious records of treatment in man, in which the symptoms of sleeping sickness have disappeared, but the trypanosomes are still found in the cerebrospinal fluid, suggesting that, though the parasites have not been killed, they have lost their virulence and their power of invading the brain substance.

The features of the action of this remedy, however, which have most interest for the physiologist and the biochemist are those related to the long persistence of its effect. "205" has a large molecule, but it is extremely soluble in water and diffusible through collodion membranes. How, in such circumstances, can we explain the persistence of its sterilizing and prophylactic action for months after an injection? At first sight one is tempted to regard it as incredible that a substance with these properties should persist in the body for such a period, and to suggest that the action must be due to its stimulation of the body to form its own protective substances. This possibility, however, seems to be excluded by the fact that the serum of the protected animal does not lose its curative properties if heated. On the other hand there have recently appeared, some of them only in preliminary abstract, a series of highly suggestive observations, indicating that "205" has properties of entering into a combination of some kind with the serum proteins. After standing for an hour or two in serum, "205" no longer passes into an ultrafiltrate through collodion, and if the proteins are coagulated by heat is not to be found in the filtrate. The proteins of the blood, moreover, are stated to lose many of their characteristic properties by entering into this combination, the blood losing its normal power of clotting and the serum proteins not being precipitated by mercury salts or tannin.

It would be both useless and presumptuous for a mere onlooker to speculate in detail on the significance, for the curative action of "205," of properties which are only now beginning to be investigated. One conclusion, however, I think we are entitled to draw. It is sufficiently evident that here is no question of a substance curing simply on account of its affinity for parasites and lack of affinity for the host's tissues. What direct action on the parasite "205" itself may possess has still to be demonstrated; we may feel reasonably certain, on the other hand, that its affinities for the constituents of the host's blood and tissues play an important part in its remarkable and peculiar curative properties.

Derivatives of arsenic.—In the case of the other series of investigations which I mentioned, that dealing with the organic deriva-

tives of arsenic, we find again many difficulties in the way of the simple theory of a cure due to distribution by chemical affinities. None of the compounds of this series which have reached practical trial and success in the treatment of spirochetal or trypanosomal infections, atoxyl, salvarsan, or tryparsamide has a directly lethal action on the parasites in dilutions at all comparable to those which can be safely and effectively produced in the body of the host. The paradox of this direct inertness of atoxyl, the starting point of the series, seemed to be explained when Ehrlich showed that its reduction to the corresponding arsenoxide produced a substance with an intense directly lethal action on trypanosomes. Similarly, the partial oxidation of salvarsan to the corresponding arsenoxide produced a substance having the intensely lethal action on spirochetes or trypanosomes *in vitro*, which salvarsan itself conspicuously and paradoxically lacked. In these cases we may make the supposition which Voegtlin and his coworkers especially have recently supported by detailed evidence that the reduction or oxidation effected by contact with the tissues is the essential preliminary to the curative action, a supposition which, it will be noted, again introduces the host as an essential participant in the cure. The fact that the administration of these relatively inactive predecessors is therapeutically more effective than the injection of the directly active oxides derived from them would then be explained on the assumption that the slow liberation of these latter in the body at a rate which never produces a high concentration provides the optimum condition for their persistent action on the parasites without danger to the host. This slow and persistent liberation of the directly active substance would be favored by the physical properties of salvarsan, which at the reaction of the body is practically insoluble and must be rapidly deposited after injection.

In their recent work on the action of tryparsamide, the compound prepared by Jacobs and Heidelberger at the Rockefeller Institute, which has shared with Bayer "205" the credit of making the eventual conquest of African sleeping sickness a hopeful possibility, Brown and Pearce find it necessary to introduce yet other considerations to explain its effects. Tested by Ehrlich's therapeutic index—the ratio between the lowest curative and the highest non-toxic dose—it gives a relatively unfavorable figure. Brown and Pearce practically abandon the attempt to account for its action on the supposition that it directly kills the parasites and attribute its value largely to its power of penetrating easily into the tissues and reinforcing there the processes of natural resistance.

Action of bismuth.—Another conception of the mode of action of these arsenical remedies, also involving a direct participation in the host's tissues, was put forward by Levaditi. He found that from

atoxyl a directly parasiticidal preparation could be obtained by incubating it with an emulsion of fresh liver substance. As the first step, therefore, in the curative action of atoxyl, he postulated a combination of its reduction product with some constituent of the liver or other tissue, giving rise to the essential curative complex, which he named "trypanotoxyl." Levaditi's observations were explained by Ehrlich and Roehl as due simply to the reducing action of the liver substance on atoxyl; but it would be difficult to apply this explanation to the quite recently published observations by Levaditi and his colleagues on the mode of action of bismuth in curing spirochetal infections. A sodium potassium bismuthyltartrate—a bismuth analogue of tartar emetic—had been found to have valuable curative properties in syphilis and other spirochetal infections. Later, various other bismuth salts, bismuth suboxide, and evenly finely divided metallic bismuth were found to produce similar effects. According to Levaditi and Nicolau, these preparations have, by themselves, a relatively weak action, or none at all, on the spirochetes outside the body. If they are mixed, however, with a cell-free extract of liver, which is itself harmless to spirochetes, the mixture, after incubation, acquires a potent spirocheticidal action. The possibility of a mere reducing action of the liver extract seems here to be excluded, since bismuthous oxide or metallic bismuth itself yields a spirocheticidal mixture, containing Levaditi's hypothetical "bismoxyl," when incubated with the liver extract. If these observations are confirmed, there will be a strong indication that some cell constituent enters into the composition of or is essential to the formation of the directly active substance from any of the derivatives of arsenic, antimony, or bismuth, as a preliminary to its action on an infection due to a trypanosome or a spirochete. Again we have evidence of an organotropic property of the remedy, as an essential condition of its activity.

Resistant strains of trypanosomes.—In the phenomena of the acquisition of resistance, by a strain of infecting typanosomes to a particular curative drug, discovered and largely worked out in Ehrlich's laboratory, we meet again with facts which can only with the greatest difficulty be reconciled with the assumption that the drug directly attacks the parasites. It was found, for example, that if a mouse infected with trypanosomes received an incompletely effective series of doses of atoxyl, the trypanosomes appearing in the blood at each relapse were more and more resistant to the drug, until they could not be caused to disappear by any dose of atoxyl which the mouse would tolerate. The strain, having once acquired this resistance, would retain it, on passage through an indefinitely long series of mice, without further treatment. Mesnil and Brimont, however, made the remarkable observation that, if the strain of try-

panosomes was transferred to a rat, it immediately became in that animal susceptible again to treatment with atoxyl, remained so as long as it was kept in rats, to reacquire its old resistance to atoxyl as soon at it was retransferred to mice. Such a fact seems to be not at all explicable on the theory that the directly active agent, to which the trypansome becomes resistant, is a mere reduction product of atoxyl; it is much more easily reconciled with a mechanism such as that described by Levaditi, in which a constituent of the host's tissues enters into the formation of the trypanocidal substance. We can imagine the trypanosome becoming immune to Levaditi's mouse trypanotoxyl, and remaining susceptible to the corresponding rat product.

The whole question of this acquired resistance of the parasites to the action of curative drugs bristles with points of difficulty and interest. Ehrlich attributed the sensitiveness of the parasite, for a particular curative agent, to the possession by its protoplasmic molecule of a special form of side chain, or "chemoreceptor," which determined its affinity for that agent. When the trypanosome became resistant, it was simple to suppose that it did so by losing the appropriate chemoreceptors; an atoxyl-resistant trypanosome, for example, had lost its atoxyl receptors. Apart from the objections already mentioned, this conception met a new difficulty, when in Ehrlich's laboratory it was found that the resistance was by no means as rigidly specific as it had first appeared to be. Not only imperfect treatment with atoxyl but treatment with a particular group of dyes, having no kind of chemical relation to it, was found to produce a race of trypanosomes resistant to atoxyl and to other arsenical derivatives. To suggest that the chemoreceptors for arsenic and for these dyes are identical is merely to restate the fact of this reciprocal action in terms having no definite meaning. Obviously no more precise conception as to its significance can be formed until we know something more of the conditions on which resistance and susceptibility depend. A recent suggestion by Voegtlin has interest in making, at least, an attempt at interpretation in more definite biochemical terms. Voegtlin and his coworkers point out that arsenious oxide and its derivatives readily combine with substances containing a sulphydrile grouping and find that the toxic action of the organic arsenoxides on trypanosome and mammal alike is depressed by the simultaneous injection of excess of various sulphydrile compounds.

Suggested Reaction of an Arsenoxide with a Sulphydrile Compound

The work of Hopkins, showing the importance of one such sulphydrile compound, reduced glutathione, in the hydrolytic oxidation-reduction processes of the cell, suggests to Voegtlin that a combination with such groups and consequent suppression of this vital

function may explain the toxic and curative actions of the arsenical derivates and that a formation by the trypanosome of the sulphydrile compound, in excess of its vital need, may be the basis of acquired resistance. If certain dyes similarly affect this cellular oxidation system, the production under their influence of strains of trypanosomes resistant to arsenic would also be explained. So stated the suggestion leaves many aspects of the problem still unconsidered; but it may at least be allowed the merit of an attempt to interpret the action of these drugs in terms of known biochemical facts.

Conclusion

We have considered but a few examples of the directions in which chemotherapeutic investigation has proved practically fruitful, including some in which it shows, at the moment, the most hopeful signs of progress. If one considers any one group of investigations by itself, one may easily feel at the same time, elated by the practical success obtained, in the cure of some infection which, but a few years ago, seemed beyond the reach of treatment, and depressed by the disharmony between the results of experiment and the theoretical conceptions, hitherto available, of the nature of the chemotherapeutic process. Some of the most notable practical triumphs in this field have resulted not from experimental investigations based on theory but from an almost empirical trial on human patients suffering from one type of infection of a remedy which had experimentally shown promising results in infections of a different and sometimes of a widely different type. The partial success of tartar emetic in trypanosome infections might have justified a hope that it would have some effect in kala-azar but hardly a prediction of its really remarkable efficacy in that previously intractable form of infection. Still less would it have justified expectation of the brilliant success of this same drug in infections by the Schistosoma or Bilharzia-worm, which but recently seemed almost beyond the hope of any kind of treatment. With such instances in mind, one might, but a year or two ago, have been tempted to suggest that the attempts at theoretical investigation of the intimate mechanism of the chemotherapeutic process had contributed little to the practical achievements, and that a reasonable intelligent empiricism was still the safest guide. I do not think that the suggestion would even then have been defensible, and it would assuredly have been stultified by the results of the past few years. Patient, systematic exploration by routes of which the initial sections were already mapped in the early days of chemotherapy, has in these recent years again led to results of major importance, both for practical therapeutics and for the theoretical basis of future advance. That the original theoretical

framework begins to show itself inadequate for the expanding fabric is good reason for its reconstruction; but we may well beware of hasty and wholesale rejection, remembering that it served the early builders well. I think that it is especially encouraging to note that, though, in the action of almost every remedy which has proved its value in the specific cure of infection, there are features which can not be interpreted by a strict application of Ehrlich's distribution hypothesis, the discrepancies begin to show a new congruity among themselves. Repeatedly we find phenomena which point to the need of modifying the theoretical structure in the same direction. The conception of a remedy not killing the parasites immediately, but modifying their virulence, or lowering their resistance to the body's natural defenses; of a remedy not acting as such, but in virtue of the formation from it in the body of some directly toxic product, either by a modification of its structure or by its union with some tissue constituent; of an affinity of the remedy for certain cells of the host's body, leading to the formation of a depot from which, in long persistent, never dangerous concentration, the curative substance is slowly released; all these conceptions present themselves, again and again, as necessary for our present rationalization of the effects observed. It can hardly be doubted that they will potently influence the methods by which, in the immediate future, new and still better specific remedies are sought. But though our practical aim, in relation to the affinities of a remedy for the parasite and for the host's tissues, may be radically changed, the meaning of these specific affinities, so delicately adjusted to a precise molecular pattern, remains dark. Ehrlich's chemoreceptors may no longer satisfy us, but we have nothing equally definite to replace them. I have endeavored to indicate what seem to me hopeful signs of new contacts between biochemistry and chemotherapy. There is promise, in another direction, that at least some aspects of the problem of immune specificity are being brought within the scope of strictly chemical investigation, as in the recent work of Avery and Heidelberger, on the constituent of a pneumococcus which combines with the specific precipitin. As in Ehrlich's pioneer work in chemotherapy, it can hardly be doubted that an increased understanding of the meaning of immune specificity, which but a short while ago might have seemed hopelessly beyond the range of attack by chemical weapons, will still influence ideas and help to shape the course of further investigations on the chemotherapeutic process. As the biological complexity of the problem is realized, it becomes increasingly a matter for wonder and admiration that so much of practical value has already been achieved—the treatment

of the spirochetal infections, syphilis, yaws and relapsing fever, revolutionized; Leishmania infections, kala azar and Bagdad boil and Bilharzia infections which crippled the health of whole populations in countries such as Egypt, now made definitely curable; trypanosome infections, such as the deadly African sleeping sickness, after years of alternating promise and disappointments, brought now at last within the range of effective treatment. And if such results have already been attained, in a period during which practice has often and inevitably outrun theory, we may well be hopeful for a future in which fuller understanding should make for more orderly progress.

DIATHERMY: A SPECIFIC FOR GONORRHEAL EPIDIDYMITIS

The Journal of Urology of August, 1924, contains a short paper by B. C. Corbus and V. J. O'Conor on the treatment of gonorrheal epididymitis by diathermy which the authors consider a specific. Knowing that the gonococcus is destroyed at a temperature of 108° F., the writers devised an instrument which would produce this amount of heat throughout the epididymis. The instrument consists of a fiber clamp with curved arms, one of which is movable. This movable arm may be fastened at any desired point by means of a lock nut. Two concave disks are attached to the distal ends of the arms. These disks measure 4 cm. in width and 5 cm. in length, and are swiveled that they may be easily adjusted. Each disk is connected to a binding post so that a bipolar current may be applied.

The patient is placed in the recumbent position and the scrotal and suprapubic region exposed. Shaving-soap lather is placed between the skin and the contact point of the electrodes. The entire body of the testis and the epididymis is incased between the apposed electrode surfaces and heated uniformly by the d'Arsonval current. In order to effect the greatest degree of heat induction possible in the individual, the current is increased to the extent of cutaneous discomfort. When this point is reached the current is then reduced slightly so that no unpleasant sensation accompanies the treatment. The heat is applied for at least 40 minutes, since even at 104° to 106° F. the gonococcus is killed during this time. In those cases seen during the first 12 to 24 hours of epididymal involvement by the gonococcus one such treatment has usually sufficed to check the attack and start the process of re-solution. In those instances where the inflammatory reaction has been present for a number of days, three or four treatments on successive days have been sufficient to eliminate all untoward results.

A very distressing funiculitis often accompanies the epididymal involvement and may persist after the symptoms of the latter have

completely subsided. This is quickly relieved by placing the instrument in a vertical position with one electrode over the globus minor and the other over the region of the internal abdominal ring. This permits an induction of heat throughout the accessible portion of the vas deferens; this should be continued for 40 minutes.

So mild is the attending inflammatory reaction following a heat treatment for gonorrheal epididymitis, that there is absolutely no hydrocele present. Both poles of the epididymis are distinctly palpable as hard painless nodules; this is rendered more distinct on account of the absence of any orchitis.

SYME'S AMPUTATION

Sir D'Arcy Power of London, who has contributed to the British Journal of Surgery during the past three years short accounts of the original reports on surgical advances which were epoch making, offers in the issue of July, 1924, the following comments on the origin of Syme's amputation.

"The history of amputations has still to be written. It will not be very long, because until the introduction of anaesthesia the simplest and quickest method was the best both for the patient and the surgeon: for the patient because he underwent the operation with a minimum of pain, and for the surgeon because he could the more easily control the bleeding and there was less tissue to suppurate. Circular amputation, therefore, was the accepted method, though a few brilliant operators used flaps, but even they fashioned them by transfixion and removed the limb at the traditional 'seat of election.' Amputation wounds rarely if ever healed by first intention, so that no stump was weight-bearing, and the majority were tender and irritable for years afterwards. 'The seat of election' was that point in the limb where the end of the stump was most protected and least in the way. The method was wasteful, because it led to unnecessary sacrifice of healthy tissues, and Syme introduced his operation with the statement that 'it may be startling, but it is nevertheless true that amputation at the anklejoint with hardly any exceptions may and ought to supersede amputation below the knee. The idea of amputating at the anklejoint is not new, the operation having been performed on the Continent by different surgeons before I thought of it; and it would probably ere now have become generally adopted but for the doubt that was entertained as to the ends of the bones being sufficiently covered to afford the patient a useful and comfortable support for the limb. For my own part, when I read of dissecting flaps of skin from the instep or sides of the foot, I felt so much distrust in the protection that could thus be effected against

the injurious effects of pressure on a part so exposed to it, that I had no desire to try the experiment. But it occurred to me that by performing the operation in a different way all such objections might be obviated. This was to save a flap from the sole of the foot and thick integuments of the heel, by making a transverse incision and dissecting these parts from the os calcis, so that the dense tissues provided by nature for supporting the weight of the body may be still employed for the same purpose. Two trials of this operation having proved satisfactory, I communicated them to the profession, and am glad to find that not only my colleagues in the hospital here but also the practitioners in other places have already acted upon this recommendation. The additional experience of my own practice now enables me to suggest some improvements in the mode of procedure—point out an error to be avoided—and verify the expectation formerly expressed as to amputation of the leg being hardly ever required.

" 'The best instrument for performing the operation is a large bistoury or small amputating knife. There is no occasion for a tourniquet, as the assistant has complete command of the vessels by grasping the ankle. In my first operations the flap was made unnecessarily long; and I feel confident that the following directions may be trusted for exactly determining its proper extent. The incisions across the instep and sole of the foot should be curved with the convexity forward and exactly opposite each other. A line drawn around the foot midway between the head of the fifth metatarsal bone and the malleolus externus will show their extent anteriorly, and they should meet a little way farther back, opposite the malleolar projections of the tibia and fibula. Care should be taken to avoid cutting the posterior tibial artery before it divides into the plantar branches, as in two cases where I did so, there was partial sloughing of the flap. If the ankle joint is sound, the malleolar processses should be removed by cutting pliers; but if the articulating surfaces of the tibia and fibula be diseased, a thin slice of these bones should be sawn off. The edges of the wound should be stitched together and lightly dressed. When the cure is completed, the stump is conical in form and having for its apex, or central point of pressure, the thick integument which covered the heel.

" 'In proceeding to consider the circumstances in which this operation may be performed it seems worthy of notice that until a recent period amputation of the leg was in this country generally resorted to for the removal of diseased bone when the part affected extended upward beyond the metatarsus. The operation of Chopart might frequently have accomplished all that was requisite, but unfortunately labored under a prejudice which opposed its adoption.

This was that the extensors of the heel, being deprived of antagonizing action, would point the stump downward so as to render it useless as a support for the body. In 1829 I ventured upon this partial amputation of the foot, though there was no precedent for it in Edinburg, in a case where removal of the leg had been proposed, with perfect success and without the slightest inconvenience of the kind anticipated. Encouraged by this result, I resolved to adopt the operation; and before long performed it six times with entire satisfaction. Since that time the operation has been established here and regularly practised in cases admitting of its application.

"'Although the introduction of Chopart's operation considerably abridged the field for amputating the leg, there were still two situations in which caries frequently occurs, where it was beyond the reach of any partial removal of the foot. These were the joint between the astragalus and the os calcis and the ankle joint itself. I was therefore led to think of contriving a method of amputating at the ankle joint which might afford relief under such circumstances and afford the patient a comfortable stump.'

"The first patient operated upon was a boy, age 16, who was admitted, probably into Minto House, on September 8, 1842, suffering from disease of the foot, which had suppurated and ulcerated in consequence of a twist which he had given it in walking about 12 months before. The second patient was 'Dr. W.,' a medical gentleman about 25 years of age, who had been seen in consultation with Mr. Goodsir in the early part of 1843. Both cases did well, and Mr. Syme notes that it was unnecessary to make any counteropening in the heel flap in the second case, because he had buttonholed the heel flap in dissecting it from the bone. 'The drain thus afforded has proved so useful by permitting a free escape to the discharge and allowing the edges of the flaps to unite throughout their whole extent that I think its intentional establishment would always be advantageous.' From this time onward Syme performed the operation so frequently that in August, 1844, he had records of 14 cases, 8 in his own practice and 6 in that of others, and in no instance had there been a fatal result. Incidentally he mentions the ease with which the operation could be done owing to the recent invention by Robert Liston of the straight-cutting pliers for bone, which he hoped would supplant the variously shaped saws previously in use.

"It took some years before the new operation assumed its proper position. In 1862 a report was made upon the subject of amputations through the foot and the ankle joint by a committee of the associate medical members of the Sanitary Commission of New York. The members of the commission, which included Stephen

Smith, Valentine Mott, A. C. Post, and W. H. Van Buren, reported that 'the stump after Syme's amputation is much better adapted for an artificial appliance than that resulting from either Chopart's or Pirogoff's operation.' In 1873, Mr. Henry Hancock, in his work On the Operative Surgery of the Foot and Ankle Joint, after a very careful examination of the recorded cases, expresses his most favorable approval of the operation and quotes the just and liberal criticism of Jules Roux, who, after performing the operation for the first time in 1846, said: 'It appears to me that by this operation art modifies without changing the language of nature; in fact, the malleoli being removed, the lower extremity of the leg affords a base of support which transversely exceeds that of the os calcis.'

"The operation continued to excite a considerable amount of attention and some criticism. In 1878 Dr. John A. Wyeth, of the University of Louisville, set himself to work upon the surgical anatomy of the tibio-tarsal region with special regard to amputation at the ankle joint. He found that in 80 consecutive dissections not a single calcanean branch was given off by the posterior tibial artery before its terminal bifurcation, while in every one of the 80 dissections one or more good-sized calcanean arteries were derived from the external plantar, within 1¼ inches of its origin. 'In 80 cases,' he says, 'the number of calcanean branches derived from the external plantar was 221, and every one of these was safely inside the line of incision in amputations at the ankle joint, when the incision is not more than half an inch posterior to the axis of the leg, the foot being at right angles. In all cases articular branches are derived either from the posterior tibial or internal plantar or from both. In some exceptional cases the internal plantar gave off some small branches to the heel. The anterior flap is plentifully supplied by branches from the anterior tibial, especially the malleolar arteries. The anterior and posterior peroneal arteries distribute branches to the outer portion of the calcanean flap, but they are not large enough for the blood supplied by them to maintain the integrity of the calcanean flap, especially when their anastomoses are cut off by division of the posterior tibial or its plantar branches too near their origin.'"

NAVY NURSE CORPS

IN ALASKA WITH PRESIDENT HARDING

By Sue S. Dauser, Chief Nurse, United States Navy

"The Floating White House" was the term applied to the U. S. S. *Henderson* by the people of the Alaskan villages, as she plied from one to the other in her epoch making trip along the far northern frontiers of our Republic. With the President's flag flying and as the largest ship to navigate Alaskan waters, she added to her already historic record, the honor of carrying for the first time a President of the United States to visit our sub-Arctic wonderland, the scenic and inspiring shores of Alaska.

The vessel was spotless in her new coat of paint, as she waited for her distinguished guests at the community wharf at Tacoma, on that 5th day of July, 1923. Her upper decks were a solid avenue of flowers and blossoms of all the hues and magnificence that only the State of Washington can give.

Everywhere on the banks of Puget Sound around Tacoma throngs of people had gathered. Mingled with the loud cheers of the assembled multitude was the lively and gay music of many bands, and the roar of 21 guns, the President's salute, as the ship slowly backed away from the wharf and started her journey to the far north, with two ever alert, ever watchful destroyers, one before and one aft.

For a thousand miles we plied through Canadian waters and toward evening of the fourth day we had our first sight of Alaska. The scenery of the Inside Passage and Alaska is beyond all human description. For days we glided among those timber-covered mountans. They seemed so near on either side, and the ship so large, that it seemed they would play with her shadow as she tried to swing herself around the many curves and bends. There was no flat land; the mountains came directly out of the deep waters of the channel. Single mountains completely surrounded by water formed thousands and thousands of islands. Hundreds of miles apart there would be signs of human habitation—little fishing villages—that seemed fairly to cling to the sides of the mountains or would be partly built over the water.

Gradually the scenery changed to higher mountains, with snow above the timber line, with many waterfalls and frequent glaciers.

Many of these glaciers are dead now, but nevertheless, particularly with their coloring in the sunlight they did add much to the magnificence of the scene. Most fortunately, we had sunshine every day except for parts of two rainy days.

The fifth morning, a Sunday morning, we were awakened by shrill whistles and an Indian band playing the Star Spangled Banner. Small craft surrounded us with the reception committee from the little Indian village, Metlakatla. Launches were lowered, and our landing in this little community on the island of Annette was the first time in history that a President of the United States had set foot on Alaskan soil. This little island was granted by a special act of Congress as a haven to Father Duncan and his Indian converts. The largest building was a small church with twin towers, standing as a landmark to the memory of the early missionary.

The village of about 100 houses, many of them deserted, told us a story of better days. The board walk was built over luxuriant vegetation almost tropical in appearance, with a generous mixture of the bright fireweed. The entire population of this little island was gathered at the landing to greet the President. The children led the way through some arches under an inscription, "God Bless our President," to the front yard of the schoolhouse. Here a simple and primitive entertainment was given as a welcome. A picturesque closing to this entertainment was the address of an old Indian chief who came forward and spoke to President Harding in broken English. He told of the happy days before the white man came and robbed the waters of their fish, of the days when his people had no worries, of the time when, if he or his family were hungry, he could go to the water and get plenty of fish. He beseeched the President to bring back those days to the Indians.

For a few hours after leaving Metlakatla we again sailed among myriads of forest-covered islands, and landed at our first port of call in Alaska, the town of Ketchikan. This is a very cosmopolitan seaport and people from every State of the Union waited at the dock to welcome our President, while the reception committee came with all the dignity and formality of silk hats. Many ex-service men with their snappy salute could be singled out in the city's population as it stood with heads bared, while the President stood at attention before leaving the ship, the band playing the national anthem. The city is like a large wharf, with business buildings, streets and sidewalks built on stilts over the water, while many of the houses are built far up on the mountain sides. The party was taken over these boards in automobiles through the city and along the water's edge to visit some canneries, then up a small canyon to

view the city's latest acquisition, a ball park. Hitherto ball playing was only with "tide permitting" and as a result with many interruptions.

Each following stop, although very similar in general appearance and spirit, had its own particular historic points of interest and ever increasing scenic splendor and magnificence. Wrangell, on the famous Stikine River, dates far back in the history of Alaska. Juneau, the capital of Alaska, is the metropolis of the Territory. Skagway, "the deserted village," is impressive with ghostlike memories of the wild days of adventure, when it served as a short cut to the Yukon and Dawson.

A sail of three days brought us across the Gulf of Alaska to the most impressive spot of all, Resurrection Bay and Seward. During this sail we had glimpses to the north of Mount Elias, the Muir Glacier, and the icy crags of many of the other larger glaciers. Through "Harding's Gateway," so named in honor of the day when the distinguished visitor passed through and because this spot seemed to have impressed him the most, we entered wonderful Resurrection Bay. This landlocked harbor was surrounded by snowcapped mountains, and between the snow and water line was a band of most luxuriant vegetation, timber, shrubs, and wild flowers. We were here six nights and never saw real darkness; it would be twilight for about four hours, then dawn. No matter when we looked, day or night, ever changing coloring, sometimes most gorgeous and vivid, sometimes delicate, played over the mountains and the calm water of the bay.

At one end of this harbor there was enough level land for the city of Seward, the city pronounced the most beautiful in Alaska by President Harding. As was the case in every Alaskan stop, we found hospitality beyond all conception of the word; perhaps due to the fact that our stop was longer in this town we marveled the more at the unlimited bounds. All that the people wanted or hoped for in return was a band concert by our Navy band. At every stop the President would meet in conference with the representatives of the village, and for an hour or two the inhabitants would have the pleasure of a concert by the ship's band, and it may be interesting to know that often it was the first band music for many of the children.

From beautiful Seward we went to that port of Alaska which is farthest north, Valdez, a town deserted and forsaken, yet full of memories and hopes. From here we drove to the famous Keystone Canyon, on the Richardson trail. The motors climbed up and up to the very rim of the mountain; a thousand feet below us was the rushing milky torrent, opposite us the Bridal Veil Falls. We stopped in speechless awe amid Alaska's grandeur.

Again on the *Henderson* we were to witness soon still another type of awesome inspiration. At Cordova a special train, diner and all, met us at the wharf and for several hours wound its course along the Copper River. When it came to a stop we walked a short distance on the river bank until opposite us, not a thousand feet away, was Childs Glacier, Alaska's most active glacier. It was a solid bank of ice some 300 feet high, forming the opposite bank of the river for about 10 miles. There was a continuous roaring and booming as of gigantic guns, with echo and reecho. At frequent intervals large blocks of ice weighing tons would break away and fall into the stream, hurling water 50 and 60 feet into the air, and on the bank where we stood waves would sweep up as from an incoming tide. Gleaming in the sunshine, reflecting indescribable colors, the sky line was all in turrets and spires and towers. The shrill whistle of our train called us back to a happy surprise—a delicious hot chicken dinner. It was tempting enough to cause us to sacrifice a few moments of the scenic Copper River as we wound our way back to Cordova on a train piloted by the President himself, while the regular engineer leisurely enjoyed his dinner.

The historic old town of Sitka was our next and last stop in Alaska. It was a glorious, dreamlike Sunday morning; the quiet, peaceful bay, dotted with small timber-covered islands, spread before us, and in the distance Mount Edgecumbe stood as sovereign over all. Suddenly a town appeared, a town of the Old World. The appearance and the solidity of the buildings, churches, streets, and wharf were of another century. In this quaint old town stands a simple little missionary church that will go down in history, memorable as the last church in which our late President attended divine services.

Near by was the Sheldon Jackson Museum, full of relics, and the national park full of its historic totem poles and its well-known "Lovers Lane." In the old Russian church it was our privilege to see relics seldom viewed by tourists, priceless jewels, ivory, gems, images, crucifixes, gifts of royalty, even as far back as Peter the Great.

Perhaps there was a little more than ordinary sentiment felt that Sunday evening when the band closed the day, as had been the closing of all those Alaskan days, with the beautiful strains of The End of a Perfect Day. It had been a devout and worshipful day. The *Henderson* slowly got under way to the strains of Auld Lang Syne, as had been the custom at the departure from every village. She glided out among the islands of that picturesque bay, and with hearts full of happy memories of Alaska, we watched the sun disappear for the last time in that gorgeous sky behind the mountains.

As we were ahead of our scheduled arrival at Vancouver, it was planned during the afternoon to cast anchor for the night in a beautiful spot where the Inside Passage widened into a clear, calm lake surrounded by timber-covered mountains with no signs of human inhabitants. We were at anchor, perhaps 30 minutes, all contented, enjoying the band's music, when suddenly there appeared from around a point a small boat filled with people, to be followed by another and another. Soon there were dozens of every size, shape, and description, apparently anything that would ride the water and carry people was employed. Because of the wild enthusiasm over the music, the President ordered the band to continue, and until dark that night our ship was surrounded by those Canadian fishermen and their families listening in keen delight to the melody.

That same afternoon we experienced the first of that remarkable Canadian hospitality. An airplane circled around us and landed to bring us bundles of that day's issue of the daily papers. One paper expressed the sentiment that Canada had waited a long time for the President of the United States to pay her a visit, but regardless of the long wait she would give him a most sincere and loving welcome.

In Vancouver, during the demonstration of welcome, we were standing near a group of Canadians, and overheard one say, "No one aside from the King himself would have such a reception." At that very moment I wondered how even the King himself could be more kindly received. All honor in rank, dignity, dress, and impressiveness was there. Not only at the hour of arrival but throughout the whole day, to the very hour of departure, we could see how they loved our President, and how proud they were of him as their visitor. That evening at 10.30, as throngs waved their farewell, the *Henderson* slowly backed away from the dock, her whole family standing on the decks to watch the city disappear into the darkness. It was a happy family after such a memorable day of Canadian hospitality. The President, although he looked like a tired man, remained among the last to view the disappearing metropolis, and in real contentment declared it the end of a perfect day.

The next morning was so foggy that we had to cast anchor for about five hours. When the fog lifted we proceeded to Seattle to witness one of the most impressive functions of the whole trip. Our fleet, all ships dressed, were in formation along Puget Sound to honor the President. We passed through this formation, on one side the battleships, on the other the destroyers, and in the bay all the vessels of the train. As the *Henderson* came opposite each battleship the guns fired the President's salute, while aboard all stood at attention, the *Henderson's* band playing the national anthem.

In time we came in view of the city itself—the hillsides, the streets, the docks, the roofs of buildings, every available space

crowded with people. The *Henderson* was to leave the President and his suite at Seattle and sail direct to San Diego, there to pick up the party again and continue the trip through the Panama Canal. The President bade us good-by, and in the few words of parting he realized his fatigue to the extent that he had to sit down. He and Mrs. Harding looked at the people waiting there in that city ahead of us, and in grim determination they decided they could not disappoint them. For the last time the band played the Star-Spangled Banner, and the President descended the gangplank.

As we stood at the ship's rail watching the party entering the assigned automobiles we saw the President perform an act so characteristic of him. He was seated in the machine; the crowd was so dense around him that there was delay for a few moments in starting. Just as the automobile was beginning to move he asked the driver to stop; some 5 or 6 feet back in the crowd a man was trying to give a small child, about 2 years of age, a view of the President by holding it above the heads of his neighbors. He called to the man, and over the heads of the people the child was passed to him in the car. He held it on his lap for a few moments and then handed it back; the machine started and soon was lost to view in the crowd.

THE DIVISION OF PREVENTIVE MEDICINE

Lieut. Commander J. R. PHELPS, Medical Corps, United States Navy, in charge

Notes on Preventive Medicine for Medical Officers, United States Navy

MYCOSIS OF THE HANDS AND FEET, CRUTCH ITCH, BULLOUS DERMATITIS OF THE FEET, ETC.

The purpose of these remarks is to invite attention to the very useful article by Commander C. S. Butler, Lieut. J. E. Houghton, and Lieut. (j. g.) G. F. Cooper, Medical Corps, United States Navy, which appeared in the November, 1924, number of the BULLETIN.

It has gradually become quite generally recognized that lesions of the skin caused by mycotic organisms are very common in all walks of life, but doubtless many medical officers will be surprised by the frequency with which these infections are to be found among officers and enlisted men of the Navy, as indicated by the data collected and the studies made by Commander Butler and his colleagues at the United States Naval Medical School.

All the dermatomycotic lesions studied by these observers were found to be caused by fungi belonging to three genera: *Microsporon*, *Trichophyton*, and *Epidermophyton*. Epidermophyton lesions are especially common. These organisms as distinguished from trichophyton do not grow on the hair or in the shaft of the hair. Trichophyton, however, although not so commonly found in lesions of the hands and feet or in cases of intertrigo do grow in nonhairy regions and cause lesions.

The common and familiar intertrigo of the thigh and groin or axillary space, so-called crutch itch, dhobie itch, etc., is caused by these fungi and in most cases the offending organism is an epidermophyton species. True ringworm lesions involve the hair and are caused by one species or another of trichophyton. Heretofore the intertrigos, and itches commonly spoken of as dhobie itch in the Tropics, have been put down as ringworm, and if it has been neccessary for the patient to go on the sick list the case has been reported under the only available title, "Trichophytosis."

Where it is not practicable to determine the genus to which the fungus belongs in the case of a given lesion of this kind it may usually be assumed that the causative agent is an epidermophyton.

It is only by the slow process of culturing that the trained observer may differentiate microsporon, trichophyton, and epidermophyton molds in the laboratory.

It should be remembered also that lesions on the hands and feet due to one or another of these molds are very common in the Navy. They are likely to be active especially in warm weather. These fungi thrive when the skin is moist with perspiration. In the paper referred to the lesions are classed as acute vesicular or bullous, and hyperkeratotic. Practically, one should suspect the presence of one of these fungi in all cases where there are more or less intractable vesiculated, squamous, lardaceous, or hyperkeratotic lesions between the fingers or toes—the so-called soft corns, minute vesicles on the lateral surfaces of the fingers, persistent proliferative lesions on the palms, and pompholix of the soles of the feet. Sore feet are not infrequently complained of on board ship, and the condition is often attributed to walking or standing on hot decks, work in the engine room, fireroom, dynamo room, etc.

Undoubtedly the heat and the limited ventilation of the feet resulting when ordinary thick leather shoes are worn under such conditions favor the growth of the organisms and the development of the deep vesicles or painful bullæ sometimes found.

Rational treatment in such cases is based on the assumption that there is a vegetable fungus organism to be dealt with. The presence of the mold may usually be demonstrated by following the technique recommended by Commander Butler and his colleagues. Their suggestions regarding treatment will prove helpful to many. As the writers remark, it would seem that the matter of treatment resolves itself into the question of persistence in the use of agencies which will destroy the organisms until all the seeds, the resting forms, are desquamated and killed.

In this connection it may not be out of place to remark that an ointment compounded according to the following formula is highly recommended in the 1923 report of the medical department of the United Fruit Co. in the treatment of dhobie itch or Tinea cruris.

FORMULA

	Per cent
Salicylic acid	4
Bismuth subnitrate	10
Mercury salicylate	4
Oil of eucalyptus	10

Lanolin and vaseline sufficient to make up 100 per cent.

Dr. William E. Deeks, general manager of the medical department of the United Fruit Co., reported that this ointment has been found very useful in the treatment of pruritis ani, and that during an ex-

tensive experience in the Canal Zone, Panama, he used it with very satisfactory results in the treatment of the exceedingly common affection known as dhobie itch, regarded as caused by epidermophyton cruris or inguinale. He states that three or four thorough applications will usually cure the affection, and that the ointment is now extensively used in the Tropics under the name of " Dhobie ointment."

The reader is also referred to a paper by H. H. Hazen entitled, " Eczematoid ringworm," which was published in the Journal of the American Medical Association, October 11, 1924. Under this title Doctor Hazen describes the mycotic skin diseases, and states that between 9 and 10 per cent of all new patients seen in his office seek relief from such affections. Although he gave the title " Eczematoid ringworm " to his paper, Doctor Hazen himself writes that the expression, eczema, is an unfortunate one. He appears to consider, and doubtless correctly, that all cases of pompholyx are mycotic infections. He states: " I am of the unqualified opinion that the disease formerly known as pompholyx does not exist." According to him, eczematoid ringworm infections must be differentiated from eczema, irritant dermatitis, and erosio interdigitalis blastomycetica.

The prevalence of mould infections of the skin in civil life was discussed with Doctor Hazen while the studies were being carried on at the United States Naval Medical School. These infections appear to be less common in women, probably because they keep the skin of the groins and axillary spaces dry with powders and ordinarily their footwear permits the feet to be well ventilated.

From the standpoint of prevention it is of first importance that medical officers realize how prevalent mycotic infections of the skin are, and that they recognize the lesions early so that rational treatment may be applied promptly and persistently. Frequent changes in remedial agents tried under the assumption that the disease is eczema are of course to be avoided. While intertrigo and lesions on the hands and fingers may not cause serious disability, lesions on the feet frequently make admission to the sick list necessary sooner or later. Fewer cases will reach a stage where admission to the sick list becomes necessary—and of those that do fewer sick days will be charged—if the true nature of the case is promptly recognized.

Much remains to be learned regarding sources of infection, modes of transmission, and practical methods of disinfection. Laboratory work incidental to the study of these molds has shown that they may be treated with strong solutions of the caustic alkalies without destroying them. Nothing definite is known as to what chemical agents may be used in practical methods of disinfection. Hazen states: " It is also well known that boiling socks for 10 minutes in a weak alkali solution will not destroy their infectivity." That

seems incredible; at any rate the wet heat thermal death point should be checked up by careful technique as soon as possible. Some of the fungi have been found to resist drying for many days, and it is not unlikely that all will withstand desiccation, a most unfortunate circumstance so far as the prevention and control of infection is concerned.

Pending further experimental work and the synthesis of more exact knowledge regarding the more important modes of transmission and the factors which especially determine the development of lesions, it seems likely that occasional or frequent contact with these disease-producing fungi is almost universal and that infection very often does not follow. From the standpoint of prevention the apparent lesser frequency of infection among women is significant, and this suggests certain measures of possible prophylactic value, such as frequent cleansing of the feet and the skin in the folds of the groin and axillary space, thorough ventilation of the skin, and keeping the skin dry by means of dusting powders, etc.

While it is not known what part the floors of washrooms and shower-bath compartments play in spreading infection of feet on board ship, it is probable that the fungi are picked up in this way in many cases. What to do about it is a question. We can at least fall back on the general proposition that frequent cleansing and thorough scrubbing will mechanically remove many of the organisms. At least, there should be no neglect with respect to cleaning details.

From the part gymnasiums not infrequently play in the spread of intertrigos it appears that wrestling mats, towels, etc., are potent agencies in the transfer of infection. Doubtless direct transfer from person to person often takes place. The likelihood that handshaking is a common method of transfer has been pointed out. On board ship the common wash bucket probably accounts for infection in many cases.

RETURN TO STRAIGHT TYPHOID VACCINE

The commanding officer of the United States naval medical supply depot, Brooklyn, N. Y., has been instructed to procure and henceforth issue to the naval service plain typhoid vaccine containing 1,000,000,000 bacilli to the cubic centimeter, or as near that number as it is possible to attain with present standards and methods of manufacture. This change represents essentially reversion to the vaccine used in the prophylaxis of typhoid fever in the Navy

from 1912 to the summer of 1917, and approximately the same dosage.

At present the Manual of the Medical Department requires that all persons under the age of 45 years who can not submit bona fide evidence of having had typhoid fever shall be inoculated as soon as practicable after entry into the service, and that the administration shall be repeated every four years until three complete courses of three inoculations each have been administered at proper intervals of not less than 5 nor more than 15 days between inoculations. Hereafter only two complete courses will be required—a series of three inoculations upon entering the service, repeated once four years later—except in the case of an individual furnishing satisfactory evidence that he has had typhoid fever.

So far as can be determined, very few cases of paratyphoid infection occurred in the Navy before paratyphoid A and paratyphoid B bacilli were added to the vaccine in 1917. From the time that strains of the paratyphoid bacilli were added, severe reactions following inoculation have been more common, and from time to time very severe reactions have been reported.

Vaccine containing only a single strain of *B. typhosus* may cause severe reactions, especially, it seems, after a second or third inoculation in a second or third series. Moreover, even with plain typhoid vaccine a considerable percentage of all persons inoculated must expect to have moderately severe reactions. Such reactions must probably be regarded as unavoidable and essential to the immunizing process. However, it appears that reactions in the aggregate were not so severe and severe reactions were not so commonly encountered in the Navy before 1917 when straight typhoid vaccine was issued as since the paratyphoid bacilli were added.

It is unfortunate at this time that comparison with regard to the character of reactions in the two periods can not be made on the basis of complete data relating to all inoculations given as could have been obtained by requiring systematic recording of the results throughout the service. In the future the collection of such information will be required. Medical officers will be glad to record their observations, because they themselves among more than 100,000 officers and enlisted men who must submit to vaccination have a personal interest in the matter, and they must realize the importance of carefully collected statistical data bearing on dosage as well as the question of whether or not paratyphoid bacilli should be included in the vaccine.

The question is not simply one of protection; the probable risks of exposure and the probable risk of death, temporary disability, or permanent damage in case of infection must be weighed against

the possible hazards of vaccination and the amount of disability resulting directly from inoculation of a considerable part of the entire personnel each year.

Many perplexing questions relating to the prevention and control of typhoid and paratyphoid infections by the method of creating mass immunity through the use of bacterial vaccines remain to be answered. The knowledge which has come thus far from the experimental laboratory is not sufficient or exact enough to settle the question as to nature, degree, and duration of protection afforded by inoculation of killed microorganisms. One feels especially the need of such knowledge regarding the paratyphoid bacilli.

With the matter of protection unsettled we turn to the question of exposure and risk of infection and likewise find a lack of trustworthy evidence that might permit a definite estimate to be made of the prevalence of paratyphoid infections and their exposure hazards in comparison with the likelihood of contracting typhoid fever and of dying or undergoing a serious or prolonged illness in case of infection.

Nowhere can cases reported or recorded as cases of paratyphoid infection be accepted as having been caused by a paratyphoid bacillus rather than by *B. typhosus* unless the bacteriological findings are known to have been determined after careful and prolonged study with repeated trials of agglutination reactions by an experienced bacteriologist who is conversant with the vagaries of these microorganisms with respect to their agglutination properties.

The possibility of error must be borne in mind regardless of the standing of the laboratory from which the report issues. For example, we recently learned of a case of typhoid fever treated in a hospital in one of our largest cities. The laboratory work was done in a laboratory which is used for the training of the students of one of the best medical schools in the country. Both the day nurse and the night nurse in attendance upon this case of typhoid fever became ill. Bacilli were isolated in both of these cases. One nurse was found to be infected with paratyphoid A bacilli and the other with paratyphoid B. It is necessary to invoke a rare coincidence to assume that the laboratory findings were correct in these cases.

Last spring an outbreak of typhoid fever occurred in Portland, Oreg. It was reported in the American Journal of Public Health for October, 1924, by H. J. Sears, R. W. Garhart, and D. W. Mack under the title, "A milk borne epidemic of typhoid fever traced to a urinary carrier." The outbreak consisted of 26 cases with 5 deaths. Eventually all the cases were recognized as *B. typhosus* infections and all were traced to the same milk supply contaminated

by a single carrier, a milker at the dairy farm who proved to be a persistent carrier of *B. typhosus*.

Those studying the outbreak were confused in the early part of the investigation by the fact that several of the cases were diagnosed by laboratories in the city as paratyphoid A and one or two as paratyphoid B on the basis of agglutination reactions. The epidemiologists were not satisfied with the only conclusion that could be drawn from these findings—that they were dealing with a mixed epidemic. Specimens of stools and urine were collected from those patients, although a number of them were already convalescent. The investigators succeeded in isolating and identifying the typhoid bacillus from five of them, while paratyphoid bacilli were not met with once. The epidemiological findings were sufficient when the study was completed to clear up any remaining doubt. This study suggests how readily isolated cases of typhoid fever can get into statistical compilations as cases of paratyphoid infection.

There were several interesting points brought out with respect to the carrier; not so much that the conditions encountered were especially unusual but because they are instructive to one not thoroughly versed as to the conflicting results which must not infrequently be dealt with in attempting to establish the identity of the the typhoid bacillus. In the first place, stool specimens collected from each of the five men employed at the dairy were found negative for typhoid bacilli. Nevertheless, with suspicion thrown on the milk supply, a week later specimens were again taken from the workers at the dairy; this time both stools and urine. All of the specimens were examined with negative results. The investigators continued to collect specimens at intervals of about one week. In the fourth week the specimen of urine from one of the milkers yielded on a plate of Endo's medium a Gram negative bacillus, which proved to be sluggishly motile, resembling *B. coli* in this respect more than *B. typhosus*. On Russell's medium it showed a tendency to give a slight acidification on the upper part of the slope as well as in the butt of the tube. As microorganisms of this sort are not infrequently met with in normal stool cultures, it was not believed likely that the bacillus was *B. typhosus*. It was tested with a fairly potent rabbit serum, and no agglutination occurred. However, the investigators did not wish to overlook any possibility, and after several generations a subculture was tested for its agglutinating properties. Absolutely no evidence of agglutination appeared after two hours in the water bath, but the following morning, after the tubes had remained in the ice box all night, it was observed with much surprise that very definite agglutination was obtained in all dilutions up to 1:6400. Subsequently the microorganism

which proved to be the typhoid bacillus was agglutinated by the carrier's serum in a dilution of 1:160. His serum agglutinated bacilli isolated from two of the patients in dilutions of 1:160 and 1:320, respectively. The carrier's serum agglutinated a laboratory stock culture of *B. typhosus* in a dilution of 1:320, and serum from one of the patients agglutinated the carrier strain in a dilution of 1 to 80. The carrier was isolated and his urine and feces were repeatedly examined during a period of seven weeks. Typhoid bacilli were never isolated from his feces. Every sample of urine taken during this period showed large numbers of bacilli.

Experiences such as those mentioned above make it clear that the question of the prevalence of paratyphoid infections must be approached indirectly. In the Navy during the years 1913 to 1917 when straight typhoid vaccine was in use, admissions for typhoid and paratyphoid infections together averaged 32 admissions per 100,000 of personnel per year. Since 1917 the yearly average has been 15 admissions per 100,000. Before 1917 the average strength of the Navy was considerably less than 100,000 and since 1917 considerably greater. The figures indicate that there has been a yearly average of 17 (plus or minus) fewer cases of infection caused by the typhoid and paratyphoid bacilli per 100,000 of personnel during the period that triple vaccine has been issued. Mathematically, of course, the figures represent a reduction of more than 50 per cent in the rate of incidence, but the important consideration is that of a maximum average saving of less than 20 cases per 100,000 of personnel to be weighed against the estimated increase in the severity of reactions and the corresponding disability caused by the presence of the paratyphoid bacilli in the vaccine. To what degree the paratyphoid bacilli are responsible for severe reactions has not been definitely established, but it is a matter of general knowledge that reactions among naval personnel have been more severe with the triple vaccine. The point has been raised that during the first five years—1913 to 1917—the personnel was in great part undergoing a first series of inoculations, whereas since 1917 those undergoing a second or third series of inoculations have represented greater percentages of the total number inoculated each year. The question is, Would not severe reactions have resulted more frequently in the second five-year period even if straight typhoid vaccine had been used? That question can not be conclusively answered. But it may be pointed out that about a third of the enlisted force every year are new men, and severe reactions among recruits inoculated at training stations for the first time have been of more frequent occurrence with the triple vaccine than appears to have been the case in the earlier years when straight typhoid vaccine was used. In recent months with a lower dosage of all three microorganisms—typhoid

bacilli as well as paratyphoid A and paratyphoid B organisms—the various training stations have reported marked reductions in the percentages of severe reactions among recruits inoculated. It appears, however, that severe reactions are still being encountered in the service at large among those undergoing second and third series of inoculations.

It can not be assumed that all of the average of 17 fewer cases a year during the period that triple typhoid vaccine has been used represent cases of paratyphoid infection. It is altogether probable that there has been a considerable reduction in the admission rate for typhoid fever in the Navy since 1917. A continuous reduction in the typhoid fever death rate has been taking place in representative cities of the United States during this period. Assuming that the triple vaccine has conferred immunity to infection by the paratyphoid bacilli, it does not seem possible that as many as 17 cases per 100,000 per year have been prevented.

Inoculation of all persons in the Navy under 45 years of age with typhoid vaccine was ordered December 1, 1912. The sudden drop in the admission rate for typhoid and paratyphoid infections which occurred in 1913 certainly suggests that a developed mass of immunity in the personnel of the Navy bore a causal relationship to that phenomenon, and notwithstanding the very low rates which have been secured through the enforcement of sanitary measures in many cities in all parts of the United States, it appears probable that many cases of typhoid fever have been prevented in the Navy through the use of the vaccine, especially among personnel serving abroad. Of course, sanitation has been a factor, and undoubtedly there has been less exposure of naval personnel in communities in the United States in recent years. Reduction of exposure hazards in American cities alone would have accounted for considerable reduction in admission rates in the Navy. For example, in Norfolk, Va., where several or many cases of typhoid fever among naval personnel were either known or logically estimated to have been contracted each year before the city attacked its typhoid fever problem with adequate public health effort, so great a reduction in exposure hazards has been secured that Norfolk is now on the honor roll in the twelfth annual report of survey of typhoid fever mortality in the cities of the United States, published by the Journal of the American Medical Association, February 2, 1924. Typhoid fever caused no deaths in Norfolk in 1923; only 6.4 per 100,000 in 1922, and 4.1 in 1921.

Admission rates for typhoid and paratyphoid infections together in the Navy, by years, from January 1, 1913, to January 1, 1918,

were 35, 29, 33, 30, and 35 per 100,000, respectively. It is not possible to estimate just how many of these were cases of paratyphoid infection; certainly it is not likely that half of them were, and many will be found to agree that it is improbable that a third or a fourth were. Although statistical evidence is not competent to settle the point, it is commonly thought that paratyphoid infections are less serious, shorter in duration, and carry much smaller case fatality rates than typhoid fever. Some weight may be fairly attached to these points from clinical evidence. So, assuming a somewhat less serious type of infection to begin with, it appears that the damage to the Navy from the incidence of paratyphoid infections before triple vaccine was used but during the period when straight typhoid vaccine was issued is indicated as resting somewhere on the scale represented by the figures given above. There we have represented the damage against which must be weighed that part of the damage resulting from prophylactic inoculations chargeable to the presence of the paratyphoid bacilli in the vaccine.

The evidence that the paratyphoid microorganisms do tend to cause severe reactions is strong enough when weighed against the small damage to be expected from paratyphoid infections to make it advisable that they be dropped. Whether or not the paratyphoid bacilli, and especially the paratyphoid B strain in the vaccine, develop toxic substances in the killed cultures more provocative of severe reactions than *B. typhosus*, fewer severe reactions may be expected to follow inoculations of straight typhoid vaccine for the reason that a single specific foreign protein instead of three will be injected. There is the possibility, of course, that occasionally an individual sensitive to *B. typhosus* protein will react badly.

Before 1917 no death chargeable to typhoid prophylaxis occurred in the Navy. In 1918 two deaths were recorded as having been caused by triple vaccine. That was during the press of war work and the circumstances were not reported in sufficient detail to justify a statement at this time that those deaths were or were not the direct result of inoculation. They were so regarded by the medical officers who saw the cases. In 1923 a death occurred a few hours following the second inoculation, first series, in the case of an individual 23 years of age without history of typhoid fever. One more death which must be regarded as the direct result of inoculation has occurred this year.

The following table shows admissions and deaths and rates per 100,000 for typhoid and paratyphoid infections in the Navy, by years, since 1907. It will be noted that death rates have not been notably lower since paratyphoid bacilli have been included in the vaccine.

Admission rates and death rates per 100,000, by years, 1907 to 1923, typhoid fever (including paratyphoid fever), entire Navy

Year	Average strength, Navy and Marine Corps	Admissions	Deaths	Admission rate per 100,000	Death rate per 100,000
1907	46, 336	249	17	537	36. 7
1908	52, 913	176	10	332	18. 9
1909	57, 172	189	17	335	29. 7
1910	58, 691	193	10	330	17. 1
1911	61, 399	222	15	361	24. 4
1912	61, 897	57	2	92	3. 2
1913	65, 926	23	4	35	6. 1
1914	67, 141	20	0	29	0. 0
1915	68, 075	23	1	33	1. 5
1916	69, 294	21	0	30	0. 0
1917	245, 580	86	1	35	0. 4
1918	503, 792	83	9	17	1. 8
1919	298, 774	49	2	16	0. 7
1920	140, 773	35	7	25	5. 0
1921	148, 861	16	1	11	0. 7
1922	122, 126	12	2	10	1. 6
1923	116, 565	14	2	12	1. 7

Comparison of death rates in the Navy with the rates of seaport cities of the United States for corresponding recent years is interesting. The figures for cities are taken from the twelfth annual survey of typhoid-fever mortality in cities of the United States, Journal of the American Medical Association, February 2, 1924:

Typhoid fever death rates per 100,000, by years

	1923	1922	1921	Average, 1916–1920	Average, 1911–1915	Average, 1906–1910
United States Navy	1. 7	1. 6	0. 7	1. 5	6. 8	26. 4
Boston	1. 0	1. 4	3. 1	2. 5	8. 0	16. 0
Cambridge	3. 6	0. 9	10. 8	2. 5	4. 0	9. 8
Providence	0. 8	0. 0	2. 5	3. 8	8. 7	21. 5
New York	2. 4	2. 2	2. 1	3. 2	8. 0	13. 5
Jersey City	1. 6	1. 6	3. 5	4. 5	7. 2	12. 6
Philadelphia	1. 7	2. 7	2. 3	4. 9	11. 2	41. 7
Washington	6. 0	5. 2	6. 6	9. 5	17. 2	36. 7
Baltimore	4. 3	4. 0	5. 4	11. 8	23. 7	35. 1
Norfolk	0. 0	6. 4	4. 1			
Chicago	1. 9	1. 0	1. 1	2. 4	8. 2	15. 8
New Orleans	8. 8	10. 2	9. 3	17. 5	20. 9	35. 6
Seattle	2. 5	2. 8	2. 2	2. 9	5. 7	25. 2
San Francisco	3. 0	2. 2	4. 2	4. 6	13. 6	27. 3
Los Angeles	3. 1	3. 7	2. 6	3. 6	10. 7	19. 0

In conclusion, it should be said that the hazards of typhoid fever for naval personnel are far greater than those of paratyphoid infection. The reasons which justify discontinuance of paratyphoid vaccine do not apply to typhoid vaccine. Naval personnel are not

likely in view of the statistics given above to be exposed to typhoid fever in Boston, New York, Norfolk, and other cities in the United States, but exposure is likely to occur elsewhere. All persons inoculated do not develop complete protection against infection, and the average duration of the immunity conferred has not been satisfactorily determined, but there have been enough instances of probable exposure of large bodies of vaccinated troops to typhoid infection without serious consequences to indicate that most persons inoculated do develop protection. On the evidence as it stands to-day it is an act of prudence on the part of anyone taking his family into a locality where typhoid fever is likely to be encountered to see to it that every member is inoculated with typhoid vaccine. On the score of doubtful protection, lesser hazards of infection, and liability to severe reaction it is not clear that inoculation with paratyphoid bacilli is indicated.

DATA RELATING TO REACTIONS FOLLOWING INOCULATIONS WITH TYPHOID VACCINE

Henceforth the following information will be required in all monthly and annual sanitary reports:

(A) Number of complete courses of three inoculations administered during the period covered by the report.

(B) First course:

1. First inoculations—
   - (*a*) Number administered_____
   - (*b*) Number of severe reactions_____
   - (*c*) Number of severe reactions requiring admission to sick list__
2. Second inoculations—
   - (*a*) Number administered_____
   - (*b*) Number of severe reactions_____
   - (*c*) Number of severe reactions requiring admission to sick list__
3. Third inoculations—
   - (*a*) Number administered_____
   - (*b*) Number of severe reactions_____
   - (*c*) Number of severe reactions requiring admission to sick list__

(C) Second course:

1. First inoculations—
   - (*a*) Number administered_____
   - (*b*) Number of severe reactions_____
   - (*c*) Number of severe reactions requiring admission to sick list__
2. Second inoculations—
   - (*a*) Number administered_____
   - (*b*) Number of severe reactions_____
   - (*c*) Number of severe reactions requiring admission to sick list__
3. Third inoculations—
   - (*a*) Number administered_____
   - (*b*) Number of severe reactions_____
   - (*c*) Number of severe reactions requiring admission to sick list__

Comparatively few inoculations are followed by severe reactions, so that little additional work will be required to collect the data. It is important that this be done because of the relationship between the question of dosage and the character of reactions.

By a severe reaction is meant one that unquestionably renders a man unfit for the performance of his ordinary duties. It should be borne in mind that local and general reactions of considerable intensity are not to be regarded as unusual, but rather as essential, to the immunizing process.

In some instances the medical officer may consider it advisable for the man not to work after he is inoculated until the following day, but the reaction is not to be recorded as severe unless there is actual disability and suffering. If the man is disabled for more than 24 hours, it is expected that he will be admitted to the sick list and a Form F card will be returned for the admission.

INFORMATION REQUIRED IN CONNECTION WITH CASES REPORTED AS TYPHOID FEVER OR PARATYPHOID INFECTION

In order to insure the systematic collection of all obtainable evidence relative to such cases of typhoid and paratyphoid infection as occur, with particular reference to the relationships between cases and previous administrations of prophylactic inoculations, so that all obtainable facts necessary for a satisfactory review of the cases will be at hand at the end of the statistical year, the following questionnaire will be sent upon receipt of the Form F card reporting the case, to the medical officer who forwarded the card.

It is not expected that many questionnaires will be sent out. The estimated expectancy for typhoid and paratyphoid infections together, as represented by the median admission rate for the last five years, amounts to less than 15 cases a year per 100,000 of personnel.

QUESTIONNAIRE TO BE RETURNED IN CASES REPORTED AS TYPHOID FEVER OR PARATYPHOID INFECTION

1. Name and rate of patient.
2. Age.
3. Length of service.
4. Probable place and source of infection.
5. Probable date of exposure.
6. Clinical evidence on which the diagnosis was based.
7. Was there any history of previous typhoid or paratyphoid infection.
8. Complete and exact statement of bacteriological or blood findings which served to confirm the diagnosis.

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9. Date on which convalescence was established.

10. Were stools cultured during convalescence for the isolation of typhoid and paratyphoid bacilli?

11. How long did the carrier state persist, and was the patient a carrier when discharged to duty?

12. Give complete vaccination history, including dates of inoculation, and stating whether straight typhoid or triple vaccine was recorded in the health record.

13. In case the health record is not available and memoranda from which question 12 can be answered have not been kept, answer the questions which can be answered and forward the questionnaire to the medical officer of the organization to which the patient has been transferred, notifying the bureau that the questionnaire has been so forwarded.

TYPHOID FEVER AMONG HOSPITAL EMPLOYEES

The following comment is taken from the weekly bulletin of the department of health, city of New York, for the week ended June 28, 1924:

"The commissioner of health has repeatedly called the attention of the authorities in charge of the various hospitals of the city to the fact that it is necessary to take more than ordinary precautions to prevent typhoid fever among patients and hospital employees. Several months ago we published the fact that in one of the hospitals of this city a person was employed in the preparation of foodstuffs who was later discovered to be a chronic typhoid carrier. It also developed that this food handler had for a term of years suffered from mental disease and was irresponsible, notwithstanding which fact he was employed in the hospital kitchen.

"Such incidents, fortunately few, indicate a source of danger that must be constantly guarded against. The health department is glad to know that the public health committee of the Academy of Medicine was moved by the publication of the fact mentioned above to make an investigation to determine what precautions were being taken in the various hospitals of the city. We learn that as the result of this investigation the committee has arrived at the conclusion that, for purposes of protection of the hospital workers and in the interest of public health, the following precautions ought to be scrupulously observed by those in authority of each of the hospitals in the city:

"'1. Every hospital in New York City should observe strictly the requirements of the sanitary code of the city and submit all food handlers to physical examination annually;

"'2. A Widal test and stool analysis should be made in the case of every food handler and every nurse, irrespective of whether or not a history of typhoid fever is reported; and

"'3. It should be the rule in all hospitals for every nurse and others coming in close contact with patients to be inoculated against typhoid fever.'

"The above recommendations of the public health committee of the Academy of Medicine are most heartily indorsed by the health department. These recommendations tell in brief what the health department has been attempting to put into effect in the various hospitals of the city for some time.

"The investigation conducted by the public health committee indicates that in spite of our repeated instructions and warnings there is apparently much variation and even laxity in the safeguards employed by various hospitals to prevent the spread of typhoid fever. The directors of hospitals and of similar institutions are under a moral and legal obligation to exercise rigid observance of the precautions required by the department of health and indorsed and reiterated by the public health committee of the Academy of Medicine. We welcome and appreciate the support given our efforts by the latter body."

INFORMATION REQUIRED IN CONNECTION WITH CASES REPORTED AS CEREBROSPINAL FEVER AND CEREBROSPINAL MENINGITIS

Existing instructions governing statistical returns indicate clearly the distinction drawn between the title "cerebrospinal fever" and the title "cerebrospinal meningitis." The title "cerebrospinal fever" is intended to include only cases known or presumed from the clinical and epidemiological evidence available to be meningococcus infections. Cases of cerebrospinal meningitis known or presumed to be caused by pneumococci, streptococci, or other microorganisms are to be reported under the title "cerebrospinal meningitis."

Despite instructions, every year during the course of the annual analysis of the vital statistics of the Navy it becomes apparent that some cases have not been properly reported. Last year certain ships reported several cases of cerebrospinal meningitis. These were all transferred to naval hospitals, where they were carried throughout the course of the disease and terminated without changing the diagnosis. Upon inquiry it was found that they were all regarded as cases of meningococcus meningitis.

Such practice makes it appear that there were fewer cases in the Navy during the year than actually occurred. We do not want many cases, to be sure, but in any event we want to know the truth. By recording meningococcus cases under the title "cerebrospinal

meningitis" fictitiously low case fatality rates are indicated for the miscellaneous forms resulting from infection by pneumococci, streptococci, and certain other causative agents exclusive of the tubercle bacillus. Tuberculous meningitis should be reported as a form of tuberculosis.

To insure the proper classification of cases in the future, in so far as the clinical evidence and laboratory findings permit, the following questionnaire will be sent to the medical officer forwarding the Form F card in all cases reported as cerebrospinal fever or cerebrospinal meningitis:

QUESTIONNAIRE TO BE RETURNED IN CASES REPORTED AS CEREBROSPINAL FEVER OR MENINGITIS, CEREBROSPINAL

1. Name and rate of the patient.
2. Age. Length of service.
3. Was this presumably a case of meningococcus meningitis?
4. If not, what microorganism was identified or suspected?
5. State precisely what laboratory findings served to confirm the diagnosis.
6. Is the patient known to have been a carrier before he became infected?
7. Is he known to have been in contact with a case or carrier? Was such contact suspected? If so, state circumstances.
8. Probable place and date of exposure.
9. Were there influences predisposing to infection?
   (a) Overcrowding?
   (b) Defective ventilation?
   (c) Overheating?
   (d) Fatigue?
   (e) Exposure to chilling?
   (f) Wet clothing?
   (g) Predisposing infection?
   (h) Any other factor deemed worthy of mention?
10. In case memoranda have not been kept or the health record is no longer available for preparing the answers to the above questions, answer such questions as can be answered and forward the questionnaire to the medical officer of the organization to which the patient has been transferred, notifying the bureau that the questionnaire has been so forwarded.

EPIDEMIOLOGICAL REPORT RELATIVE TO SIX CASES OF CEREBROSPINAL FEVER WHICH OCCURRED AT THE UNITED STATES NAVAL ACADEMY, ANNAPOLIS, MD., DURING MARCH AND APRIL, 1924

The following report which deals with the conditions and circumstances considered in connection with a small outbreak of cerebrospinal fever which occurred among mess attendants and midshipmen at the United States Naval Academy last spring was received in the bureau after the season in which cerebrospinal fever may be expected to occur had closed. It seemed preferable to reserve the report for publication until this time when it might better serve as a reminder of the factors which seem chiefly to be related with the occurrence and spread not only of cerebrospinal fever but the pneumonias and communicable diseases of the respiratory type in general.

The report, submitted by Capt. William H. Bell, Medical Corps, United States Navy, is as follows:

"Attention is invited to the attached tabulated summary of the six cases, which gives pertinent data concerning each, and which should be studied in connection with the following observations:

"On first analysis one would be inclined to believe that these cases constitute a small epidemic of the disease, where transfer by contact and 'droplet infection' played a part, for the following reasons:

"(1) All six cases occurred within a period of less than one month.

"(2) Grouping: The first four cases all occurred in men of the same rating, viz, mess attendants, three being Filipinos.

"(3) Two cases occurred later in midshipmen, who are served in the mess hall by Filipino mess attendants.

"However, a careful investigation into the epidemiological factors proves that, like in many other minor epidemics of this disease, the cases were apparently all sporadic, for the following reasons:

"(1) The three Filipinos housed on the *Cumberland* had their berth billets on different decks and there was little or no mingling between them, since owing to the large number of Filipino mess attendants on duty here, it was found that these particular men did not fraternize and had established but a passing acquaintance. The fourth mess attendant to develop the disease was a negro, on duty in the galley on the *Reina Mercedes*, berthed on that ship when not at his home in Annapolis, and consequently there was no contact or mingling whatsoever between him and the other mess attendants.

"(2) A study of assignments to mess tables reveals that none of the Filipino mess attendants afflicted served at any time during the past several months at either one of the tables occupied by the two midshipmen who came down with the disease. Nor did these mess attendants serve at tables even in close proximity to those occupied by the two midshipmen.

"(3) The two midshipmen who developed the disease were of different classes, were housed in widely separated rooms, and occupied tables in entirely different parts of the mess hall.

"It was impossible also to trace the origin of the infection to any common source, and the occurrence of these cases can perhaps best be explained on the ground of lowered resistance in certain carriers or exposure of susceptible individuals to certain scattered carriers. The weather during April was unusually cool and inclement for this locality, and the Filipino notoriously shows little resistance to infection in this climate. One of the midshipmen was of poor physique and apparently run down. The other was more robust, but had been on Easter leave in Washington and had climbed to the top of the Washington Monument the day before he became ill.

"All cases were diagnosed early and promptly treated at the local naval hospital, and the specific microorganism was demonstrated in the spinal fluid in every case. Three of the earlier cases have been returned to duty and the others are convalescent. Up to the present writing no new cases have developed since April 25 (a period of about three weeks), but careful lookout is still being maintained both in the yard and in the hospital for the prompt detection of any further cases. Out-of-door exercise is being encouraged and enforced, particularly among the mess attendants, and ventilation and the prevention of overcrowding and the proper spacing of berthing billets on both the *Cumberland* and the *Reina Mercedes* are being carefully supervised. The midshipmen's routine gives him ample out-of-door exercise daily, and his sleeping quarters are satisfactorily ventilated, largely by natural means.

"The above discussion and the following tabulated summary were prepared by Lieut. Commander H. R. Hermesch, Medical Corps, United States Navy, after consultation with the medical officer of the academy. They are presented without modification as expressing this station's view of the circumstances attending the appearance of the disease.

Six cases of cerebrospinal fever occurring recently at United States Naval Academy

Rate	Age	Date of arrival on this station	Where berthed	Date of transfer to hospital	Date diagnosis was established
1. M. att., 3 (Filipino)	26	29 Aug., 1921	Cumberland and room ashore.	28 Mar., 1924	28 Mar., 1924
2. M. att., 2 (Filipino)	23	10 Oct., 1921	Cumberland	2 Apr., 1924	2 Apr., 1924
3. M. att., 3 (Filipino)	23	28 June, 1921	...do	8 Apr., 1924	10 Apr., 1924
4. M. att., 3 (negro)	24	9 Aug., 1919	Reina Mercedes and home ashore.	12 Apr., 1924	15 Apr., 1924
5. Midshipman, 4th c	19	6 July, 1923	Bancroft Hall	21 Apr., 1924	21 Apr., 1924
6. Midshipman, 3d c	19	14 June, 1922	...do	23 Apr., 1924	25 Apr., 1924

INFORMATION REQUIRED IN CONNECTION WITH CASES REPORTED AS SMALLPOX

It is not expected that many cases of smallpox will occur in the Navy. The median admission rate for the last five years is 11 per 100,000 of personnel.

Smallpox is seldom seen by medical officers of the Navy. Even for epidemiologists in civil public health practice who see the disease from time to time it is sometimes impossible in mild cases and cases with lesions modified by previous immunization to be certain of the diagnosis.

It is desirable that every case that occurs in the Navy be recorded, but it is not desirable that any case which in reality is something else should be recorded as smallpox merely on suspicion or because in view of the possibility of its being smallpox the case has been isolated and treated under conditions suitable for smallpox. The clinical notes eventually received in the bureau for some of the cases which have been reported and irrevocably charged as smallpox in recent years make it very doubtful, to put it mildly, if they were really cases of smallpox.

The most important points in the diagnosis are:

1. Local and general distribution of the rash: The lesions in smallpox are least frequent on the least exposed parts of the body and in those parts protected from irritation, such as the folds and hollows of the skin.

2. Prostration before the rash comes out: It is rare for smallpox to occur without some degree of prostration before the appearance of the focal eruption.

3. Character of the lesions: The lesions are likely to be most typical, though least numerous, on the protected parts of the body. On account of modification of the lesions by immunization or naturally, particularly with mild strains of smallpox, diagnosis in questionable cases is less certain from the character of the lesions than from their distribution.

4. Course of development of the lesions: It may be necessary to wait for the eruption to progress, to mature, and to regress before a definite diagnosis can be made, especially when acne or syphilis is suspected. The eruption of smallpox begins in a typical case about 14 days after exposure following about 2 days of fever and more or less prostration; it is papular for about 2 days, vesicular for about 2 days, pustular for about 4 days, and dries for a week or two before the crusts fall. These stages, except the periods of incubation and invasion, are shortened in many mild cases.

Differential diagnosis between smallpox and chicken pox:

SMALLPOX	CHICKEN POX
1. The rash is most abundant on the face, most scanty on the abdomen and chest.	1. The abdomen and chest are covered as thickly as the face or more thickly.
2. The rash is much more abundant on the back than on the abdomen.	2. The abdomen is covered equally with the back.
3. The rash is more abundant on the shoulders than across the loins and on the chest than on the abdomen.	3. The distribution is indifferent.
4. The rash favors the limbs and, generally, the arms next to the face.	4. The rash tends to avoid the limbs.
5. The distribution on the limbs is centrifugal.	5. The distribution on the limbs is centripetal.
6. The rash favors prominences and surfaces exposed to irritation; it tends to avoid protected surfaces, flexures, and depressions.	6. The rash, while occasionally showing patches at sites of irritation, is not consistently distributed according to irritation and protection.
7. The lesions are deep-seated, with infiltrated bases.	7. The fresh, uninfected lesions on sites where the skin is soft and protected are superficial, and the base is not infiltrated.
8. The lesions are generally circular in outline.	8. The lesions frequently have an irregular outline; when they lie near a flexure they are apt to be oval or elongated.
9. The lesions are homogeneous in character; or, if they are heterogeneous, they are heterogeneous by law; the smaller the lesion and the nearer it lies to the face the greater should be its apparent age.	9. The lesions often are not homogeneous, and the want of homogeneity bears no relation to the sizes of the lesions and to their situation.
10. The vesicles are generally multilocular.	10. The vesicles are generally unilocular.
11. Frequently some of the vesicles are indented.	11. The vesicles are never indented and seldom dimpled.

The diagnosis of purpuric smallpox is not covered in this outline, but such cases are rare. Further details of diagnosis may be found in The Diagnosis of Smallpox, by T. F. Rickett, New York and London, 1908, and How to Diagnose Smallpox, by W. McC. Wanklyn, London, 1913.

To promote the accuracy of morbidity reporting and the statistics relating to this disease, which of course are matters of importance to the entire public health world, the following questionnaire will be sent in every instance to the medical officer who forwards a Form F card bearing the diagnosis "smallpox":

QUESTIONNAIRE TO BE RETURNED IN EVERY CASE REPORTED AS SMALLPOX

1. Name and rate of patient.
2. Age.
3. Length of service.
4. Probable place and source of infection.
5. Probable date of exposure.
6. Clinical evidence on which diagnosis was made, including description and distribution of the skin eruption, stating whether lesions were (a) absent, (b) occasional lesions, (c) relatively numerous, (d) thickly studded on the following areas:

Forehead.	Lower arm.
Folds of skin behind the ears.	Wrists and dorsal surfaces of the hands.
Neck.	Palms.
Chest.	Hips and thighs.
Abdomen.	Lower legs.
Shoulders.	Ankles and areas back of the feet.
Lower back.	Soles of the feet.
Axillæ.	
Upper arm.	

7. Vaccination history, including description of any vaccination scar or scars and transcript of data contained in health record relative to vaccination, supplemented by any information which may have been obtained from the patient.

NOTE.—Refer to reactions to cowpox virus as (a) primary take; (b) accelerated reaction; (c) immunity reaction. In the case of accelerated reactions and immunity reactions mention the degree of intensity and the time elapsing between inoculation and the time at which the reaction reached its greatest intensity if this information has been or can be obtained.

8. In case memoranda have not been kept or the health record is not available for preparing the answer to question 7, answer the other

questions and forward the questionnaire to the medical officer of the organization to which the patient has been transferred, notifying the bureau that the questionnaire has been so forwarded.

CARE OF SANITARY SCUTTLE BUTTS

Scuttle-butt terminals or drinking fountains are designed to make drinking safe so long as the scuttle butt is kept clean and in proper working condition. There are sanitary drinking fountains on the market in which the stream of water is delivered at an angle so that water can not possibly fall back from the mouth of the drinker upon the terminal. While such a fountain may be regulated as preferable to the vertical stream of the ship's scuttle butt, the latter is not forthwith to be condemned. In several respects it is well designed; the deep cone, 6 inches in diameter at the top, prevents the drinker from placing his lips to the terminal, and if the terminal is bent slightly away from the vertical the water will not fall back upon the outlet. There will be no danger that the stream will juggle and hold bacteria-laden secretions—a possible property of some of the older drinking fountains much discussed a few years ago.

If the scuttle-butt drinking terminals can not be trusted to keep themselves clear of infectious material, or at least to dispose of such by the flow of water and escape into the drainpipe, it would seem that little additional safety is to be secured by the periodic application of a gasoline blowtorch flame. If the drinking fountain can be contaminated by one drinking from it, the presumption is that it will be contaminated shortly after it has been heated and that it will pass the microorganisms on to many before it is again rendered safe for a brief period. It is not likely, however, that the scuttle butt is so great a menace. It would seem sufficient to keep the drainage system clear and all parts clean.

There is more danger that the causative agents of communicable diseases will be spread indirectly by the valve handle which must be turned in order that one may drink. On board the U. S. S. *Texas*, it appears, a scuttle butt is located so that it is passed by patients coming from the venereal disease treatment room. It is natural for them to stop for a drink. If their hands have not been carefully disinfected, the result can readily be imagined.

The once or twice daily torching of scuttle-butt terminals is more a matter of tradition than a practical method of concurrent disinfection. If medical officers have evidence that pathogenic microorganisms are taken into the mouth during the act of drinking, the design of a safer type of drinking fountain should be urged. So far as the writer remembers, the safety of the present type of scuttle butt was not questioned in any annual sanitary report last January.

ACTION RECOMMENDED TO OVERCOME THE DANGER OF FOOD POISONING IN CONNECTION WITH THE PREPARATION OF HASH

It having become apparent from the study of recent outbreaks of food poisoning which have occurred on board battleships that special danger of contamination of meat with bacilli of the meat-poisoning group, leading to the subsequent production of toxin, may attend the preparation of hash, the Bureau of Medicine and Surgery has recommended to the Bureau of Supplies and Accounts that suitable instructions be issued to overcome the danger, and it is understood that this will be done by circular letter addressed to commanding officers and supply officers.

The special danger of permitting a period of incubation or exposure for several hours in the warm galley to take place after the meat has been intimately handled and possibly contaminated with some member of the enteritidis-paratyphoid group of bacilli, as may occur before or at the time the meat is ground up for making hash, was pointed out. It is in connection with the preparation of hash for breakfast, where the meat is ground up the night before and left in the warm galley for many hours, that the danger is greatest. It was recommended that the practice of preparing the meat several hours before the hash is to be served be abolished except in instances where it is practicable to return the meat to the cold-storage room immediately after grinding, where it may be kept in suitable containers at a temperature low enough to prevent multiplication of the bacilli in case accidental contamination has occurred. It was also recommended that the service be instructed as to the importance of requiring that men who grind or cut up meat be free from manifestations of intestinal disease and that their hands be thoroughly washed with soap and water invariably before handling meat.

In the several outbreaks of food poisoning which have occurred on board battleships in which the suspected food has been hash served for breakfast, although bacteriological confirmation is lacking, the cause of poisoning in each instance in all probability was contamination of the meat with one of the members of the enteritidis-paratyphoid group of bacilli, otherwise known as the meat-poisoning group. The epidemiological and bateriological points involved were therefore reviewed as follows:

These microorganisms in growing upon meat and certain other foods, at a temperature favorable for growth, such as they find in a warm galley, are capable of producing toxic substances in the course of a few hours which, when ingested, will cause symptoms similar to those recorded in the outbreaks mentioned above. These microorganisms characteristically cause no evidence of spoilage—the contaminated meat is unchanged in appearance, odor, and taste.

The most probable methods of contamination are:

(*a*) Meat infected during life of the animal—a sick animal overlooked during inspection on the hoof.

(*b*) Meat contaminated by intestinal contents in cutting up the carcass after slaughter. The intestines of healthy animals not infrequently contain bacilli belonging to the meat-poisoning group.

(*c*) Contamination by rats, mice, or cockroaches which have had access to the feces of rodents in the slaughterhouse or other place in which the meat is stored.

(*d*) Contamination by the hand of a human carrier. Such contamination may occur at any point from the slaughterhouse to the kitchen, but is most likely to occur while the meat is being prepared for cooking or after it has been cooked. The food handler with diarrhea or one who harbors bacilli of this group without symptoms, and who fails to wash his hands carefully after visiting the toilet, is probably the most frequent cause of contamination.

(*e*) Infestation of the galley with rodents or cockroaches.

With any of these methods of contamination the essential condition is that an incubation period at suitable temperature—50° F. to 100° F. or higher—shall follow to permit the microorganisms to grow and produce toxic substance. Rapid growth will take place in a warm room in 10 or 12 hours.

The bacilli are not heat resistant and are destroyed by a temperature as low as 145° F. in about 15 minutes. The toxic substance produced by the bacilli is resistant to heat, however, and is often capable of withstanding a temperature of 212° F. for 10 minutes. The bacilli tend to die out in the course of time when meat is held in cold storage and particularly when frozen. Unfortunately, any toxic substance previously formed is preserved by the low temperature.

These are the principal points to be considered in investigating an outbreak of this kind of meat poisoning—the time and method of contamination, nature and duration of a subsequent period of incubation, and the circumstances in detail relating to the cooking and serving of the food thereafter.

When meat is ground for hash and incubated overnight, assuming contamination has occurred, it is not likely that the heat used in cooking the hash for breakfast will destroy all toxic substance which has been produced, although no living microorganisms may survive the cooking. If the meat has been contaminated by one of the men handling it, growth of the bacilli will obviously occur at warm room temperature no matter how carefully the containers are covered, although covering containers may serve to prevent rodent or cockroach contamination. Opportunity for contamination by flies must also

be considered. The only safe practice to guard against the consequences of contamination which may have taken place on board ship after the meat has been taken from the cold-storage room, or from the cans in the case of canned meats, is not to permit a period of incubation to ensue after the moment of possible contamination.

CHANGE IN REGULATION GOVERNING THE SALE OF ICE CREAM IN THE CITY OF NEW YORK

As published in the weekly bulletin of the health department, June 21, 1924, at a meeting of the Board of Health of the Department of Health of the City of New York held May 22, 1924, the following resolution was adopted:

"Resolved, that section 177 of the Sanitary Code be, and the same is hereby, amended and made to read as follows:

"Section 177. Ice cream; sale of adulterated or misbranded prohibited: the terms 'ice cream,' 'adulterated,' and 'misbranded' defined.—No person shall bring into, or have, sell, or offer for sale, or exchange, or expose for sale or exchange in the city of New York, any product as and for ice cream which is adulterated or misbranded. The term 'ice cream' as herein used shall be taken to mean and include the frozen product or mixture made from pasteurized cream, milk, or product of milk, sweetened with sugar, and with or without the use of wholesome flavoring extract, food gelatin, vegetable gum or other thickener, and which contains not less than eight per cent (8%) by weight of milk (butter) fat.

"Ice cream as herein defined shall be deemed adulterated:

"(1) If any substance or substances has or have been mixed and packed with it so as to reduce or lower or injuriously affect its quality or strength.

"(2) If any inferior or cheaper substance has been substituted wholly or in part for any of the above ingredients.

"(3) If any valuable constituent of the article has been wholly or in part abstracted.

"(4) If it consist wholly or in part of diseased or decomposed or putrid or rotten animal or vegetable substance.

"(5) If it contain any added poisonous ingredient, or any ingredient which may render it injurious to health; or if it contain any antiseptic or preservative not evident or known to the purchaser or consumer.

"(6) If it contain chrome yellow, saccharin, salts of copper, iron oxide, formaldehyde, boric acid, ochers, or other mineral substance or poisonous color or flavor, or other ingredient deleterious or detrimental to health.

"(7) If it contain less than eight per cent (8%), by weight, of milk (butter) fat.

"(8) If it contain more than one per cent (1%) of pure wholesome gelatin, vegetable gum, or other thickener.

"(9) If it contain any added vegetable or mineral oils or fats.

"Ice cream shall be deemed misbranded:

"(a) If it is an imitation or offered for sale under the distinctive name of another article or is labeled or branded so as to deceive or mislead the purchaser.

"(b) If in package form and the contents are stated in terms of weight or measure, such weight or measure is not plainly or correctly stated on the outside of the package.

"(c) If the package or its label shall bear any statement, design, or device regarding the ingredients or the substances contained therein, which statement, design, or device shall be false or misleading in any particular.

"The provisions of this section shall be deemed to apply to all mixtures or compounds such as frozen, flavored water ices sold or offered for sale under any distinctive name, provided that cream, milk, or milk products have been added thereto and shall include all frozen products made, or sold, or offered for sale in imitation of or semblance to ice cream."

AN INSTRUCTIVE INCIDENT IN THE CAMPAIGN AGAINST MOSQUITOES AT THE NAVAL OPERATING BASE, HAMPTON ROADS, VA.

The following information is taken from the sanitary report of the United States Naval Operating Base, Hampton Roads, Va., for the month of September, 1924:

"The sources of the mosquitoes noted in last month's report were located at Sewalls Point coal pier and the Virginian Railway coaling station in nine barrels of water used for controlling fires. Seven of these barrels were emptied, and the superintendents of the two places promised to keep the remaining barrels oiled. This was not accomplished, however, until thousands of Culex mosquitoes had been blown over the base by the then prevailing southerly wind. These mosquitoes immediately stocked every available body of water—of which the frequent rains, unfortunately, supplied many—in the made ground on the north side of the base. Although nearly 4 tons of niter cake and 150 gallons of crude oil were used during the month, reducing the breeding to a minimum, we still have thousands of Culicidæ. Thorough surveys were made at three units on the base for Anopheles, but none could be found. Culex larvæ were collected at three places and the containers either treated or destroyed. Several water holes were filled during the month."

SMALL TOOL HAZARDS

The following extract of an article on small tools, published in the Travelers' Standard Magazine for July, 1924, has been furnished commandants and commanding officers of navy yards and naval stations by the Assistant Secretary of the Navy (Navy Yard Division) with the recommendation that it be copied and distributed among employees:

"Since the time when man first walked on the earth and began to use crude implements, millions of painful bruises and cuts have been caused by mishandling small tools and appliances.

"When there is occasion to use a hammer, there must be something to strike, and the thing to be struck may have to be held. It may be a chisel, for example, in a chipping operation; or it may be a common, everyday nail, which must be supported until it is well started. This requires coordination of muscular effort and often a nicety in judgment if painful bruises are to be avoided. Some persons can hold a chisel in one hand, moving it about apparently at random, while with the other hand they swing a hammer squarely down upon the chisel every time—all this, perhaps, while the eyes are directed anywhere except toward the work. The same sort of thing may be seen when a pianist keeps his eyes on the music score while his hands dexterously manipulate the keys. It takes long training to do either of these things successfully, bruised fingers being the common result in one case and jangled chords in the other. Tyros with a hammer have to figure that in starting a nail two out of every three blows will hit it on the head, while the third one may land anywhere in its general vicinity. They try to get the nail started with two blows, and trust to luck that they are the right two.

"The majority of persons come between these extremes, and among this class a great many misdirected hammer blows result in painful hand wounds. There is little that can be said or done to prevent accidents of this nature. A high measure of safety could be secured by using pliers or small tongs when starting to drive a nail, but we know quite well how advice of this sort would be received. The exercise of due care, and a proper recognition of the driver's limitations and failings will help to a certain extent. When a good deal of chipping and chiseling has to be done, a rigid handle offset at right angles to the chisel affords a certain amount of protection, without undue interference with the work. If a workman's aim is so poor that he often hurts himself even with this protection, his employer should recognize that the man is a heavy liability when engaged in work of that sort and should give him a broom or a shovel, so that he may become an asset instead.

"A ball player who makes an error while trying to execute a play with one hand when both hands might have been used to better advantage is usually advised by some leather-lunged enthusiast on the bleachers to 'use both hands.' Yet the very man who gives the advice may have tried to handle a heavy milling cutter, for example, with one hand when he ought to have used two, and the cutter may have escaped from his grasp and dropped upon his foot, leaving him with nothing to blame for the accident except his other hand. It is just such a man who will leave sharp-edged tools—such as hatchets, axes, chisels, and drills—projecting beyond the edge of a workbench. If he has to stoop down and reach under the bench he is likely to receive a painful scalp wound when he straightens up again.

"A good deal has been said about keeping cold chisels and other such tools properly dressed; but apparently there is need for yet more counsel in this direction, because bad burrs are still altogether too common. The writer nearly had an eye knocked out a while ago by a flying burr that came from a cold chisel in the hands of a workman who was cutting concrete out on the street. The burr was a big one, and it missed the eye by about 2 inches.

"We often read of severe injuries and occasionally of a fatal accident caused by workmen laying down tools that will roll, such as screw drivers, chisels, or drills, and then inadvertently stepping on them and getting a heavy fall. If the man who does this is on a raised platform (where many such accidents occur) the chances for severe injury are very great. Accidents of this general type are primarily due to a violation of one of the fundamental rules in safety work—'a place for everything, and everything in its place.'

"Many workmen daily confuse the real purpose of a wrench with that of a hammer. Their guiding principle for the moment appears to be, 'a wrench in the hand is worth two hammers on the bench.' Now, a wrench is not such a bad thing if we only have to give something a slight tap or two, but it is a poor substitute for a real hammer when several solid blows are required. If the object to be hit must be held or guided with one hand, the chances for injury are increased, because few of us have the same deftness in dealing a blow with a wrench that we have in using a hammer. There is an old saying to the effect that every man uses his thumb-nail as a screw driver once, and that he uses his monkey wrench as a hammer until the boss catches him. The thumb-nail experience teaches its own lesson, but the wrench-hammer habit appears to fasten itself upon a man like a dreadful disease—until the foreman applies some curative remarks.

"Even the apparently harmless task of carrying small tools from the tool room to the workbench or to a machine may have its dangers. A certain workman, for example, requisitioned several drills and dropped one of them into his hip pocket, but carried the others in his hands. The drill in the hip pocket tipped over in such a way that when the man swung his arm his elbow and the drill point met, and a deep cut was the result. On another occasion a workman, while carrying in each hand several sharp-pointed tools with the points downward, was jostled so that one of the tools slipped out of his grasp. In falling it nearly cut off one of his toes. It should hardly be necessary to say that if proper receptacles are not provided for safely conveying a number of tools of this kind at once, the workman should carry only a few at a time, and should rest them in the crook of his elbow and hold them firmly with the other hand, being sure that the cutting edges point upward.

"A skilled carpenter takes pride in keeping his tools sharp and in good repair. Yet carpenters do not always take the same care in handling or placing their tools that they do in keeping them in good condition. Many an accident has been caused, for example, by sharp hatchets that have been carelessly laid down on a bench or some other resting place. On one occasion that we recall a hatchet was left on a sawhorse so that one of the sharp corners projected over the edge of the horse. Another man started sawing a piece of timber on another horse near by and immediately received a severe cut on the forearm.

"It would be easy to go on citing accidents of this nature, all caused by the mishandling or neglect of tools. Many of them are trivial and have no serious results, but, on the other hand, there is always the possibility of a serious accident, and every little while the serious one occurs. It is often mere chance (or shall we say a beneficent Providence) that decides between a serious injury and no injury; and just as long as workmen fail to observe simple safety precautions, and continue to work in careless and thoughtless ways, just that long will needless accidents be associated with the use of small tools.

"Moreover, do not forget that you can get just as bad a case of hydrophobia from a little dog as you can from a big one. This, being interpreted, means that blood poisoning is equally likely to cost you a hand or a foot whether the injury that leads to it comes from a small tool or from a big one."

ADMISSIONS FOR INJURIES AND POISONINGS, JANUARY TO SEPTEMBER, INCLUSIVE, 1924

Form F cards received in the bureau between January 1 and September 30, 1924, notified injuries and poisonings as follows:

	Within command		Leave, liberty, or A. W. O. L.	Total
	Connected with actual performance of work or prescribed duty	Not connected with work or prescribed duty		
Injuries	2, 531	1, 269	786	4, 586
Poisonings	13	108	24	145
Total admissions	2, 544	1, 377	810	4, 731

Of these admissions, 82.87 per cent were for injuries or poisonings occurring within the command, and 17.13 per cent for cases incurred while on leave or liberty.

Of the cases incurred within naval commands, 64.88 per cent were connected with actual performance of prescribed work or duty and 35.12 per cent were not so connected. Of the total admissions for injuries and poisonings, only 53.78 per cent were connected with the actual performance of work or prescribed duties; i. e., the result of true naval industrial hazards. The remainder were incidental to liberty, athletics ashore or afloat, skylarking, quarreling, falls other than those connected with work, etc.

Poisoning by a narcotic drug or by ethyl alcohol is recorded under the title "Drug addiction" or "Alcoholism," as the case may be. Such cases are not included in the above figures.

The following cases are worthy of notice from the standpoint of accident prevention:

Ship.—Multiple burns of upper extremities incurred by engineer when back fire from engine of power boat ignited gasoline which, because of neglect, had collected in the bilges of the boat. This man was carried on the sick list 43 days. Five other occupants of the boat received minor burns involving to date a total of 81 sick days.

Battleship.—Burn of face caused by the flaming up of gasoline which had been carelessly poured on a live wire.

Ship.—Burn of hands and wrists received while throwing bucket containing burning gasoline overboard. Gasoline in an open bucket was contrary to orders, being used in the engine room of barge for cleaning purposes. It was said a lighted cigarette thrown by some one outside of barge passed through an open hatch and fell in the gasoline.

Battleship.—Lacerated wound of right forearms suffered while repairing *running* motor. Man's sleeve caught in the magneto gears and pulled his arm into the gears.

Battleship.—Man *without authorization* lashed his hammock on the main deck to a ventilator and a loading machine. The loading machine *was not secured* and during the night it fell over when the ship rolled and caused a contusion of the right inguinal region which required five days' hospitalization.

Ship.—Injury to foot necessitating 88 sick days caused by a falling hatch door. Material was being lowered through hatch and the hatch door was secured by wire hooks which straightened and permitted the door to fall.

Marines in Cuba.—Four marines were poisoned by eating castor beans which they had picked from a castor plant.

Training station.—Multiple wounds of hand befell a man while polishing the shaft of a food chopper which was in operation. Resulted in 36 sick days.

Destroyer.—While painting over the side, staging, which had been improperly secured by another person, carried away and man fell into dry dock, suffering, by good fortune only, a contusion of the lumbar region, for which he was carried on the sick list five days.

Submarine.—Death followed multiple burns resulting when valve of Diesel engine on submarine blew out.

Station.—While cutting metal, the distal phalanx of the right middle finger was amputated when another person negligently pulled the lever of the metal cutter.

Station.—Because of inadequate protection afforded by installed safety device, a marine while operating a planing machine received a lacerated wound of the right thumb.

Ship.—Ankle injured by falling material. Drums of gasoline were being hoisted from hold when a comparatively new 4-inch line parted. Two drums fell and struck patient. Forty sick days resulted.

Ship.—Lacerated wound of heel occasioning 146 sick days was incurred while hoisting whaleboat. Due to negligence on the part of some one else, the cotter pin of the lifting pin was missing. Nut backed off the lifting pin and permitted the boat to fall, when patient's heel was caught in the boat falls.

Battleship.—Multiple wounds of right hand were met with in the following accident which caused 28 sick days. Man was passing between gun compartments and grasped the closed half of the flame-tight doors between the compartments, when the ship rolled and the open half shut on his hand. Report stated there was no safety device (hook) present for securing the door when open.

Training station.—Tripping over a loose sidewalk board, man sustained a fracture of right foot and 36 days' disablement.

Destroyer.—Burn of face and arms due to flareback caused by excess accumulation of gas in fire box. One week later there were three other cases burned about the face and arms from the same cause and on the same ship, all of which were transferred to a naval hospital for treatment.

Marine barracks.—Marine injured by the explosion of a hand grenade which was being carelessly tampered with by another marine. Minor multiple wounds of the arms and legs resulted which necessitated but five days' hospitalization.

Destroyer.—Because the lighting circuit was temporarily disconnected, man stepped through an open, unguarded manhole into a fresh-water tank and sustained a contusion of the lumbar region, which necessitated transfer to hospital.

Repair shop.—A lacerated wound of the foot and 21 sick days followed the stepping backward into a broken deadlight.

Submarine.—Battery water was negligently left standing in a container from which a man drank, not knowing the contents. Poisoning resulted and case was hospitalized immediately.

Station.—Marine suffered a gunshot wound of the left hand when his pistol, on which the safety lock was not set, accidently fell from his holster.

Marines.—A marine was struck by the ball of a supposedly unloaded rifle fired by another marine. The wound, luckily, was not a serious one.

Battleship.—While unloading 14-inch shells, the same were temporarily placed on the loading shelf in turret and held in place by ropes. The men became careless when transferring shells from the turret and left off the line holding the shells, when one of the shells fell from the shelf and struck a man on the leg, causing a compound fracture of the tibia.

CHANGE IN QUARANTINE REGULATIONS, PORT OF KINGSTON, JAMAICA

Through the Department of State the Navy Department has been notified of a change in the quarantine regulations of Jamaica. In forwarding copies of the new regulations issued by the secretary of the quarantine board under Jamaica laws the American vice consul in charge at Kingston, Jamaica, recommended publicity in order that naval vessels entering Kingston Harbor may have a thorough knowledge of the quarantine regulations in force.

Medical officers will note for possible future reference the publication of the new regulations herewith:

CIRCULAR No. 251

OFFICE OF THE QUARANTINE BOARD,
Kingston, October 1, 1924.

SIR: I have the honor, by direction of the quarantine board, to inform you that Circular No. 41 has been canceled, and the regulations set forth below are now in force:

RAT GUARDS

1. All vessels must place metallic rat guards in a manner satisfactory to an officer of the quarantine board, and of a type approved by him, on all mooring lines leading from the vessel to the wharf or to another vessel immediately the vessel is berthed, and keep such metallic rat guards properly adjusted to the satisfaction of an officer of the quarantine board during the time the vessel remains moored to the wharf or other vessel. Such guards must not be less than 3 feet in diameter, must fit the lines tightly, must be approximated at all points along the circumference, and must be applied fairly near the vessel so as not to overhang the wharf.

2. All hawser holes and main deck scuppers on side next to wharf must either be plugged with a solid piece of wood or covered with thick canvas while the vessel is alongside the wharf.

GANGWAYS AND FENDING OFF

3. Between the hours of 6 p. m. and 6 a. m. all gangways, cargo chutes, or anything by means of which rats can travel from the ship to the wharf must either be removed altogether or kept raised not less than 8 feet above the wharf, and all lighters or boats must be removed from alongside the ship during the same hours.

4. No cargo shall be loaded or discharged between the hours of 6 p. m. and 6 a. m. without permission being obtained either from the secretary of the quarantine board or a visiting officer. Such loading or discharging shall be under the supervision of an officer of the quarantine board; and immediately work ceases, whether during hours for meals or for any other reason, all gangways, cargo chutes, or anything by means of which rats can travel from the ship to the wharf must be removed at once.

5. While alongside the wharf vessels must keep all hatches and portholes closed unless actually being used in the loading or discharging of cargo.

6. Vessels of low freeboard, if on the weather side of the wharf, must put off into the stream between 6 p. m. and 6 a. m., or fend off 8 feet, and vessels on the lee side of the wharf must fend off 8 feet between the same hours.

PLAGUE REGULATIONS

7. Vessels from countries infected with plague may accept first-class passengers and will be granted pratique on arrival here provided they are six days out, all well on board, and the captain of each vessel produces a certificate from the British consul certifying of his own knowledge that the vessel while in a port of any of the countries named in the next paragraph was anchored not less than a quarter mile from the shore and that cargo was not taken on board. Disinfection of clothing and effects may be required. The captains of vessels which have been alongside or taken cargo on board at a port of any of the countries mentioned in the next paragraph in order to obtain pratique here must produce a certificate of complete fumigation, satisfactory to the quarantine board, certifying that the vessel has been fumi-

gated since being alongside or taking on cargo, and six days must have elapsed since the fumigation took place.

8. The following countries are infected with plague: Ecuador; Chile; Peru; Argentine Republic; Brazil; Uruguay; Paraguay; Cape Verde Islands; Hongkong; Azores; Ceylon; China; Java; Egypt; Greece; Hawaii; India; Indo-China; Japan; Dakar; Straits Settlements; Chios Island; Zanzibar, British East Africa; Madagascar; Mauritius; Rhodes; Siam; Syria; Constantinople; Algeria; Jaffa; Haifa; Manila; Lisbon; Portuguese West Africa; Barcelona, Cartagena, Valencia, Malaga (Spain); Mesopotamia; Bolivia; Canary Islands; Tunis; Morocco; Uganda; Celebes Island; Russia (certain Provinces); Siberia; Union of South Africa (certain Provinces); and West Africa. Vessels which have been at any port in the countries named in this paragraph within the two months preceding their arrival here are to be detained and reported to the quarantine board.

9. Vessels arriving from ports in which plague has occurred may be allowed alongside during the daytime to discharge or load cargo under supervision, provided in each case the quarantine board is satisfied that there is no danger to the public health.

FUMIGATION

10. No fumigation will be done at any outport. Fumigation is done entirely at the risk of the owner or owners of the ship.

11. Vessels which have been at ports other than Jamaican before turning drogher for coastal service or going on the slip for cleaning or repairs must be fumigated.

12. Sailing vessels which have had communication with ports other than Jamaican, while in any outport of Jamaica, must anchor not less than 200 yards from the shore, and when alongside in Kingston Harbor they must not anchor or remain within 8 feet of a drogher or other coastal vessel.

YELLOW-FEVER REGULATIONS

13. Vessels from countries infected with yellow fever, in order to obtain pratique in Jamaica, must be either 18 days out from those countries or submit to fumigation on arrival here; crew remaining on board for 6 days after the fumigation, and passengers will be landed and detained at the quarantine station for 6 days; or bring a certificate from the British consul certifying that while in port the vessel had anchored away from the shore.

14. The following countries are infected with yellow fever: Bahia, Pernambuco, San Salvador, Spanish Honduras (Pacific coast), and West Africa (French Dahomey).

INFLUENZA

15. Passengers arriving from ports in which influenza is epidemic will be allowed to land here if two and a half days out and all well on board. Passengers less than two and one-half days out must complete that period at the quarantine station. Crews must also remain on board for the same period.

SMALLPOX REGULATIONS

16. Passengers from Colon, Panama, Cartagena, Colombo, Santa Marta, persons from the Republic of Mexico and the islands of St. Andrews and Old Providence who desire to land here must either be 14 days out or show to the health officer at Port Royal marks of recent successful vaccination or submit to vaccination on the voyage and detention at the quarantine station until the

health officer is satisfied that it is successful, or complete the remainder of 14 days from the date of embarkation at the quarantine station. Fumigation of baggage at the quarantine station will also be required.

COSTA RICA, GUATEMALA, CUBA, HAITI, SANTO DOMINGO, SPANISH HONDURAS, NICARAGUA

17. Passengers must either show marks of recent successful vaccination or submit to vaccination on arrival here.

CHARLES DON,
Secretary Quarantine Board.

HEALTH OF THE NAVY

This report is for the month of November. The general admission rate, all causes, was 584 per 1,000 per annum, a low rate, inasmuch as the median November rate for the preceding five years is 632.

The regular seasonal increase in the prevalence of acute infectious diseases of the respiratory type is taking place, but no unusual increase has been recorded yet.

With regard to diseases of Class VIII (A), United States Navy Nomenclature of Diseases and Injury, comparatively few admissions for this time of year were reported under any of the titles in this group except influenza and pneumonias. There were notified for the entire Navy 101 cases of influenza. These made an admission rate of 10.28 per 1,000 per annum for the month, which is a lower rate than the five-year median November rate, 13.03. There were 23 cases of pneumonia (all forms), making the admission rate just about equal to the expected rate.

One case of acute poliomyelitis in the person of an ensign was reported by the United States Naval Hospital, Chelsea, Mass. Only three cases of measles, six cases of mumps, and six cases of scarlet fever were recorded for all ships and stations.

Practically no increase in the prevalence of Class VIII (B) diseases, common diseases of the respiratory type, occurred during the month. As was the case earlier in the fall, there were more admissions for acute tonsillitis than for acute bronchitis. As a rule, admissions under these titles are about equal.

The following table shows admission rates per 1,000 per annum for the principal communicable diseases, November, 1924. For comparison, corresponding median rates are given for the same month, years 1919 to 1923, inclusive:

	November, 1919–1923	November, 1924
Cerebrospinal fever	0	0
Diphtheria	.38	.10
German measles	.41	.10
Influenza	13.03	10.28
Malaria	9.40	4.48
Measles	4.71	.31
Mumps	11.51	.61
Pneumonia	2.39	2.34
Scarlet fever	.47	.61
Smallpox	0	0
Tuberculosis	3.25	2.85
Typhoid fever	.10	0

VITAL STATISTICS

The Monthly Health Index, which is published on the 15th of each month, contains the statistical data for individual ships and shore stations. The statistics appearing in this BULLETIN are summaries compiled from those published in the Monthly Health Index.

Annual rates, shown in the succeeding statistical table, are obtained as follows:

The total number of admissions to the sick list or the number of deaths reported during the period indicated is multiplied by $\frac{365}{28}$ or $\frac{365}{35}$, or 12, depending upon whether the period includes four or five weeks or a calendar month. The product is then multiplied by 1,000 and divided by the average complement.

TABLE No. 1.—*Monthly report of morbidity in the United States Navy and Marine Corps for the month of November, 1924*

	Forces afloat	Forces ashore	Entire Navy	Marine Corps
Average strength	75,037	42,851	117,888	21,024
All causes:				
Number of admissions	2,676	2,024	4,700	944
Annual rate per 1,000	427.95	566.80	478.42	583.71
Disease only:				
Number of admissions	2,336	1,751	4,087	826
Annual rate per 1,000	373.58	490.35	416.02	510.75
Communicable diseases, exclusive of venereal disease:				
Number of admissions	558	525	1,083	253
Annual rate per 1,000	89.24	147.02	110.24	156.44
Venereal diseases:				
Number of admissions	847	254	1,101	150
Annual rate per 1,000	135.45	71.13	112.07	92.75
Injuries:				
Number of admissions	336	271	607	118
Annual rate per 1,000	53.73	75.89	61.79	72.96
Poisons:				
Number of admissions	4	2	6	0
Annual rate per 1,000	0.64	0.56	0.61	0

TABLE No. 2.—*Admissions; diseases of special interest reported during the month of November, 1924*

	Forces afloat, Navy and Marines (strength, 75,037)		Forces ashore, Navy and Marines (strength, 42,851)		Total (strength, 117,888)	
	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000
Class III:						
Appendicitis, acute	41	6.56	33	9.24	74	7.53
Cholangitis, acute	41	6.56	12	3.36	53	5.39
Colitis, acute	2	.32	0	0	2	.20
Enteritis, acute	37	5.92	11	3.08	48	4.89
Gastritis, acute catarrhal	13	2.08	14	3.92	27	2.75
Gastroenteritis, acute	30	4.80	44	12.32	74	7.53
Ulcer, duodenum	2	.32	1	.28	3	.31
Ulcer of stomach	0	0	1	.28	1	.10
Total	166	26.56	116	32.48	282	28.70
Class VIII (A):						
Chickenpox	1	.16	0	0	1	.10
Diphtheria	1	.16	0	0	1	.10
German measles	0	0	1	.28	1	.10
Influenza	50	8.00	51	14.28	101	10.28
Measles	1	.16	2	.56	3	.31
Mumps	5	.80	1	.28	6	.61
Pneumonia, broncho	2	.32	0	0	2	.20

TABLE No. 2.—*Admissions; diseases of special interest reported, etc.*—Contd.

	Forces afloat, Navy and Marines (strength, 75,037)		Forces ashore, Navy and Marines (strength, 42,851)		Total (strength, 117,888)	
	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000
Class VIII (A)—Continued						
Pneumonia, lobar	14	2.24	7	1.96	21	2.14
Poliomyelitis, acute anterior	0	0	1	.28	1	.10
Scarlet fever	3	.48	3	.84	6	.61
Whooping cough	1	.16	0	0	1	.10
Total	78	12.47	66	18.48	144	14.66
Class VIII (B):						
Angina Vincent's	37	5.92	19	5.32	56	5.70
Bronchitis, acute	111	17.75	96	26.88	207	21.07
Catarrhal fever	89	14.23	117	32.76	206	20.97
Tonsillitis, acute	180	28.79	100	28.00	280	28.50
Total	417	66.69	332	92.97	749	76.24
Class IX:						
Dysentery, bacillary	2	.32	18	5.04	20	2.04
Dysentery, entamebic	1	.16	5	1.40	6	.61
Total	3	.48	23	6.44	26	2.65
Class X:						
Dengue	24	3.84	67	18.76	91	9.26
Malaria	17	2.72	27	7.56	44	4.48
Pappataci fever	1	.16	0	0	1	.10
Total	42	6.72	94	26.32	136	13.84
Class XI:						
Tuberculosis (all forms)	18	2.88	10	2.80	28	2.85
Class XII:						
Chancroid	266	42.54	59	16.52	325	33.08
Gonococcus infection	555	88.76	162	45.37	717	72.98
Syphilis	26	4.16	33	9.24	59	6.01
Total	847	135.45	254	71.13	1,101	112.07

TABLE No. 3.—*Summary of annual admission rates for venereal diseases reported from ships for October, 1924, and from various shore stations for the four-week period November 2–29, 1924, inclusive*

	Annual rate per 1,000, October, 1924			Average rate since July 1, 1924		
	Minimum rate	Mean rate	Maximum rate	Minimum rate	Mean rate	Maximum rate
All ships	0	159.08	895.52	0	192.34	1,468.53
Battleship divisions:						
Battle Fleet	50.14	143.60	306.31	114.83	158.95	193.09
Scouting Fleet	66.02	164.02	358.34	63.82	205.75	352.81
Asiatic Fleet [1]	0	412.50	648.65	74.07	435.97	1,157.89
Light cruiser divisions:						
Scouting Fleet	25.32	129.61	500.00	58.95	161.42	381.05
Destroyer squadrons:						
Battle Fleet	0	89.98	342.86	0	118.09	346.99
Scouting Fleet	0	99.66	300.00	0	98.28	246.91
Asiatic Fleet [1]	0	408.51	763.64	103.45	480.83	1,468.53
Miscellaneous [2]:						
Battle Fleet	0	119.73	400.00	0	140.76	354.68
Scouting Fleet	0	130.47	461.54	0	133.93	426.26
Asiatic Fleet [1]	0	425.40	895.52	0	428.47	767.26
Naval forces, Europe	302.52	302.52	302.52	135.85	410.72	646.15
Special Service Squadron	0	144.08	369.49	155.61	218.84	301.18
Naval transportation service	0	160.25	360.00	104.35	248.41	340.21
Special duty	0	114.15	363.64	31.17	187.28	303.80

[1] Month of September, 1924.

[2] Vessels of train, base force, etc.

TABLE No. 3.—*Summary of annual admission rates, etc.*—Continued

	Annual rate per 1,000, Nov. 2 to Nov. 29, 1924			Average rate since July 1, 1924		
	Minimum rate	Mean rate	Maximum rate	Minimum rate	Mean rate	Maximum rate
All naval districts in the United States	0	65.09	568.75	5.26	67.06	226.42
First naval district	11.21	50.78	111.59	22.18	47.56	85.71
Third naval district	0	107.10	225.55	5.26	61.84	131.74
Fourth naval district	19.29	34.21	55.79	20.79	54.52	76.39
Fifth naval district	0	56.03	78.88	11.88	75.08	148.15
Sixth naval district	79.08	86.44	161.83	53.85	67.26	151.64
Seventh naval district	568.75	568.75	568.75	135.00	135.00	135.00
Eighth naval district	0	97.26	120.09	78.63	85.87	138.84
Ninth naval district	61.71	61.71	61.71	86.89	86.89	86.89
Eleventh naval district	24.95	54.29	71.19	33.27	53.01	68.88
Twelfth naval district	11.22	15.91	27.37	41.10	42.19	42.57
Thirteenth naval district	46.18	79.27	141.30	72.70	116.11	226.42

RATIO OF GONOCOCCUS AND SYPHILIS INFECTIONS TO TOTAL CASES OF VENEREAL DISEASES

	Per cent September, 1924		Per cent since July 1, 1924	
	Gonococcus	Syphilis	Gonococcus	Syphilis
All ships	62.88	10.16	66.80	8.12
Battleship divisions:				
Battle Fleet	85.71	9.71	83.53	8.24
Scouting Fleet	65.59	2.15	70.25	4.34
Asiatic Fleet [1]	40.91	12.12	45.25	14.48
Light cruiser divisions:				
Scouting Fleet	73.53	14.29	71.05	5.26
Destroyer squadrons:				
Battle Fleet	85.71	4.76	83.64	6.54
Scouting Fleet	67.57	13.51	70.70	12.10
Asiatic Fleet [1]	48.75	5.00	50.36	5.04
Miscellaneous: [2]				
Battle Fleet	66.67	25.93	74.73	16.85
Scouting Fleet	52.11	12.68	64.17	6.84
Asiatic Fleet [1]	26.67	8.33	35.17	5.52
Naval Forces, Europe	100.00	0	65.73	11.19
Special Service Squadron	38.10	9.52	58.73	3.97
Naval Transportation Service	47.62	11.90	59.00	7.33
Special duty	75.51	12.24	78.06	5.40

[1] Month of September, 1924.

[2] Vessels of train, base force, etc.

	Per cent Nov. 2, to Nos. 29, 1924		Per cent since July 1, 1924	
	Gonococcus	Syphilis	Gonococcus	Syphilis
All Naval Districts in the United States	61.54	18.88	71.22	14.27
First naval district	84.62	15.38	80.00	8.57
Third naval district	76.19	4.76	80.88	8.82
Fourth naval district	66.67	33.33	80.00	7.50
Fifth naval district	46.51	27.91	64.62	16.92
Sixth naval district	44.44	5.56	64.79	5.63
Seventh naval district	42.85	14.29	44.44	11.11
Eighth naval district	25.00	75.00	72.22	22.22
Ninth naval district	100.00	0	90.91	4.55
Eleventh naval district	87.50	12.50	82.43	16.22
Twelfth naval district	50.00	50.00	39.29	53.57
Thirteenth naval district	83.33	0	79.17	8.33

TABLE No. 4.—*Number of admissions reported by Form F cards and annual rate per 1,000, entire Navy, for the four-week period November 2 to 29, 1924, inclusive*

	Navy (strength, 96,864)		Marine Corps (strength, 21,024)		Total (strength, 117,888)	
	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000
Diseases of—						
Blood	2	0.27	1	0.62	3	0.33
Circulatory system	28	3.76	9	5.57	37	4.08
Digestive system	306	41.07	91	56.27	397	43.78
Ductless glands and spleen	6	.81	0	0	6	.66
Ear	275	36.91	91	56.27	366	40.36
Eye and adnexa	47	6.31	14	8.66	61	6.73
Genito-urinary system (nonvenereal)	80	10.74	18	11.13	98	10.81
Communicable diseases transmissible by—						
Oral and nasal discharges (A)	116	15.57	21	12.99	137	15.11
Oral and nasal discharges (B)	583	78.24	142	87.80	725	79.95
Intestinal discharges	10	1.34	16	9.89	26	2.87
Insects and other arthropods	59	7.92	73	45.14	132	14.56
Tuberculosis (all forms)	25	3.36	1	.62	26	2.87
Venereal diseases	900	120.79	150	92.75	1,050	115.79
Other diseases of infective type	175	23.49	57	35.25	232	25.58
Diseases of—						
Lumphatic system	39	5.23	12	7.42	51	5.62
Mind	37	4.97	9	5.57	46	5.07
Motor system	83	11.14	23	14.22	106	11.69
Nervous system	43	5.77	7	4.33	50	5.51
Respiratory system	37	4.97	8	4.95	45	4.96
Skin, hair, and nails	60	8.05	24	14.84	84	9.26
Hernia	21	2.82	5	3.09	26	2.87
Miscellaneous diseases and conditions	70	9.39	36	22.26	106	11.69
Parasites (fungi and certain animal parasites)	57	7.65	7	4.33	64	7.06
Tumors	20	2.68	3	1.86	23	2.54
Injuries	472	63.35	118	72.96	590	65.06
Poisoning	6	.81	0	0	6	.66
Dental diseases and conditions	10	1.34	8	4.95	18	1.98
Total	3,567	478.72	944	583.71	4,511	497.45

TABLE No. 5.—*Deaths reported, entire Navy, for the four-week period November 2 to 29, 1924, inclusive*

	Navy (strength 96,864)	Marine Corps (strength 21,024)	Total (strength 117,888)
Pneumonia, lobar	3	0	3
Tonsillitis, acute	1	0	1
Other diseases	1	0	1
Drowning	6	0	6
Other accidents and injuries [1]	12	1	13
Total	23	1	24
Annual death rate per 1,000, all causes	3.09	.62	2.65
Annual death rate per 1,000, disease only	.67	0	.55

[1] Three of these deaths reported this month were caused by multiple burns from an explosion of gunpowder on the U. S. S. Trenton at sea October 20, 1924.

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Washington, March 20, 1907.

This UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

Owing to the exhaustion of certain numbers of the BULLETIN and the frequent demands from libraries, etc., for copies to complete their files, the return of any of the following issues will be greatly appreciated:

Volume VII, No. 2, April, 1913.
Volume VIII, No. 1, January, 1914.
Volume VIII, No. 3, July, 1914.
Volume VIII, No. 4, October, 1914.
Volume X, No. 1, January, 1916.
Volume XI, No. 1, January, 1917.
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PREFACE

The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April, 1907, as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officers, reports from various sources, historical essays, notes and comments on topics of medical interest, and reviews or notices of the latest published medical books.

The bureau extends an invitation to all medical officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit, the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit and will recommend that copies of such letters be made a part of the official records of the officers concerned.

The bureau does not necessarily undertake to indorse all views or opinions which may be expressed in the pages of this publication.

E. R. STITT,
Surgeon General United States Navy.

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When contributions are typewritten, *double spacing* and wide margins are desirable. Fasteners which can not be removed without tearing the paper are an abomination. A large proportion of the articles submitted have an official form such as letterheads, numbered paragraphs, and needless spacing between paragraphs, all of which require correction before going to press. The BULLETIN endeavors to follow a uniform style in headings and captions, and the editor can be spared much time and trouble and unnecessary errors can be obviated if authors will follow in the above particulars the practice of recent issues. This is not only important in special articles, but still more so in reviews.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

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U. S. NAVAL MEDICAL BULLETIN

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SPECIAL ARTICLES

THE REAL CAUSE OF ELEPHANTIASIS

By H. M. STENHOUSE, Lieutenant Commander, Medical Corps, United States Navy

There are a great many misconceptions about elephantiasis. Even in the tropics where it is prevalent the underlying causes and the step-like process by which it is brought about are but imperfectly understood. For this reason I have devoted a large part of the last two years to a study of the condition as it exists on the island of St. Croix in the Caribbean Sea.

The purpose of this paper is to sum up briefly the step-like process to which reference has been made, to add a constructive thought of etiological significance, to touch on the surgical treatment, and to clarify if possible the subject in general.

Filariasis and elephantiasis.—*Filaria bancrofti* bears a relationship to elephantiasis somewhat similar to that which exists between *Treponema pallidum* and general paresis. Filariasis is the forerunner and most important single factor in the etiology of tropical elephantiasis. But the development of elephantiasis is a sequel to the general defense reaction against the parasite. It is not a mere blocking of lymphatics by either the adult worm or the embryos to which it gives birth (the Mansonian theory).[1]

It is not caused by the sealing up of lymphatic spaces by streptococcus infection.[2 3]

The process.—Three distinct phases of the process are discernible:

(*a*) The filarial infection and filarial damage to the host.

(*b*) The defense reaction of the host.

(*c*) The post-defense benign hyperplasia of lymphatic and fibrous tissue.

(*a*) The phase of infectivity: The young worm matures in the lymphatics. A mild chronic inflammatory reaction is set up by the adult parasite. There appear in the superficial blood vessels at night the characteristic sheathed embryos of *F. bancrofti*. In the

[1] Stitt, E. R., Diagnostics and treatment of tropical diseases, 2d edition 1917, pp. 314, 320, P. Blakiston's Son & Co.

[2] Sistrunk, W. E., Journal American Medical Association, vol. 71, no. 10, Sept. 7, 1918, p. 800.

[3] Mahon, G. D., American Journal of Medical Sciences, vol. CLXV, p. 875, 1923.

day the embryos gather in the deeper structures especially in the lungs and kidneys. This phase may continue for years, the defense effort being insufficient to destroy the adult parasite.

Among the early and constant signs of injury to the definitive host are the pathological changes in the urine. Albumen, casts, and cellular elements appear as a result of the slow persistent damage to the kidneys.

Nycturia becomes a prominent clinical feature. There are circulatory changes resulting in early and eventually extreme arteriosclerosis. The blood during the period of infectivity shows an increase of lymphocytes and transitionals (Table 1). The percentage of lymphocytes ranges from 21 to 59; of transitionals from 2 to 12. These are the prominent features of the infective phase.

TABLE I.—*White blood counts in filariasis*

Sex	Case number	White blood counts	Polymorphonuclears	Lymphocytes	Transitionals	Other varieties
			Per cent	*Per cent*	*Per cent*	*Per cent*
PHASE 1						
Male	9842	6,500	75	21	2	mono 2.
Female	9657	6,400	36	59	4	eos 1.
Male	9819	5,800	52.7	41.8	3.6	eos 1.9.
Male	10007	8,400	55	43		mono 1. mast 1.
Male	9816	6,200	36.4	58.2	3.6	eos 0.9. mast 0.9.
PHASE 2						
Female	7877	[1] 16,800	85	13		eos 0.2.
		[2]	64	31	2	mono 1, eos 2.
Female	5558	[1] 2,200	85	15		
		[2]	57	30	12	mono 1.
Male	9653	[1] 8,000	70	28		eos 2.
		[2] 5,800	60	40		
Male	5471	[1] 8,400	64	34		lge mono 2.
		[2] 6,000	35	60	5	
Male	7089	[1] 2,200	54	39		eos 7.
		[2] 5,600	54	40	2	eos 4.

[1] Febrile. [2] Afebrile.

(*b*) Defense reaction: The gland enlarges as a rule where the adult parasites lodge. There occur periods of quiescence and periods of acute reaction. During the latter there are chills and fever. The patient takes to his bed. The temperature rises to 101° or 102° F.; occasionally to 104° or 105°. This is the so-called elephantoid fever and lasts from four to seven days. The white blood count may rise as high as 16,000 or 20,000 and the afebrile lymphocytosis gives way to a preponderance of polymorphonuclears. There may be excruciat-

ing pain in the affected region lasting for several days. In females the acute reactions are often associated with menstrual periods and are more severe than those in males. As the flare-up subsides the temperature falls to normal and the blood count falls to its former level and constituent ratio. The lymph circulating through the extremity is chylous.

Such an acute defense effort may completely clear up. The phase of lymphatic hyperplasia may follow immediately, or there may be an interval between the second and third phases.

At the end of the defense reaction, if complete, the adult filaria dies and the embryos disappear from the blood. The filaria ceases to be a vital factor and if other pathological changes ensue they are in no way dependent on the presence of living filaria. The damage is started by the filaria but the elephantiasis is completed in a host free from living filaria.

(*c*) Post-defense hyperplasia: Lymph obstruction occurs in fully 6 per cent of the persons infected with *Filaria bancrofti*. Unless complicated by secondary invasion of streptococcus or other infection, the hyperplasia progresses painlessly. Pure elephantiasis follows a simple mechanical blockage of lymph spaces. It is brought about by the deposit in the intercellular spaces of chemical substances contained in the lymph. The fluid is pent up in the minute spaces as well as the larger lymphatics of the superficial tissues.

As a result of the swelling, the hydrostatic pressure exerted, and the increased weight of the limb, there is a benign hyperplasia of those tissues. It becomes gradually more difficult for the fluid to escape because of the overgrowth of cells. The skin is stretched. It becomes glossy, loses its elasticity, and joins with the subjacent layers in the unnatural growth. It becomes thickened and leathery. Verrucous outgrowths occur in certain parts particularly about the ankles and feet. Folds and fissures form where there is less or more resistance to the pressure exerted from beneath. The stress may reveal a weak spot where clear lymphs oozes out. The circulation is disturbed; ulcers are prone to form. Depigmentation may appear at the site of healed ulcers.

The tense skin does not pit on pressure as does that in ordinary edema. The intercellular spaces are so occluded that there is no localized interchange of fluid under the pressure of the examiner's finger.

Although the superficial tissues are those chiefly affected there are also changes in the deeper structures. The bones exhibit irregularities in contour. The muscles become pale from pressure. Their fibrous covering thickens.

Sources of information.—I have searched in many directions for elements which have any possible bearing on the development of the

disease. I have dealt with some of those explorations in another article. An epidemiological review of 611 cases of filariasis (Table II), investigation of the younger patients, necropsy and laboratory gleanings, and surgical experiences of a wide and varied nature were mentioned.

TABLE II.—*Filariasis*

[Population St Croix (1917 census), 14,901. 611 filariasis case reported (1919–1923, inclusive)

SEX DISTRIBUTION

Census		Filariasis
47.9 per cent	Males	56 per cent.
52.1 per cent	Females	44 per cent.

AREA DISTRIBUTION

Census	Filariasis
Rural, 48.2 per cent	Rural, 67.3 per cent.
Town, 51.8 per cent	Town, 32.7 per cent.

AGE WHEN DISCOVERED INFECTED

	Census
20 years or under, 24.3 per cent	Under 20, 36.3 per cent.
21 to 40 years, 36.1 per cent	20 to 39, 33.2 per cent.
41 to 60 years, 21.1 per cent	40 to 59, 20.7 per cent.
61 or over, 18.5 per cent	Over 60, 9.6 per cent.

Youngest case a male, age 2 years.
Eldest case a male, age 85 years.

In addition I have also examined and tabulated certain physical findings in three groups of elephantiasis patients—one of 33 such inmates at Kings Hill Poor Farm, a second of 8 children of school age, and a third of 11 hospital patients who were personally examined, observed, and studied. These, of course, form only a fraction of the many persons in a community of 14,000 souls where at least 6 per cent of the population have elephantiasis. One is frequently impressed by many things which may not at the moment be recorded as patients are seen in the wards or elsewhere. These basic data are mentioned only to give evidence as to the sources of our information and to guarantee the validity of the conclusions advanced.

TABLE III.—*Elephantiasis, Based on figures from Neumann*

[Population St. Croix (1880), 18,430. 217 cases of elephantiasis among 3,454 persons (6.22 per cent)]

SEX DISTRIBUTION

Census		Elephantiasis[1]
44. 1 per cent	Males	40 per cent.
55.9 per cent	Females	60 per cent.

[1] Figures from Neumann. Based on rural districts.

Rural population 56 per cent of total.

Age at onset of 104 cases

	Number	
Under 20 years	61	Youngest aged 6.
21 to 40 years	29	
41 to 67 years	14	Oldest aged 67.

Predisposition.—Through generations of men who struggle for survival in the tropics unseen forces day by day and year by year build up in some directions and tear down in others. The incidence of elephantiasis is subject to the laws of chance as applied to human life. Everyone who becomes a victim of the disease is subjected to certain combinations of physical environment. Climate plays its part.

Added to the consideration of climate there is the effect of racial mixtures. For centuries past, and still, each year a leaven of new blood adds potential differences in men. The blending of the negro with the white and yellow, the gentile and Jew introduces infinite new permutations and combinations. Heredity is a factor.

Neumann [4] has shown that the disease is more frequent in females than in males. I have substantiated this by counting the persons afflicted in various places and by finding among 101 inmates of Kings Hill Poor Farm, 36 per cent of the females and 28.9 per cent of the males with elephantiasis. Neumann's proportion was 6 females to 4 males.

The white man seems relatively immune. The number of pure whites on the island is about 600.[5]

We have been able to find among these only one case in two years. The patient was what might be termed a poor white male, a native Cruzian creole. The reasons for the relative immunity of the pure white stock are unknown. *Filaria bancrofti* appears to display

[4] Neumann, L., Symptomatologien af Elephantiasis Arabum Pedum Oplyst ved Iagttagelser Paa St. Croix-Afhandling for Doctorgraden I Medicinen af L. Neumann offentlig Laege I Christiansted. Kjobehavn, August Bangs Boghandel. Triers bogtrykken (H. J. Schou), 1881, p. 10.

[5] Census of the Virgin Islands of the United States Nov. 1, 1917, Government Printing Office, Washington, D. C., 1918. Table 5, page 45.

some selective affinity for dark-skinned people. The nocturnal periodicity may be occasioned by the dislike of the embryo for the light. The intermediary host, the mosquito at least, hides in the day and forages in the darkness.

But we must also bear in mind the comparative isolation of the white man. His contacts with negroes are mostly in the day. Servants sleep outside the master's domicile and while at work their blood is filaria free. The probability of multiple and repeated infections is therefore lessened.

Endocrine anomalies undoubtedly contribute to the chemical changes in lymph which underly elephantiasis. The influence of sex has been mentioned. On two males recently subjected to the Kondoleon operation the breasts were large and full like those of a young girl in her early teens. The nipples were erect as in lactating breast. This observation led to further similar findings. Among 76 males at King's Hill Poor Farm 22, or 28.9 per cent, had elephantiasis; 17 of the 22 had breasts approaching the female type. Five showed some thyroid fullness which is extremely rare on the island. Generally there was complete absence of hair from the chest and a thin soft texture of the skin on the chest or the chest and face.

Exciting causes.—Injuries such as contusions or sprains are accompanied by swelling of the affected part. The usual history obtainable from credible witnesses attributes elephantiasis to such injuries. Often the injury would seem insignificant of itself. But this is the crystallizing influence which precipitates an actual elephantiasis in a potential area.

Walking in water or working in water as washers do has also been given as a cause by patients. In such cases the slowing of the circulation added to the lowering of the temperature favor the deposition of chemical substances from saturated lymph.

Explanation of the process.—Many patients show elephantoid tissue in parts more or less remote from the lodgment of the adult parasite. Elephantiasis of the scrotum, the vulva, breasts, and fallopian tubes; hydroceles of the tunica vaginalis, cysts of the peritoneal cavity and in hernial sacs; all these are examples of lymph obstruction in parts not adjacent to the adult worm's place of abode. The absence of filarial embryos from nearly all of these cysts and from all pachydermatous tissue makes it apparent that filarial embryos are not the immediate cause. On the other hand cholesterol crystals and chemical deposits are fairly constant findings in hydroceles and cysts. In addition to the chemical deposit of crystals many hydroceles have a thick fatlike skum on the surface of the fluid.

The defense phase of the disease is characterized by certain alterations in the constitution of the blood and lymph, viz, increase of the

lymphocytes and transitionals in the blood, and the chylous appearance of the lymph.

The presence of the adult filaria sets up a chronic inflammation. The natural consequences of a chronic inflammation follow, a low-grade reaction at the site of the causative agent. Thrown around the parasite are cells which form a giant cell resembling those formed in tuberculosis, syphilis, and about a foreign body matrix. Caseation, dissolution, or encapsulation and calcification are possibilities. Fibrosis is a constant sequel.

The chronic inflammation set up by the adult parasite is a localized defense reaction, but the chemical change in the circulating lymph is more generalized.

Prominent among the chemical constituents of the chylous lymph is cholesterol. Deposits of cholesterol are found in fresh lymph, hence there is a superabundance of that fat-like substance in the lymph. Because of the low solubility of cholesterol crystals, precipitates are not readily absorbed; by a process of accretion the deposits are built up; the intercellular spaces become less permeable; the natural flow of lymph is impeded.

Accompanying the cholesterol deposits other unidentified crystalline deposits are found. Although not demonstrated, lecithin probably shares with cholesterol the rôle of obstructive agent. Lecithin, because of its tendency to swell when it absorbs water, would aggravate the hyperplastic tendency.[6]

The precipitate of cholesterol in affected area, the bony irregularities which appear early in the disease, and the later extreme fibrosis of soft tissues resemble in a way the pathology of cholecystitis and cholelithiasis when cholesterol stones form in the gall bladder. Precipitation of cholesterol crystals in the interstitial spaces explains fully the blockage which ends in elephantiasis. The superabundance of cholesterol is a result of the generalized defense effort against the adult and embryonic filaria. It is augmented by the nephritis and endocrine anomalies.

Surgery of tropical elephantiasis.—To relieve the tension in the affected part, recourse must be had to some artificial means of lymph drainage. The operation of Kondoleon has been popularized by Sistrunk and Matas in the United States (2) for elephantiasis of the extremities. Jaboulet devised the so-called bottle operation for the cure of hydrocele, and Fauntleroy (1) is credited with a method of treating elephantiasis of the scrotum by massive excision.

At the outset of our studies we questioned the advisability of doing the Kondoleon operation for tropical elephantiasis. Then the true

[6] MacLeod, J. J. R., Physiology and biochemistry in Modern Medicine, 4th ed., 1922, p. 721, C. V. Mosby Co.

nature of the process was not known. A danger was suspected that a parasite which had been effectually walled off might again find access to the general circulation. That suspicion can now be seen to have been unwarranted. The defense process has subsided. We are dealing with a resultant overgrowth of tissue and trying to free the fluid accumulation in the part. Operations on the simple hyperplasia will not cause an extension elsewhere.

Before operation it should first be determined that streptococcus is not actively at work. This is indicated by the absence of flare-ups of "elephantoid fever." Such cases should be given streptococcus vaccine to control the infection before operation. Fibrosis and calcification should not be extreme. Roentgenograms assist in estimating the amount of calcareous deposits in soft tissues. Observation is usually sufficient. The blood should be negative for filarial embryos.

The object of the operation is to open up a new channel by which the superficial lymphatics may be drained through deeper tissues. Too much should not be expected nor promised. If the hyperplastic tendency can be arrested the patient should be satisfied.

I have done the Kondoleon operation on 5 patients, the Jaboulet eversion for 25 tropical hydroceles, 1 enucleation for elephantiasis of the right breast, 1 plastic repair of lymph scrotum, salpingectomy in an apparently early elephantoid affection of the female adnexa, and 1 early case of elephantiasis of the forearm and hand.

The results have been satisfactory. In no case has there been any extension of the hyperplastic process. In one case with extreme fibrosis the circulation was so poor that a zone of necrosis of the skin followed. Convalescence was prolonged but the eventual outcome was satisfactory. One patient—a woman—left the hospital before the second side had been done. She had previously suffered from acute attacks of ague and fever. The operation so far as it went was satisfactory but the fever episodes were repeated after the operation as before.

Lymph scrotum and hydroceles taken together frequently demand surgery. Because of the poor circulation it is wise to close them partially and to pack with iodoform gauze.

The breast case healed readily. No evidence of extension or complications resulted. The elephantiasis tissue was removed with the breast by simple enucleation. The fascia of the pectoralis major was excised over a corresponding area to establish deep drainage.

The salpingectomy was performed in January. As I see the patient every day it can be positively stated that no complications have resulted.

In the forearm and hand case a small section of skin and fascia were removed from the dorsum of the hand. At the same sitting a

bilateral hydrocele was operated upon by Doctors Welch and Malcomson. The hydroceles contained much cholesterol. The swelling of the forearm and hand was cleared up by the next day.

Other remedies.—There are superstitions and beliefs in the Tropics as elsewhere. Most of them are ridiculed by the newcomer. But long experience in a locality proves that many seemingly strange beliefs are built on natural laws.

One afternoon while going about the village of a country estate a local home remedy became known to me. I then found some humor as well as pathos in the apparently unwarranted faith of a young girl in lime juice. I had made a list of those who were filaria blood positive in 1919 and who were not over 21 when reported. I was investigating this group to ascertain the number of elephantiasis cases which had become apparent during the five-year period. This girl (whose name was on my list) was sitting in her doorway rubbing something on her legs. The shiny appearance of the skin attracted my attention and she told me she had been rubbing lime on her legs. Reluctantly she admitted that this was done for swelling of her ankle.

Some time later an old planter told me of a sure cure in early cases. This was to wrap the limb in a watery alcohol solution of salicylic acid and change the dressing three times a day.

That the reputation of such simple remedies may after all rest on good therapeutic ground seems logical in view of the underlying chemical deposits of cholesterol. The well-known fact that bile acids hold cholesterol in solution suggests a parallel effect from other organic acids if they can be absorbed through the skin. Combinations of cholesterol with fatty acids are known to be circulating in the normal body fluids.

TRAUMATIC NEUROSES[1]

By F. R. SHEEHAN, Lieutenant Commander, Medical Corps, United States Navy (retired)

The term traumatic neuroses has been applied to the group of disorders which follow shock, either physical or mental, or the combination of both. They have become of considerable importance in the field of industrial insurance and in litigation. This is not alone because they represent a large number of claimants, but more so because their symptoms are subjective. Therefore they are difficult to evaluate, and they readily lend themselves to expansion. Further, as the make-up of the individuals presenting these conditions is such as to render them readily susceptible to suggestion,

[1] Reprinted from The Clinic of October, 1924.

there is no doubt that this entity is a fertile field for the unscrupulous among claimants and lawyers. Claimants are frequently coached so that they simulate or exaggerate symptoms.

Often the diagnosis of these conditions is made when no other can be put forth to account for damage.

This syndrome is made up of various symptoms which are commonly classed as neurasthenic, hysteric, or even psychotic. The usual normal period of excitement which follows the casual factor is not the condition considered. There is usually an interval of days or even weeks between the alleged cause and the onset of the actual symptoms.

The cause invariably includes the element of concussion. This may be either to the brain or spinal cord. The concussion may produce physical changes in the nerve cells and the associated fright may cause chemical changes with the same result.

The cases are mostly in two groups, one of which shows the symptoms of what has been termed "neurasthenia." These include a feeling of pressure in the top of the head, painful reverberations of sounds, insomnia, spinal irritation, certain paresthesias, easy fatigability, emotional irritability, and some depression.

The other group shows symptoms of a hysterical or mental character or perhaps those verging upon the psychotic. This condition immediately follows the cause which always involves mental shock. The symptoms are various and include headache, apathy, lassitude, slowness of ideation, lack of attention and initiative, loss of memory, perplexity, emotional states, possibly obsessions, maybe somatic hallucinations, and at times convulsive attacks. Hysterical anesthesias are not common. Restriction of the visual fields is seen oftener. It is this group which was denoted shell shock during the war.

The various manifestations, whether of the hysterical, compulsion, anxiety or neurasthenic types, may be associated in varying degrees.

Traumatic neuroses differ from ordinary neurasthenia in that they present more acute, intense, and variable symptoms, particularly mental, many of which may be of a hysterical character, and in their prolonged course.

Most of these conditions include an anxiety element. This is shown by disturbances of heart action, such as palpitation, arrhythmias, tachycardia, and pseudoanginas. There may be disturbances of respiration and asthmalike attacks.

Increased perspiration usually at night is common. Trembling, shaking, and various tremors occur. There is locomotor dizziness and paresthesias. The dizziness may tend to vertigo and, if so, is a grave symptom. It may be accompanied by actual syncope.

This may lead to various phobias referring to locomotion, such as of being alone, in narrow or closed spaces, as in subway trains. There may be digestive distrubances, such as nausea and even vomiting, inordinate appetite, and diarrhea. There is often a frequent desire to urinate.

There may be a psychopathic condition characterized by a pathological state of restlessness almost resembling actual delirium, based upon the idea of unjust treatment, with the state of uncertainty regarding the outcome of the situation and the anxiety as to the compensation which may be secured. The patient may actually be much better and he realizes the fact, but not finding himself as well as he was before his accident, he hesitates to return to work. He feels that he will not be as efficient as he used to be. He is incapable of concentrating upon any form of regular work and is haunted by his injury and its symptoms. He is generally troubled by vague pains which do not suggest any actual lesion and are rather a true psychalgia, further increased by concentration of his thoughts upon his injury. Depressed, suffering, and sleeping poorly, he begins to question whether he will ever be well again, and even if in the distant future he will be capable of returning to his occupation or any work whatsoever. Frequently in older men this attitude is easily assumed because it gives them an excuse both to themselves and to their families to stop work, and at the same time receive care and sympathy, and possibly compensation.

This is really a condition of hypochondriasis, exaggerated and modified by the predominant preoccupation of anxiety as to the outcome of the situation precipitated by the accident.

If an attempt is made to appeal to the individual's self-respect, he may burst into tears, declaring that he is incapable of undertaking any work and that he is hopelessly and permanently injured.

It is often thought that an adjustment of the claim will cause all of the symptoms to disappear. As a matter of fact, although complete recovery often follows settlement, this is not always true. In these latter instances the symptoms undergo a change and the hypochondriacal ideas of the first stage are replaced by ideas of new claims. The development of this condition presupposes a make-up especially prepared by previous deterioration. These individuals have since infancy shown symptoms of mental instability and obvious physical and mental defects. They are paranoid. They are never satisfied with the awards made. They continually protest at what is allowed them so that they really become psychotic. This condition is only the expression of a more or less latent and constitutional mental condition and is really incurable. In the adjustment of claims this factor should be taken into consideration and should be separated

from and not charged to the accident. The traumatism is not the true cause of the neurosis but only the occasion. In other words, the traumatism would not produce the neurosis in the absence of the specific etiology and this is the preexistence of the disorder itself in a mild form, or at least the predisposition thereto. This accounts for the fact that the symptoms may be out of all proportion to the injury. In the forms of concussion with definite evidence of contusion of the nervous system, in which consciousness has been temporarily abolished, psychoneurotic symptoms are less common than those of an organic nature. In cases of concussion without any obvious external sign of injury, the development of hysterical symptoms is usually attributable to emotion, and in some cases there is an interval of retrospective emotion and suggestion, the shock being relative and not entailing loss of consciousness. Concussion pure and simple, unaccompanied by any emotional element, rarely if ever gives rise to neuropathic symptoms.

In some cases the original symptoms may be due to the direct concussion of the nervous system but later fuctional symptoms are superimposed. In these cases it is difficult to determine where the evidence of the emotion merges into that of the actual concussion.

Aside from concussion, local injury in any part of the body may produce a neuropathic disturbance in the predisposed. It acts through emotion as well as auto suggestion, in that it creates the idea of a disorder greater than could be caused by organic disease and it also acts as an agent in fixing the symptoms.

Diagnosis of traumatic neuroses must exclude conditions actually caused by organic damage to the brain, the aggregated symptoms of which have been attributed to a vasomotor disturbance of the brain. It results in headache, dizziness, irritability, insomnia, physical and mental fatigability, a certain change of character, and intolerance of alcohol. Memory defect of the retrograde type may be associated, but it is not part of the complex.

The headache complained of is described as a feeling of pain or a peculiar feeling of constriction of the head and is associated with a feeling of fullness, especially upon stooping over. The dizziness is characteristically intensified by stooping or sudden movement. The change of character is shown by depression and moodiness, The character changes may be prolonged with a gradual falling off in efficiency.

The differentiation will be assisted by the finding of signs of brain or cord injury and by X-ray examination.

The diagnosis from malingering is especially difficult, particularly in the neurasthenic group. It may require repeated examination and prolonged observation. Varied meanings have been applied to the term malingering. It is often vaguely applied to

all symptoms, especially nervous, which do not arise from an evident organic lesion. Thus it is that the neuroses and malingering are easily confused, and this often entails serious error. It is usually the least experienced observers who most often make the diagnosis of malingering.

Malingering is often spoken of as conscious and unconscious, but this is not true, for malingering implies a voluntary conscious act, willed and reasoned, and intended to mislead and deceive. It is not pathological, but a form of deception. It should include subjective and objective symptoms assumed by an individual with the deliberate intention of misleading the observer. It must also include the voluntary or intentional exaggeration or the prolongation of a real disorder.

The differentiation of assumed symptoms from those of a psychoneurosis, especially the hysterical form, is difficult, and must be done by estimating the amount of intention underlying the pathological appearance. Thus we may say that malingering is intentional simulation and hysteria is unconscious simulation. A definite diagnosis can only be made by a minute study of the clinical signs combined with a psychological analysis. It is especially difficult to distinguish malingering by exaggeration and persistence. Here there has existed a definite condition which the patient knows and has studied, and which he exploits or prolongs, sometimes adding to the symptoms or only perpetuating some of them.

The prognosis is good in simple traumatic neuroses. Where compensation is involved recovery is unusual before the settlement of the litigation. In the hysteria group recovery is delayed, and they require prolonged treatment and sometimes develop psychoses, which are always unfavorable and may be permanent.

Treatment of these disorders is always unsatisfactory. After competent diagnosis they should be handled by a neuropsychiatrist, as they require not only the usual derivative measures of treatment, which alone are insufficient, but psychotherapeutic measures and, above all, tact and care to acquire the patients' cooperation, in order to restore their morale which is essential for recovery.

PARETIC NEUROSYPHILIS: ITS ETIOLOGY, PATHOLOGY, AND EARLY DIAGNOSIS

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The expression "paretic neurosyphilis" is in need of an explanation perhaps inasmuch as it may be more or less unfamiliar to some of us. The term was first introduced by Southard (1) of Boston, the eminent neuropathologist, as being more descriptive and indica-

tive of the etiology and of the nature of the pathological processes involved than the less scientific but more common names which are in current use. He regards it as the term of choice with which to designate the disease under discussion. Following his opinion, the term "paretic neurosyphilis" will be used exclusively in this article as synonymous with general paresis, general paralysis of the insane, "dementia paralytica," the term which appears in the Navy nomenclature, and "softening of the brain," all of which should be discarded in the light of our present knowledge because they possess in every case objectionable features.

Paretic neurosyphilis is a late-appearing manifestation of syphilitic infection ordinarily developing some 5 to 15 years after the initial lesion, although this is subject to great variation. It may occur after recent luetic infection. It is customary at present to speak of paretic neurosyphilis as a parasyphilitic or metasyphilitic disease, that is as derived from syphilis, but not actually the disease itself, and to distinguish it from the strictly meningovascular syphilitic trends of which cerebral syphilis is a type, chiefly because the histological pathology is unique, the biological tests show slightly different quantitative variations, and the results of therapy are diverse (2). Inasmuch as the differences are apparently more of degree than of kind it is very likely that these qualifying adjectives will tend to disappear in the future with more intensive investigation of the matter.

The primary and essential cause of paretic neurosyphilis is, of course, syphilis. This fact, however, was exceedingly slow in gaining universal acceptance even by the profession. The earlier writers on the subject paid little or no attention to lues among the causes of the disease, and it was only casually and incidentally mentioned by one or two of them. Within the last two or three decades, however, the frequency of syphilis as an antecedent etiological factor has been brought prominently to the front, and at the present time practically all psychiatrists agree with Kraepelin (3) that without syphilis there can be no paretic neurosyphilis.

The truth of this statement can not be questioned. It is substantiated by experimental data and by a mass of clinical evidence. In the first place, syphilis occurs with striking frequency in the past histories of patients suffering from paretic neurosyphilis. In the second place, the experiment described by Krafft-Ebing, and cited by Kraepelin, of an unknown physician who inoculated syphilitic virus into nine paretic neurosyphilitics in whom no history of infection could be obtained is of corroborative value. None of these cases developed secondary symptoms showing that in all probability syphilis already existed in them. In the third place, primary lesions are exceedingly rare in paretic neurosyphilitics, although often ex-

posed to infection during excited stages. In the fourth place, the *Treponema pallidum* has been found in the paretic neurosyphilitic brain by a number of observers (4). The last link in the chain of proof of the syphilitic origin of paretic neurosyphilis has been forged through the cytological and serological studies (5). Both have shown us that in this disease we regularly find those conditions which are characteristic of syphilis, namely, a pleocytosis in the spinal fluid, occurrence of plasma cells, and complement fixation in the blood and spinal fluid. The exceptions, after careful and repeated tests, are so few that they can not be seriously considered. We can, therefore, to-day with the greatest certainty declare that syphilitic infection is an essential to the later appearance of paretic neurosyphilis.

Admitting syphilis as the primary factor in the etiology of paretic neurosyphilis there still remain some questions to be answered. Syphilis is a common disease, but only about 2 per cent of those infected become paretic neurosyphilitics. Just why the Treponema pallidum in most cases either fails to involve the nerve centers or confines its ravages to the meninges and only in such a small proportion of cases attacks the deeper brain structures has not been fully demonstrated. It is quite conceivable that it only affects the nervous tissues under the provocation of certain predisposing conditions that make them especially vulnerable or when their resisting powers were originally impaired. In other words, something else besides syphilis is necessary.

Just what these additional factors are no one knows. Several theories have been advanced, however, in way of explanation. Some observers, notably Bolton (6) and Adler (7), claim that there is present in all future paretic neurosyphilitics a congenital cerebral weakness or a defective type of cortex and that this is responsible for the disease in conjunction with other etiological factors. Osnato (8) believes that paretic neurosyphilis is more apt to develop in abnormal types of personality. Kraepelin (3) is of the opinion that the differences in susceptibility must be sought in the people themselves and he lays great stress upon those habits of life which have a profound effect on health, particularly alcohol. The causal significance of this substance has not been proved but the general deterioration in the resistance of the race through intemperance may increase the susceptibility to paretic neurosyphilis. Several authorities have shown that symptoms of paretic neurosyphilis are apt to follow the milder cases of primary syphilis (9) and it has been suggested that a florid syphilis tends to furnish an immunity to later involvement of the nervous system. Neglected and inadequate treatment in the early stages of syphilis is certainly responsible for a definite number of cases of paretic neurosyphilis. Still another explanation is that

there exists a special strain or variety of the Treponema pallidum that shows a particular predilection for attacking the nerve centers (10) and there is abundant evidence both from the clinics and the laboratories to support this contention. Another theory that has many advocates is that the mental strain and emotional overexertion entailed by modern civilization produces "the last straw that breaks the back" of the weakened nerve element.

From a military standpoint paretic neurospyhilis is one of the most important diseases with which we have to deal. In times of peace it is fairly frequent, forming about 7 per cent of the admissions of mental cases in the Navy. During war it is increased because old syphilitics are especially liable to break down under the stress of their difficult surroundings and strenuous duties and on account of their general lack of adaptability. Since it is a disease of more advanced life it is obvious that the percentage of paretic neurosyphilitics should be relatively high among middle-aged officers and older enlisted men. We have already seen that some other factor than syphilis is necessary for its development. This, of course, brings up questions concerning line of duty; and retirement and compensation are both involved. Life in the Navy entails many hardships, the personnel is subjected to a great deal of stress, and existence aboard ship is in an ultimate analysis decidedly abnormal and unnatural even in peace times. During war the tremendous physical and moral strain, fatigue, injuries, violent cerebral trauma, even the tremendous concussion of the big guns, as well as excessive exposure, may be the fuel which is added to the flame, so to speak. These facts being true it seems only fair to assume that they might have a definite bearing upon the development of paretic neurosyphilis. The patient suffering with this disease should, in my opinion, always receive the benefit of the doubt and be given line of duty and compensated especially if there is the slightest chance that his disability was aggravated in any way by conditions as pictured above or by long continuous service.

The macroscopic anatomy and the gross appearance of the central nervous system in paretic neurosyphilis is quite characteristic and we can readily recognize the disease at autopsy. The changes seen are both encephalic and spinal and are evident in the calvarium, the membranes, the surface vessels, and in the brain itself.

The calvarium presents nothing of significance except that it is usually very much thickened. Occasionally one sees caries of the cranial bones and in addition various forms of periostitis and osteitis.

The dura is abnormally adherent in places to the calvarium. It is not uncommon to find pachymeningitis interna as well as areas of hemorrhagic extravasations of fresh blood. The pia is always more

or less cloudy and thickened especially along the vessels. These changes are generally more apparent over the anterior and middle portions of the hemispheres but less prominent on the basal surface and entirely lacking over the occipital lobes.

All the surface vessels are distended and often show thickened walls.

The brain is usually atrophic and reveals the presence of small cysts in the white and gray matter in a certain percentage of the cases as well as areas of softening. The convolutions are reduced in size and a local sinking in of the brain substance occurs. The cortex is adherent to the pia so that the latter can not be removed without tearing the brain tissue. These changes are seen especially in the frontal lobes. The ventricles contain an excess of fluid and their lining membrane is thickened.

The essential features of the microscopical picture are parenchymatous degenerations and alterations in the cortical nerve cells, the nerve fibers, the connective tissue element, and the vessels of the brain and spinal cord.

The changes which are found in the cortical nerve cells are (1) acute swelling, (2) chronic sclerosis, (3) Nissl's so-called grave alteration. This latter condition is recognized by (1) the lysis of the stainable substance, (2) the reduction in the size of the limiting membrane, (3) loss of the stroma, and (4) the bluish violet stain taken by the nucleus. These alterations and degenerations lead to (1) a destruction of a greater or lesser number of cells and (2) a dropping out of cells by layers. The changes as outlined vary in distribution and extent. The occipital cortex is but little involved while the parietal, frontal, and temporal lobes are greatly affected. It should be mentioned that these changes are not pathognomonic of paretic neurosyphilis because they occur in other deteriorating psychoses.

In all cases there is a widespread loss of nerve fibers and their destruction is in direct ratio to that of the nerve cells.

To compensate for the wiping out of the cells and the disappearance of the fibers there is (1) a tremendous growth of the connective tissue element, (2) a noticeable increase in the number of glia cells, and (3) an abundance of neuroglia fibers.

The vessels themselves are profoundly affected and show (1) endothelial proliferation with nuclear division, (2) new formation of vessels by branching, (3) new capillary loops by growth of endothelial and adventitial cells into the surrounding tissues, and (4) accumulation of plasma cells in the widened adventitial lymph spaces. These latter are found in other diseases than paretic neurospyhilis but not a single case of the latter has been reported without them.

In most cases of paretic neurosyphilis degenerations are found also in the spinal cord. The lateral tracts are usually affected and sometimes the posterior columns are involved. The gross appearance is similar to that described for the brain and its membranes.

The degenerations and alterations, the characteristic perivascular exudate of lymphocytes and plasma cells, and inflammatory changes affecting the vessels, lymphatics, and membranes are due to the active toxins of syphilis and the irritation of the products of nerve decay. These changes lead to a progressive deterioration with a complete undermining of the whole mental and physical personality accompanied by peculiar irritative and paralytic phenomena.

The recognition of paretic neurosyphilis, a disease which attacks insidiously the deeper structures of the brain and cord, and which causes such widespread changes and destruction in these tissues, in its very earliest stages is one of the most important problems in medicine to-day. The victim of this disorder is always a potential menace to himself and to his family and associates and is invariably antisocial in his conduct at some time or other during the course of the disease. Sexual crimes are especially common in the very beginning and consist for the most part of homosexuality and shameless escapades with prostitutes (12). This is not the only sphere, however, in which he refuses to heed the ordinary demands of propriety. He not infrequently jeopardizes his own life and that of others suddenly and without any warning, as in the case of the paretic neurosyphilitic who shot at Mayor Gaynor, of New York, several years ago. In addition, he becomes involved in scandals of various sorts, gets himself into debt, wrecks his fortune, and, as a last resort, plunges into a career of debauchery and vice despite the frantic efforts of his relatives and friends to stop him (13).

As a result of these indiscretions a great variety of social and economic entanglements ensue and it is not difficult to imagine the medico-legal complications that might arise. The unfortunate part of it all is that the occurrences as just outlined might be prevented if the physician only recognizes in them the onset of a definite mental disorder instead of a temporary regression to an earlier period in the life of the patient when "he sowed his wild oats," assumes a bold attitude, and advises the family exactly what course to pursue.

If the early diagnosis of paretic neurosyphilis is important and if failure to recognize it is fraught with such manifold dangers in civilian life, the same thing is equally true in the military services only to a more marked degree. Occurring ordinarily, as it does, late in life between the ages of 35 and 50, it attacks commissioned officers of high rank and responsibility and warrant officers and chief petty officers of many years' service. These men in some instances possess unlimited authority and occupy comparatively important positions

in which they control the destinies of thousands of human beings. To their care is also intrusted, as a rule, property which is invaluable and confidential papers and records which can not be duplicated.

When these facts are taken into consideration and when it is realized that the disease requires in a large majority of cases quite a long period for its full development and that it is characterized by progressive deterioration, especially at the mental level, defective judgment, and impairment of the intellect, it is easy to picture the havoc that can be wrought, the number of lives that may be imperiled, and the misery and untold suffering that can be caused by the victim of paretic neurosyphilis if the medical officer fails to protect his shipmates, the government which he represents, and himself by being ever on the alert to make an early diagnosis and remove the patient to a hospital where he belongs and where he can secure the maximum supervision which his condition demands.

The early diagnosis of paretic neurosyphilis is based upon (1) examination of the blood by the Wassermann reaction, (2) study of the cerebrospinal fluid, (3) neurological examination, and (4) mental examination.

The Wassermann reaction in the blood serum of patients suffering with paretic neurosyphilis is positive in approximately 100 per cent of the cases (10). It must be remembered, however, that a certain number exhibit a negative reaction. Neurosyphilis, like syphilis elsewhere, gives a positive reaction, and a negative reaction is differentially diagnostic against paretic neurosyphilis.

A study of the cerebrospinal fluid embraces (1) the Wassermann reaction, (2) the cell content, (3) the globulin reaction, (4) the albumin content, (5) the Lange colloidal gold solution test, and (6) the pressure.

The Wassermann reaction of the fluid of the paretic neurosyphilitic is positive in about 95 per cent of the cases using 0.2 c. c. of the fluid and the original method, and in 100 per cent with larger quantities of the fluid (14). If the fluid is negative in all dilutions, the case is not one of paretic neurosyphilis, and if it is negative in the smaller but positive in the larger dilutions we are probably dealing with some other form of neurosyphilis. It should be borne in mind that a positive reaction may occur in the fluid for a considerable time prior to the actual outbreak of the symptoms (15). This fact is of significance with respect to the early diagnosis and will be referred to later.

Pleocytosis is present in paretic neurosyphilis in about 95 per cent of the cases. The normal cell count may be stated as being up to 6 cells per centimeter; from 6 to 12 cells may be considered as suggestive of pathological conditions; and more than 12 cells as definitely pathological. The type of cell in syphilitic diseases is

preponderantly the small lymphocyte. Other varieties do occur, however, and the finding of plasma cells in any number in the spinal fluid is highly suggestive of, although not conclusive proof for, the diagnosis of paretic neurosyphilis. It is of extreme importance to note that a pleocytosis, oftentimes of a very marked degree, may antedate all neurological signs of the aftercoming disorder. This has been shown repeatedly by many observers (15). This pre-paretic period has been diagnosticated as long as two years before the onset of the disease.

The globulin reaction is positive in from 95 to 100 per cent of all cases of paretic neurosyphilis. The presence of globulin in the fluid is an indication of abnormality of the cerebrospinal axis. There is nothing differential in the finding as it occurs in all inflammatory processes. It is, however, quite characteristically present in all cases of syphilis of the nervous system and particularly paretic neurosyphilis.

Albumin is present in all fluids in small quantities. Increase over the normal amount occurs in pathological conditions, such as most cases of neurosyphilis, especially those in which globulin is found.

The colloidal gold solution reaction is an empirical test discovered by Lange and is dependent upon a color reaction which makes it very delicate. A positive reaction is indicated by a precipitation or throwing down of the colloidal gold into its metallic form. This produces a change in color. The precipitation may be partial or complete and the amount of precipitation is indicated by the color and is read as follows: The unchanged fluid is called 0; a slight change, giving a red blue, as 1; a further change, giving a blue red, as 2; a straight blue as 3; a lavender or violet as 4; and the colorless fluid, representing complete precipitation, as 5. The fluid from a case of paretic neurosyphilis will give a complete precipitation beginning in the first tube and running through a number of tubes and then grading off. It may be indicated 5555431000. When a syphilitic fluid does not give a strong paretic reaction it is good presumptive evidence that the case is not one of paretic neurosyphilis. The unsupplemented gold solution test is insufficient evidence on which to make a diagnosis, but used in conjunction with the other tests mentioned above it offers very much information looking toward the differential diagnosis of paretic neurosyphilis or cerebrospinal syphilis, brain tumor, tuberculous meningitis, and purulent meningitis.

The pressure of the fluid in paretic neurosyphilis is nearly always increased, although this fact in itself is of no great significance.

The neurological signs are definite and characteristic. Inasmuch as we are concerned with the early diagnosis only those symptoms

which occupy the picture during the initial stages will be mentioned. These include (1) pupillary changes, (2) speech defect, (3) visual disorder, (4) optic atrophy, (5) adiadochokinesis, (6) ataxia, (7) tremors, (8) reflex changes, (9) loss of manual dexterity, (10) hypalgesia, (11) nasolobial flattening, (12) vocal changes, (13) writing disorder, (14) seizures, (1).

Among the various somatic conditions met with reflex pupillary rigidity or the failure to contract on exposure to light is of first importance. This symptom is present in about one-third of the cases, while in the other two-thirds we observe more or less definite slowness or reduced range of the reaction. A fully developed Argyll-Robertson syndrome is sometimes seen. By this is meant a loss of direct pupillary reflex with free and ample response to accommodation reflexes in one or both eyes. When this phenomenon does occur it is particularly significant, and some authorities regard it as pathognomonic of paretic neurosyphilis. This is a fallacious view, however, as it may appear in other neurosyphilitic conditions and also in chronic alcoholism. In addition to these changes we have irregularity in the pupillary margins and in the size of the pupils, impairment of the consensual light reflex, weakness of the individual eye muscles, and nystagmus, all of which constitutes extremely delicate and valuable criteria for the clinical appraisement of neurosyphilis in general (2). At the same time the fact that paretic neurosyphilis may be associated with normally reacting pupils should not be lost sight of. This is a diagnostic pitfall that should be avoided.

The next most important neurological sign is the peculiar speech disturbance. Once we have learned to recognize it by experience a diagnosis can practically be made on it alone. In repeating the usual test phrases, such as Methodist Episcopal, medical electricity, communicability, truly rural, third riding artillery brigade, and others, syllables are either left out or doubled. The difficulty in movements of the lip and tongue muscles prevent the patient from pronouncing the individual letters clearly and still more from speaking complicated series of letters in correct sequence. There is thus a drawling of the speech, the difficulty being made all the more noticeable by the active associated movements of all the other facial muscles.

One of the early signs is a characteristic visual disturbance which is attributed to focal disease of the occipital cortex. It consists in a difficulty in recognizing and localizing objects, the eye grounds being normal.

In about 5 per cent of the cases optic atrophy of various extent is the first indication of the approaching disease.

Patients early exhibit an inability to carry out several different movements in quick succession, such as, to close the eyes, open the mouth, and show the teeth. This is the so-called Babinski adiadochokinesis.

The finer adjustments of muscular efforts suffer early and ataxia develops. The movements are clumsy and awkward especially when performing the usual simple incoordination tests. The gait is unsteady. There is pronounced swaying in the Romberg position.

Fibrillary tremors of the eyelids, the protruded tongue, the extended fingers, and the facial muscles are extremely common and are of diagnostic importance appearing early in the course of the disease.

Alteration in the reflexes is usually a prominent symptom in paretic neurosyphilis. Their behavior depends in large part upon the location of the spinal cord changes which are always present. In the spastic form of the disease they are increased, while in those cases involving the posterior columns, we find a diminution or loss of the reflex.

The paretic neurosyphilitic very soon becomes incapacitated for all occupations involving special manual dexterity, such as drawing, painting, violin playing, typewriting, and the various lines of arts and crafts.

Sooner or later there develops a marked hypalgesia and insensibility to pain. This is preceded, however, by a number of paraesthesias which for a long time may be the only sign of the disease present.

The features are flabby and expressionless and there is a characteristic flattening of the nasolabial folds.

The voice is monotonous, has no melody, and is tremulous. It loses its capacity for expression and often its normal resonance.

The writing shows alterations very similar to those of speech. Misplacements, omissions, and repetitions occur, little or no attention is paid to spacing, and the general untidiness together with the uncertain movements and strokes render it almost impossible to decipher the writing.

Convulsive phenomena in the form of epileptiform or apoplectiform seizures are rarely missed in paretic neurosyphilis. They often occur early in the disease, frequently ushering in the attack. Besides the two types mentioned there are certain seizures of a less definite and complete nature, ranging all the way from simple fainting spells and dizziness and petit mal attacks to various spinal forms of irritative muscular contractions and temporary speech disorders. Transient paresthesias, visual field defects, and especially attacks of vomiting, which according to Kraepelin may precede paretic neurosyphilis by years, are to be regarded as sensory seizures.

It must be remembered that the above neurological signs are not always as evident and easy of recognition as they appear to be on the surface. They are at times very vague and indefinite and repeated painstaking and careful examinations are often necessary before they can be brought to light.

The distinctive feature of the mental disturbances which develop early in the course of paretic neurosyphilis is a peculiar psychic weakness. This is manifested by (1) memory and retention disorders. (2) impaired intake, (3) clouding of consciousness, (4) defective judgment, (5) increased fatigability, (6) early irritability, (7) quick shifting emotions, (8) character change, (9) lack of insight, and (10) conduct slump, (1).

The defects in memory are diagnostically important. The patient forgets the more recent happenings. Thus, he does not remember with whom he made appointment the day before, or he may arrange a dinner or luncheon and leave his guests in the lurch. It is very common also to find an inability to adjust statements of time to each other in their proper relations. Circumscribed gaps in the memory appear and the lapses are filled out of the imagination and the patient given to confabulation.

One of the first changes noticed is difficulty in the perception and the understanding of events which transpire in his immediate environment. The patient is absent-minded, inattentive, does not notice details, and mistakes persons and objects, and not infrequently loses himself among familiar surroundings.

Kraepelin (3) has called attention to a clouding of consciousness and drowsiness on the part of the patient which he states is an important diagnostic point in the beginning of the disease.

Another important and early appearing symptom is defective judgment. The patient will often do the most unusual things, often involving his entire fortune. He often sponsors some absurd plan and forms rash conclusions which play havoc with all his carefully woven social fabric. His train of thought is disturbed and he loses his grasp on the fundamental principles by which we judge the world. All of these changes attract attention at an early period.

An increased tendency to fatigue is frequently among the first symptoms of the disease. Ordinary work is difficult, renewed efforts are necessary, and weariness at times overcomes the patient.

In the early stages the patient is irritable, capricious, easily angered, loses control of himself, and flies into a violent rage at the most trivial causes.

The abrupt alteration of the emotions is so highly characteristic of paretic neurosyphilis that recognition of the disease can almost depend entirely upon it. Laughter and tears follow one another in quick succession and a great variety of fleeting, changeable, often

contradictory emotional states are passed through. It is frequently possible artificially to induce these quick changes.

The character of the patient is altered. He loses his will power, he is indecisive, suffers from lack of initiative, becomes docile and easily led, he is unstable, and falls victim to the clumsiest of frauds.

Patients seldom have any insight into their condition. On the contrary they often feel better and healthier than previously despite the fact that they have lost or are beginning to lose their mental powers.

The conduct slump is always very noticeable and this at times is the first indication that the friends and relatives have that there is anything wrong. The patient pays no attention to the restraint which society places upon him, he shows no tact, commits gross offenses, is slovenly and careless in appearance, and often discloses his most intimate affairs to perfect strangers. The blunting of repressions inculcated by the force of civilization is predominantly seen in the sexual sphere and is manifested by the telling of lewd stories, the seeking of doubtful companions, and shameless debauchery (13).

It is to be noted that nothing has been said about hallucinations and delusions. The former play an unimportant rôle in paretic neurosyphilis, a fact which is of diagnostic importance, and the latter are more often met with after the disease is fully developed and not during the initial stages.

The mental symptoms which in part, at least, occur in similar manner in other deteriorating psychoses are much less characteristic than the neurological signs mentioned. It is extremely hazardous to make a diagnosis of paretic neurosyphilis solely on the mental symptoms. One will do well to look upon all psychic signs as merely sufficient to arouse suspicion and allow them to be outweighed in the final decision by the result of physical examination.

It would seem that a disease which has such a clear-cut etiology with definite pathological changes and well-marked neurological signs as well as a fairly characteristic mental picture would be exceedingly easy to diagnose. The greatest difficulty, however, arises at the very beginning while the symptoms are still indefinite. We may here apply the rule that in the case of any mental affection without obvious cause commencing for the first time at middle life, especially in men, paretic neurosyphilis should always be thought of.

On board ship if we have such a patient the only thing to do is to transfer him immediately to a hospital for observation without waiting to establish a diagnosis. If we see him in private life or in the hospital the first step is to determine whether or not the individual is syphilitic and if he still bears traces of the disease. A careful history is important. Bear in mind, however, that the

patient can not be absolutely relied upon to give an accurate account of his past life. As a matter of fact, the paretic neurosyphilitic frequently denies the presence of early syphilitic infection. It is necessary, therefore, in all cases to obtain a serological examination of the blood. This should be a matter of routine in all nervous and mental cases. A fact worth noting here is that the alcohols interfere with the reaction and hence the results of a Wassermann are apt to be unreliable if the patient has taken anything to drink within 48 hours of the time of making the test.

If the Wassermann in the blood is positive we know then that the patient has come in contact in some manner with syphilis, either through heredity or by infection. We do not know definitely that the disease from which he is suffering is due to syphilis. If the blood is negative it is differentially diagnostic against paretic neurosyphilis.

The next step in the diagnosis, whether the blood is negative or positive, is to perform a lumbar puncture. This is usually so well borne by paretic neurosyphilitics that this circumstance in itself may be of weight in the diagnosis. This procedure should also be routine with all patients suffering from nervous or mental disorders. This can not be emphasized too strongly. If we find an increased pressure, a positive globulin reaction, and pleocytosis, either alone or in combination, we know that we are dealing with a pathological fluid. These three symptoms indicate the existence of an organic nervous disorder either syphilitic or nonsyphilitic. If it is syphilitic then the Wassermann test of the fluid will show it. If the Wassermann reaction using the original method and 0.2 c. c. of the fluid is positive and if the higher dilutions are also positive there is a great probability that the patient has paretic neurosyphilis. If, in addition, the Lange gold solution test shows a strong curve in the paretic zone, and if plasma cells are found, the diagnosis is absolutely clinched.

We need go no further than this. It is wise, however, to make a careful neurological and mental examination to corroborate the laboratory findings, bearing in mind that cases have been reported with a positive laboratory picture with no clinical symptoms. Then, too, the laboratory findings are sometimes atypical. In these cases the presence of pupillary rigidity, speech defect, incoordination, ataxia, tremors, and alteration in reflexes, combined with loss of memory for recent events, defective judgment, early fatigue, irritability, and shifting emotions, indicate that we are dealing with paretic neurosyphilis.

We have already stated that the laboratory findings in paretic neurosyphilis, particularly the Wassermann reaction and pleocytosis, often antedate the development of the neurological signs. Just how

soon after infection by syphilis this takes place has not been determined. Along this line Cornaz has made an interesting study of the cerebrospinal fluid in different stages of syphilis (16). He found, in 35 per cent of his cases of hard chancre, a pleocytosis and a positive Wassermann in 1.6 per cent at a time when the cutaneous or mucous manifestations were still totally absent or at least could not be demonstrated by the means of investigation. In the exanthematous stage 14 per cent of the fluids gave a complement fixation and 40 per cent showed a pleocytosis. An increased cell count was found in 32 per cent and a positive Wassermann in 4 per cent of the fluids in the cases which exhibited only mucous placques without skin lesions of any kind. In 30 patients who presented large condylomata with neither a rash nor mucous placques the Wassermann was positive in 13 per cent and a pleocytosis was present in 27 per cent of the fluids. With latent lues and the cases showing tertiary lesions the figures are somewhat similar, the Wassermann being positive in about 5 per cent and the cells increased in approximately 35 per cent of the fluids.

These findings are very instructive. Apparently it is the pleocytosis which at first betrays the modifications in the fluids when the generalization of the infection has not yet been demonstrated by the Wassermann reaction. We know that with active therapy the number of cells found are apt to decrease. This raises the question as to whether or not those patients who retain their pleocytosis are on the way to paretic neurosyphilis. At present there is no definite answer because the necessary time for determining the full significance of the results of cytological study of the fluid has not elapsed.

If it is possible then to detect these changes in the fluid before the onset of the definite symptoms of the after coming disorder, as a matter of routine, every man in the Navy who has had syphilis should be given a spinal puncture and an examination made of his fluid at least once a year and preferably every six months throughout his entire career in the service. This applies particularly to officers since they are the ones who occupy the responsible positions of command and can therefore do more damage. In this way we can prevent some of the terrible consequences pictured above, and by making an early diagnosis and instituting the proper treatment we can prolong the life of the patient.

We shall not concern ourselves with the differential diagnosis of paretic neurosyphilis. Several diseases are apt to be confused with it, namely, neurasthenia, manic depressive psychosis, dementia praecox, chronic alcoholism, the arteriosclerotic psychoses, and others. The confusion is due, however, simply to a failure to apply approved diagnostic methods. Laboratory tests have naturally sup-

planted the older purely clinical methods of differential diagnosis. It is superfluous and a waste of time to construct tables of differential signs when we have definite findings in the spinal fluid to rely upon which can not be questioned.

The only diseases which need be considered in this respect are the other forms of neurosyphilis, principally tabes and diffuse nonparetic neurosyphilis or cerebrospinal syphilis. An attempt has been made to differentiate them by the cytological study of the spinal fluid. We have seen that the Wassermann reaction in the fluid in paretic neurosyphilis is almost uniformly positive even when small quantities are used. In tabes and cerebrospinal syphilis it is usually negative in the smaller but positive in the greater dilutions. While this may be a useful differential at times, it is not absolutely reliable, because the intensity of the serological reactions depend more upon the localization and intensity of the process than upon the kind. The same thing is true of the pleocytosis which is found in all three conditions. It has been said that a lower number of cells pointed to cerebrospinal syphilis, the higher number to tabes, and the highest to paretic neurosyphilis. This may be true in some instances but it is not an absolute rule. The number of cells seem to bear a more definite relation to the activity of the underlying inflammation than to its kind. Thus a stationary tabes may show few cells, also a paretic neurosyphilis in remission, whereas an acute cerebrospinal syphilis may show many cells. In tabes the Lange colloidal gold solution test gives a characteristic curve, 3332100000, which is also true in cerebrospinal syphilis, 1233210000, whereas in paretic neurosyphilis the curve is more apt to be 5555432100. Clinically we have in tabes (17) the severe lancinating pains, the crises, the ataxia, the typical gait, loss of reflexes, cranial nerve involvement, occular palsies, bladder disturbances, and trophic changes to help out. The symptoms of cerebrospinal syphilis are manifested by headache, dizziness, insomnia, abnormal sleepiness, and localized neurological signs.

We have already emphasized the importance of early diagnosis. As medical officers of the Navy, the possibilities which we have in this respect are unlimited, and we are peculiarly in a position to accomplish some very definite and brilliant results. We know exactly who the syphilitics are in the service. On the yellow sheets which are attached to the health records there is accurate data as to the date of onset, the location of the primary lesion, the date and place of exposure, the character of the secondaries, the results of the blood tests, and the amount of treatment received. In addition the men are subject and amenable to discipline and we have them under control. We are much better fortified in this respect

than our civilian brethren. Then, too, we live with the men aboard the ships and at the naval stations, we come into close contact with them, and we see them at work and at play every day. We should be able, therefore, to detect the development of anything that smacks of the abnormal in their reaction, almost in the very beginning.

With these advantages at our disposal, especially if they are combined with periodic and systematic examinations of the spinal fluid of all syphilitics, there is absolutely no reason why we should not always make a diagnosis of paretic neurosyphilis in its initial stages. Yet time and time again during the period of my service at St. Elizabeths Hospital and at the psychopathic ward of the naval hospital, Washington, D. C., and later at New York, cases were continually being admitted in the final stages, the diagnosis having been made only a short time previous. The prophylaxis and the prevention of the disease under discussion depends upon a determination of the additional factors which are necessary for its development, and its ultimate cure rests upon an early diagnosis, with the institution of proper treatment. If we will but take these things into consideration and study our cases thoroughly along the lines suggested in this article, we will undoubtedly find ourselves in a position at some future date to make valuable contributions to scientific medicine.

SUMMARY

1. The term paretic neurosyphilis is the one of choice with which to designate the disease.

2. Paretic neurosyphilis is a late appearing manifestation of syphilitic infection.

3. Syphilis is the primary and essential cause of paretic neurosyphilis, but certain predisposing causes the nature of which has not been definitely determined are necessary for its full development.

4. From a military standpoint paretic neurosyphilis is one of the most important diseases with which we have to deal on account of its frequency, the invaliding which it causes, and the medicolegal questions concerning line of duty and compensation which it gives rise to.

5. Patients suffering with paretic neurosyphilis should be given "in line of duty" if their disability has been aggravated in any way by service conditions.

6. The characteristic features of the pathology of paretic neurosyphilis are inflammatory processes in the membranes, perivascular exudate of lymphocytes and plasma cells, and degenerations and alterations in the cortical nerve cells, fibers, neuroglia, and blood vessels.

7. The diagnosis of paretic neurosyphilis in its earliest stages is one of the most important problems in medicine to-day not only in civilian life but especially in the military services.

8. The blood Wassermann is nearly always positive in paretic neurosyphilis.

9. Paretic neurosphylis is associated with six positive tests in the spinal fluid, namely, Wassermann reaction, pleocytosis, globulin reaction, albumin content, Lange colloidal gold solution test, and increased pressure.

10. The most characteristic neurological signs from the standpoint of early diagnosis are pupillary changes, speech defect, ataxia, tremors, incoordination, and alteration of the reflexes.

11. The mental disturbances of diagnostic value include memory defects, poor judgment, early irritability, quick shifting emotions, character change, and lack of insight.

12. In the case of any mental affection without obvious cause, commencing for the first time at middle life, especially in men, paretic neurosyphilis should always be thought of.

13. The laboratory findings in paretic neurosyphilis, particularly the Wassermann reaction and pleocytosis, often antedate the development of the neurological signs.

14. Every man in the Navy who has had syphilis should be given a spinal puncture and an examination made of his fluid at least once a year and preferably every six months throughout his entire service career.

15. The confusion of paretic neurosyphilis with other diseases is due to a failure to apply approved methods of diagnosis.

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IODIN PROPHYLAXIS OF GOITER

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The term goiter as ordinarily used refers to a visible or demonstrable swelling or increase in size of the thyroid gland. It also usually infers some secretory abnormality or derangement.

Goiter is known in all lands and climates, very few cases occurring in one area while in certain districts of the world the incidence of thyroid enlargement, both in man and animal, has been so high and continuous for generations that it has come to be considered characteristic of or endemic in those districts.

The study of the history of the disease says Kimball (2) is like studying the history of the human race. The Arthorva Veda, an ancient Hindu collection of incantations dating from 2000 B. C. contains extensive forms of exorcism for goiter. Cæsar in his writing of the Gauls mentions the frequent occurrence of big necks as one of their peculiar characteristics. The word cretin owes its origin to the contempt of the Roman for the early Christians, for they called their myxedematous idiots Christians or cretins. The Swiss physician, Paracelsus, in 1493 was the first to emphasize the relationship between goiter and cretinism and the earliest positive information concerning the latter disease dates from this author.

About the middle of the last century the governments of European countries began to see the economic and sociologic importance of this problem. In 1864 the French Government appointed a commission to study the cause of endemic goiter and if possible find some method of relief. They reported that at least a half million people in France were suffering from goiter and that there were over 120,000 cretins and cretinoid idiots among them. This commission believed and attempted to establish as a scientific fact the popular idea that goiter is a waterborne disease. Sardinia, Switzerland, and Italy have appointed similar commissions. In recent years much work in goiter prophylaxis has been done in the United States.

The fact that goiter is almost universal is seldom appreciated. Few countries are free from localities where the incidence of goiter is so extremely high that they have been known as endemic goiter districts for years. The best known are (2):

1. The Alpine region of Switzerland and northern France, northern Italy, and the Balkan States.

2. The Himalayan section of southern Asia, the Gilget district of northern India, and the plateaus of western China and eastern Mongolia.

3. Andes region of South America, especially Peru.

4. The basin of the Great Lakes of North America, the basin of the St. Lawrence River, and the Pacific Northwest of the United States and Canada. There are some glacial valleys in southern Alaska and some districts in British Columbia and Alberta where goiter is so universal among domestic animals that it has been very difficult to breed and raise young animals. The addition of a small amount of iodin (begun in 1918) to the food and drink has completely controlled the disease.

FIG. 1.—The iodin in drinking water in the United States: In the black area, waters contain from 1 to 22 parts of iodin per hundred billion parts of water; in the white area, from 23 to 18,470 parts. Some old analyses have shown even higher values in mineral springs in the southern half of California

The accompanying figures are from an article on "The inverse relation between iodin in food and drink and goiter." by J. F. McClendon and Joseph C. Hathaway, which appeared in the Journal of the American Medical Association, volume 82, No. 21, May 24, 1924, page 1668. The remarkable accuracy with which the areas low in iodin correspond with those high in simple and also exophthalmic goiter will be noted.

To appreciate the principle of goiter prevention let us briefly review the biochemistry and function of the thyroid gland. As shown by Kendall (3), iodin exists in the thyroid in an active and inactive form. The elaboration of the physiologically active hormone goes on slowly from inactive iodin collected from the blood.

The excess of physiologically active iodin is for the most part stored in the colloid or globulin of the acini and it is believed that

the colloid acts merely as the vehicle or means of storing the excess of this remarkably active substance in a harmless manner. The percentage of iodin to the weight of dried gland varies greatly in any series of animals but there seems to be a constant minimum percentage necessary for normal structure and function of the thyroid. Thus in all species of animals with the ductless thyroid the iodin store is decreased in thyroid hyperplasias or conversely the gland shows hyperplasia in proportion to the decrease in iodin storage when that reserve gets below a certain minimum amount.

FIG. 2.—Simple goiter in the United States, from data of the Draft Board: In the white area there were from 0 to 5 military goiters per thousand drafted men; in the black area, from 5 to 111. The military goiter was defined as one too large to button a military collar around. In the region outlined below by the dotted line, and marked "Permian Salt Deposits," an arm of the sea was cut off from the Pacific Ocean by the upheaval of the Rocky Mountains during the geologic age known as the Permian period. Its evaporation left extensive salt beds, which have stratified owing to different solubilities of the salts, as shown by gypsum deposits, rock salt and deposits high in potash (in western Texas). In very dry regions, this material may reach the surface (perhaps secondarily), as shown by the potash lakes of western Texas. In moist regions, all the surface salts are washed away and the deposits are reached only in drilling deep wells. The iodin that was in the sea water is mixed up more or less with the other salts; some of it apparently reaches the food and drink of mankind to make this a low goiter region. It should be noted that the black and white areas correspond roughly to those of Figure 1, the most striking difference being that of New York State. If, however, we had included the waters of Lake Erie and Lake Ontario, which are high in iodin, and excluded the waters from mountain sources, in making Figure 1, the two areas would have corresponded

It has been shown that normal thyroids have the highest percentage of iodin averaging one-fifth of 1 per cent with one-half of 1 per cent as the extreme upper limit and one-tenth of 1 per cent as the lower limit. When the iodin store falls below one-tenth of 1 per cent the gland is no longer normal, for it has been shown that below that point active hypertrophic and hyperplastic changes begin to take place in the thyroid. The unit of the thyroid gland is an acinus lined with low columnar epithelium which rests upon a basement memberane and surrounds a colloid substance.

Scattered throughout the gland in the interstitial tissue are embryonic rests of cells known as the interstitial cells of Conheim (11). In a histologic sense the thyroid unit may depart in three definite ways: (1) By a hypertrophy of the acinar epithelium giving a parenchymatous cell type, (2) by an increase or diminution in colloid material giving a colloid type, and (3) by the development and expansion of new alveoli from embryonic tissue giving an adenomatous cell type. These anatomical and physiological changes are parallel by the clinical conditions of hyperthyroidism, hypothyroidism and dysthyroidism.

The amount of iodin stored in a thyroid may be rapidly and markedly increased by administration of iodin in any known form and by a variety of avenues, by enteral and parenteral administra-

FIG. 3.—Exopthalmic goiter in the United States, compiled from Draft Board statistics: In the white area, from 0 to 2.85 per thousand drafted men were reported as having exophthalmic goiter; in the black area, from 2.85 to 93. It should be noted that the black and white areas correspond roughly to those of Figures 1 and 2, except for the edges of contact; but owing to the fact that there is considerable migration of the population, this is to be expected

tion, by inhalation or cutaneous application. As a result of iodin administration marked changes take place in the hyperplastic gland; active hypertrophy stops and the thyroid cells and acini return to their normal resting form.

In 1915 Kendall (3) of the Mayo clinic succeeded in isolating the iodin containing hormone of the thyroid in crystalline form and determined its structural formula. He believes it to be triiodopropionic acid and calls it thyroxin.

Thyroxin possesses the physiologic activity of the gland itself and a normal metabolism may be maintained in thyroidectomized animals by injections of pure thyroxin. The colloid of the organ is not the source of thyroxin but is simply the storehouse for in-

ert iodin from which thyroxin is synthetized by the cells of the acinus. Rogoff and Marine found that while the storage of iodin in the thyroid from administration of potassium iodide is practically instantaneous, transformation into the specific hormone is much slower, only a fraction of the iodin taken up having been thus transformed in 30 hours. If another halogen replaces iodin in this salt (thyroxin) a stable chemical compound results but all physiological activity is lost. Iodin is the metabolic activator and regulator.

We are familiar with the effect which the thyroid exerts upon activity, oxidation, and metabolism in general. Congenital lack or absence of the thyroid results in retarded mental and physical development, cretinism, and sometimes in idocy. The normal individual is largely ruled by his thyroid and it plays a most important rôle in puberty and in regulating the growth and development of the fetus. Hypothyroidism in the mother results in a congenital goiter in the fetus.

There is an unusual demand for thyroid activity in any metabolic crisis. Puberty and pregnancy show it, as well as chronic disease such as tuberculosis or a febrile condition such as pneumonia, for goiters often develop with these conditions. Diphtheria antitoxin has been shown by Farrant (1) to contain iodin in organic combination, and he believes this indicates some close relationship between thyroid activity and the development of certain antitoxins. Stepanoff (1) believes that defense opsonins and tissue exudates are to a considerable extent the product of the thyroid gland. This is supported by the fact that thyroid feeding raises resistance and thyroidectomy lowers resistance.

The first practical application of iodin feeding in the prevention of goiter was the work of Marine and Lenhart (2) in the fish hatcheries of Pennsylvania. It was found that when iodin was added in small quantities to the water in which the young fish were developing their goiter disappeaed and they developed into more healthy, sturdy fishes. The first application of this principle in humans was carried out in 1916 to 1920 by Kimball (12) in the schools of Akron, Ohio. The thyroid of every girl from the fifth to the twelfth grade was examined.

At the first examination 56 per cent of these girls were found to have thyroid enlargements of some degree. Five thousand girls voluntarily underwent the iodin prophylactic treatment, which was the administration of 0.2 gram sodium iodide for 10 successive school days each spring and fall, a total of 2 grams sodium iodide being given each girl each spring and fall. Not one who was normal at the beginning of the treatment developed a goiter although two girls who had been in extremely poor health before

treatment developed goiters. It was assumed that more iodin was necessary in these extreme cases. In over 60 per cent of cases in which an initial goiter was present the iodin treatment resulted in disappearance of the growth. Among the girls who elected not to undergo the treatment 27.6 per cent who had been normal, developed goiters and of those who had goiters when first examined and did not receive the iodin the enlargement disappeared in only a few cases (12.4 per cent).

The iodin treatment was instituted in St. Gaul, Switzerland, where in January, 1918, the incidence of goiter was 87.6 per cent. In January, 1922, after four years of iodin administration, the incidence had dropped to 13.1 per cent. As a result of this work the goiter commission of Switzerland has recommended that this treatment be instituted as a public-health measure.

Apparently if the thyroid is kept well saturated with iodin during the years of adolescence no goiter will develop, although this is the period most prolific of goiters in untreated cases. The normal storage capacity of the gland is small (averaging 0.005 gram). Therefore a small fraction of a grain weekly is sufficient to assure the full normal iodin content of the gland.

A great difficulty in the institution of the prophylactic treatment has been the disagreeable taste of sodium iodide. This has been overcome by giving a chocolate-coated pill containing 10 milligrams of iodin in organic combination, each patient receiving one tablet per week throughout the year. A mild rash was observed in one per thousand where sodium iodide was administered. Exophthalmic goiter has never been observed in anyone undergoing the treatment.

If every pregnant female and every adolescent youth living in endemic goitrous regions were given iodin the condition would be practically eradicated. Goiter is from two to six times more frequent in girls than in boys, and a large number of goiters in boys are congenital and could be prevented by the administration of iodin to the mother during pregnancy. Goiters in boys following chronic infections uniformly yield to prompt and proper treatment.

Iodin prophylaxis should be carried out as a public-health measure. Adolescent girls would be most easily reached through the schools. The prophylaxis among pregnant women depends upon the cooperation and education of the profession and public.

Although the iodin treatment was not at first generally recommended for other than endemic goiter or simple goiter, Plummer (4) has demonstrated that many of the most outstanding and characteristic symptoms of exophthalmic goiter disappear rapidly and with a high degree of regularity following the administration of iodin. Mason (10) reasoning from the fact that exophthalmos has

never been produced by injections of thyroxin and has never been observed in pure hyperthyroidism, classes Graves' disease as a dysthyroidism. He says: "The remarkable results obtained recently with Lugol's solution (iodin 5 per cent, potassium iodide 10 per cent) favor the contention that Graves' disease is an intoxication with an abnormally formed chemical complex, not thyroxin, possibly an imperfectly iodized thyroxin molecule. The introduction of iodin into the system tends to enable the thyroid gland to manufacture the thyroxin complex in a normal manner * * *. Our experience indicates that through its (Lugol's solution) use in true cases of exophthalmic goiter the pulse rate and basal metabolism may be lowered to normal in a few days and that this improved state can be maintained with small doses. With its early discontinuance the clinical state returns with its former severity. Exophthalmos itself disappears very slowly, but there is a tendency for the eyeball to recede with the decreasing pulse. Whether or not cases can be completely cured, protracted records will tell, as a means of preparing a case for primary thyroidectomy the value of Lugol's solution has been definitely established. The day of ligation is over."

The above results were obtained by the use of 15 minims of Lugol's solution daily, continuing with 15 minims daily when pulse and basal metabolism had fallen to normal.

The use of iodized salt for prophylaxis and occasionally for therapy is advocated by Hirschfelder (13). He gives specific directions for preparing the iodized salt as follows: 50 c. c. of a 10 per cent potassium iodide solution in 60 per cent alcohol is sprinkled or sprayed over on a pound of ordinary salt. The resulting mixture is thoroughly evaporated, stirred, and sifted, forming the stock 1 per cent iodized salt. To prepare the salt for consumption, 5 pounds of ordinary salt are spread in a thin layer and 5 teaspoonfuls of the stock preparation are sprinkled evenly over this salt from a shaker. This mixture may be used for all household uses. It contains approximately 10 milligrams per 100 grams of salt. For table use Herschfelder recommends the addition of 2 tablespoonfuls of the stock mixture to 1 pound of ordinary salt, a mixture containing about 40 milligrams per 100 grams of salt.

Another ingenious method of supplying the iodin necessary to prevent endemic goiter is that recently inaugurated in Rochester, N. Y. (13). In that city it is planned to iodize the entire supply of drinking water twice each year for two weeks. The water bureau has already started this treatment of the water. Sufficient sodium iodide is added to raise the content to 20 parts of iodin per billion of water. It is estimated that the intake of one one-hundred-and-fiftieth grain of iodin per day will prevent endemic goiter. This is the

amount contained in 2 quarts of water. Thus the success of the measure depends upon the consumption of at least 2 quarts of water daily. This is manifestly difficult to control from a public health point of view.

Olesen (13) of the Public Health Service summarizes the methods of administration as follows: "The most favored method of administration at the present time is a chocolate-coated tablet containing 10 milligrams of iodin in the form of an organic acid. One or two tablets according to the age and requirements should be given each week during the school year to both boys and girls of from 11 to 16 years. The preventive should be used in both normal and abnormal children but with medical supervision in the abnormal cases. The use of iodized table salt holds forth considerable promise as an efficient means of preventing endemic goiter, in a wholesale manner. However, the difficulties of gauging accurately the dosage and excluding from treatment the hypersusceptible are manifest from handicaps to its uncontrolled application.

"The wholesale iodization of a municipal water supply (as was carried out in Rochester, N. Y.) may be cited as an ingenious method in need of further appraisal before a definite verdict as to its efficiency can be given.

"According to the best information available there is little if any danger in iodin prophylaxis when it is carried out intelligently. Moreover, the rationale of the procedure is sufficiently sound and the results are sufficiently marked to make its extensive application both justifiable and advisable" (13).

SUMMARY

1. The incidence of goiter in certain areas has been so high for generations that these districts have become known as endemic goitrous areas. These endemic areas correspond with remarkable accuracy to the areas with a low iodin content in soil and water.

2. The thyroid hormone, thyroxin, is triiodopropionic acid and contains 65 per cent iodin. Iodin may be replaced by another halogen in this formula, a stable compound resulting, but without any physiologic activity. Thyroxin isolated in crystalline form possesses the physiologic activity of the thyroid gland itself.

3. The prophylactic administration of iodin in various forms has proven the value of iodin in the prevention and cure of simple and endemic goiters and goiters of adolesence and pregnancy.

4. The use of iodin in the form of Lugol's solution has established its value in the treatment of exophthalmic goiter. It has strengthened the belief that Graves' disease is a dysthyroidism in which an abnormally formed or partially iodized molecule of thyroxin produces the characteristic chain of symptoms.

5. Iodin prophylaxis of goiter should be carried out as a public-health measure in endemic districts.

6. Methods of administration recommended are:

(*a*) Sodium iodide in small doses for 10 days each spring and fall.

(*b*) Iodized table salt.

(*c*) The treatment of a public water supply with sodium iodide.

(*d*) The administration of an organic iodide in a chocolate-coated pill each week throughout the year.

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THE COMMON RENAL TUMOR

(With a case report of metastasis to the central nervous system)[1]

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Ever since 1883, when Gravitz published his paper upon "Strumae Suprarenales Aberattae Renalis," a very lively discussion has ensued

[1] From the neuropathological laboratory and neurologic wards of the Philadelphia General Hospital.

regarding the genesis of certain renal tumors, particularly those coming under the general classification of hypernephroma. In that paper Gravitz set forth a temporary hypothesis to explain the origin of the majority of renal tumors. His assumption was that they arose from adrenal rests located in the kidney. Gravitz was not alone in this viewpoint; it was indorsed by many competent observers at that time. The first serious objection to this view was offered 10 years later by Sudeck, since which time it has become more and more evident that the scope of Gravitzian tumors was too extensive.

Hypernephroma, a term used to indicate the adrenal origin of these tumors, was introduced by Birch-Hirschfeld in 1892. That adrenal rests, which at that time were considered to be the precursors of a wide list of renal tumors, do occur is a well-established fact. It will be recalled that the interrenal masses, from which is formed the cortex of the adrenal glands, begin to make their appearance, in human embryos, about the beginning of the fourth week, and that not until during the fourth month do the chromaffin cells from the sympathetic system invade their substance to form the medulla, an organic differentiation which is often incompletely effected until after birth. Fragments are with questionable frequency separated from these interrenal masses and subsequently develop into what are commonly referred to as accessory adrenals. In his recent book upon "Surgical Pathology," McFarland has preferred to designate these as supernumerary interrenal bodies because they are composed of only a cortical portion of the adrenal glands.

How often adrenal rests occur in the kidney is a debatable question. They have been reported by Ivar Broman in a great many different organs and tissues. It has been estimated by Schmorl that they can be found in 92 per cent of autopsies. In a contribution to the Annals of Surgery in 1913, under a discussion of adrenal rests in the kidney, Wilson stated: "These are freely described by many authors, but are certainly much rarer than is commonly supposed. They are small, usually whitish, masses imbedded within the cortex and usually encapsulated. Careful microscopic examination of such masses will show that most of them are of Wolfian origin."

In the Annals of Surgery in 1912 Wilson offered the query: "Why should adrenal rests, though comparatively rare in the kidney, produce hypernephroma, the commonest renal tumor, while adrenal rests in other localities, though comparatively common, so rarely produce tumors, either benign or malignant?" Wilson has expressed his belief that these tumors arise from nephrogenic tissue which has remained isolated from the surrounding adult renal cortex. Some opponents of the Gravitz theory have gone so far as to doubt the origin of any renal tumor from adrenal rests. In addition to embryology and comparative pathology, the discussion has

involved varying phases of chemistry by workers endeavoring to demonstrate in the tumors the specific products of adrenals; but when it is appreciated that the structure of these rests is cortical, the failure of chemical reactions to reveal the presence of adrenalin in tumors of such origin is naturally to be expected. In his excellent book upon "Neoplastic Diseases," Prof. James Ewing states: "On these questions it may be said that the presence of adrenal rests is fully attested, although they are probably less frequent than many have supposed. It also appears that certain tumors arise from these rests, although clear descriptions of their structure have not been fully given. Finally, recent studies have demonstrated a large proportion of reported hypernephromas are renal adenocarcinomas." It is evident to contemporary pathologists that Gravitz tumors should be restricted to a relatively small group of tumors in which the structure is exactly duplicated by tumors of the adrenal gland itself.

Although so often reported in the literature as hypernephroma that statistical data regarding it are unreliable, a papillary adenocarcinoma of the kidney with clear cells is now considered the common renal tumor, in many instances having developed from a renal adenoma. It often begins in the cortex or medulla of the kindey as a small nodule, which later may increase to the size of a fist or larger, consisting of cysts filled with blood or gelatinous material, distending the overlying renal capsule. By fusion of necrotic and hemorrhagic areas large cystic cavities may result. The tumor is usually not encapsulated. On section there are found, histologically, papillary structures lined by clear fatty epithelium, and tubules reproducing features of hypertrophied renal tubules; because of great vascularity, extravasated blood is often found in the lumina. The pronounced papillary character, the presence of distinct lumina, and the occasional areas of characteristic renal epithelium free from fat should permit the recognition of this tumor, pathologically.

Case report.—J. M., negress, aged 60 years, was admitted to the neurological wards of the Philadelphia General Hospital, December 14, 1923, in the service of Doctor Weisenberg to whom I am indebted for permission to use this case. The patient was admitted because of cardiac decompensation, and a spastic paralysis of both legs of four days' duration. Examination showed just above the nipple line a definite level below which was a loss of all forms of sensation; a palpable tumor in the left kidney region, and microscopic blood in the urine; loss of sphincter control; and cardiac dilatation. The patient died from acute dilatation of the heart December 20, 1923.

The autopsy findings showed the left kidney largely occupied by a highly vascular tumor consisting of hemorrhagic and yellowish

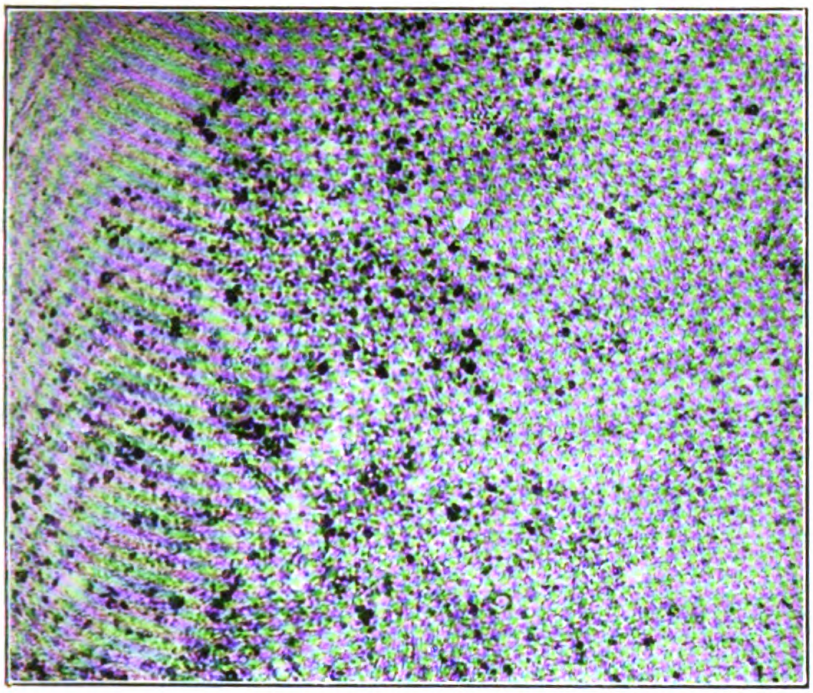


Fig. 1.—Spinal cord, region of posterior columns, showing degeneration as demonstrated with osmic acid stain

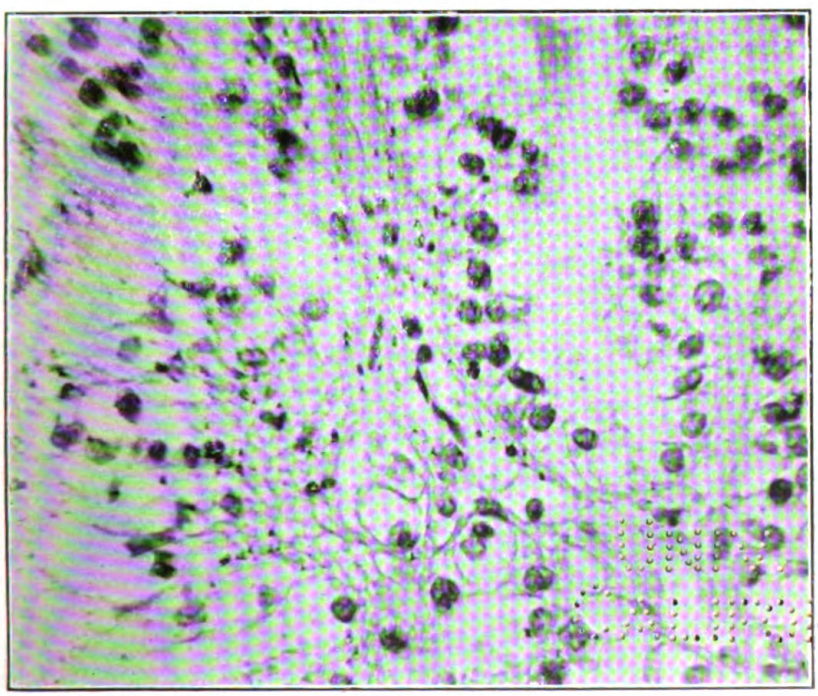


Fig. 2.—Renal tumor showing luminal clear fatty epithelium and papillary characteristics

158—1

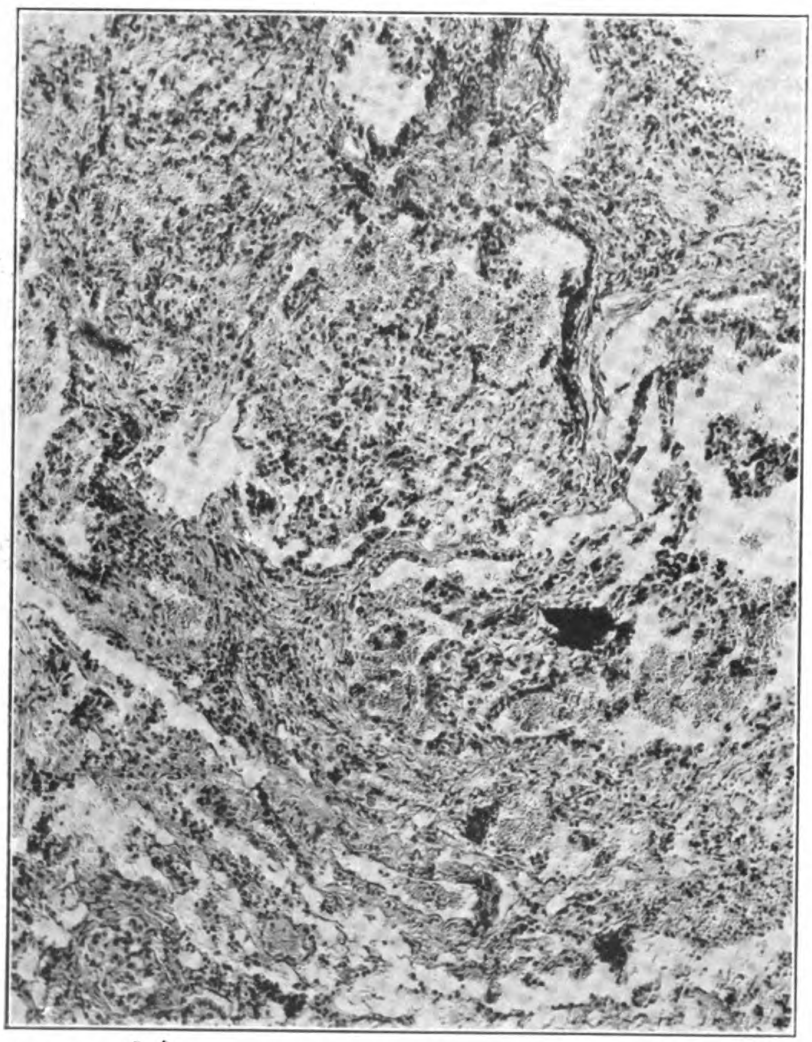
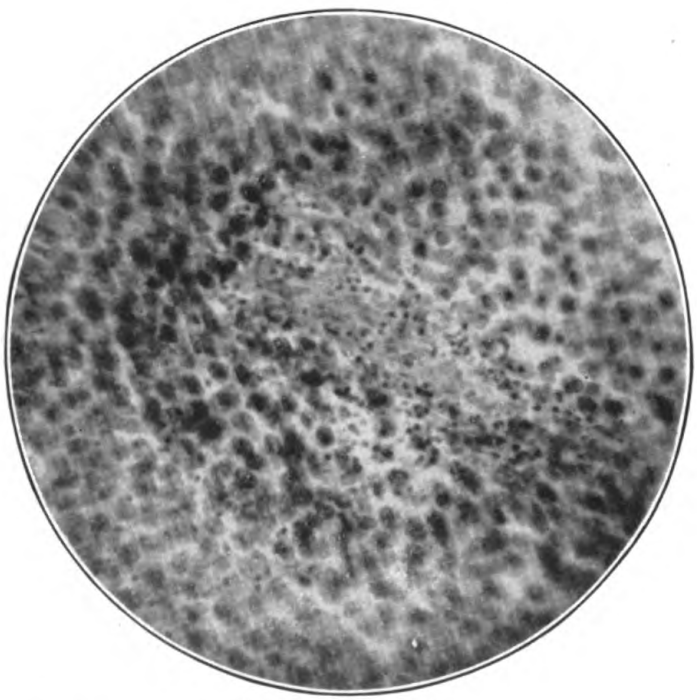


Fig. 3.—Extradural metastasis, low power

Epithelioma, squamous type

158—3



158—4 Teratoma of testicle

areas, and opposite the third and fourth thoracic segments of the spinal cord a brownish soft and friable mass measuring 4 cm. long, 2.5 cm. wide, 1 cm. deep, "pasted onto" the outer surface of the dura and apparently arising from the bodies of the first and second thoracic vertebrae which were necrotic and friable.

Microscopic examinations of the renal tumor and the extradural metastasis resulted in a division of diagnostic opinions. It was variously diagnosed as hypernephroma, perithelioma, and adenocarcinoma. Sections were examined by Prof. James Ewing, whose communication relative to the diagnosis was as follows: "I think your tumor is a papillary adenocarcinoma of the kidney with clear cells, the common tumor of the kidney. * * * In the renal section there is very little tumor tissue but this is rather characteristic. The metastatic tumor is very cellular and the structure is broken up, but this change still leaves many of the features of a primary renal carcinoma. * * * It is not a true hypernephroma, if by that term is meant an adrenal tumor, since there are no lumina in adrenal tumors." The sections showed a vascular neoplasm with papillary structures lined with clear fatty epithelium simulating hypertrophied renal tubules, lumina containing extravasated blood, and occasional areas of characteristic renal eipthelium free from fat. The sections from the renal tumor were largely taken up by hemorrhagic and necrotic areas, but in certain parts showed the definite findings enumerated above.

No changes in the spinal cord were apparent in either hematoxylin and eosin or Weigert preparations. Marchi stained sections (osmic acid) showed moderate ascending and descending degeneration above and below the lesion, respectively.

Comment.—A case with sudden onset of paralysis as the result of an extradural metastasis to the spinal cord from a papillary adenocarcinoma of the kidney with clear cells is reported.

In 13,300 necropsies of all kinds Schlesinger estimated that metastasis to the vertebrae from carcinoma occurred in 2.4 per cent.

In the Journal of Nervous and Mental Diseases, 1906, Spiller and Weiserberg concluded that carcinomatous metastasis occurred in the vertebrae, skull, brain, and, rarely, the cord itself, in their order of frequency.

The case is important because it shows that a sudden paralysis, which usually means a myelitis or vascular lesion, may be due to tumorous formation.

After death no changes may be seen in the cord either grossly or with the common laboratory stains, such as hematoxylin and eosin, Weigert, etc., but with finer stains as Alzheimer-Mann, lichtgrun, or with osmic acid (Marchi), the changes become apparent especially when death has occurred within three months.

Conclusions.—(1) Sudden onset of paralysis can occur as the result of metastatic tumor formation.

(2) The primary growth may be relatively unsymptomatic.

(3) The pathology in the spinal cord will vary with the duration of the pressure.

(4) If a degenerative lesion of the nervous system has lasted longer than three months the Weigert stain will bring out the pathology but if the period has been shorter than three months osmic acid (Marchi) technic should be used.

(5) Carcinomatous metastasis to the vertebrae is common, and symptoms referable to the central nervous system are then evoked by pressure of the metastatic neoplasm upon the spinal cord.

(6) Hypernephroma should be diagnosed by exclusion.

In closing I wish to express appreciation for laboratory facilities placed at my disposal by Dr. N. W. Winkleman, neuropathologist at the Philadelphia General Hospital, and for his instructive cooperation. For advice in pathological diagnosis I am particularly indebted to Prof. James Ewing, whose authoritative work upon "Neoplastic Diseases" is recognized throughout the world.

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MALIGNANT NEW GROWTHS—A YEAR'S REVIEW

By L. H. Williams, Lieutenant, Medical Corps, United States Navy

When one attempts to review the malignant new growths of the patients through a year in a hospital, such as the naval hospital, New York, where both veterans and active naval personnel are cared for, he encounters a series of human tragedies not equaled save in battle or an epidemic.

During the year from July 1, 1923, to July 1, 1924, 17 patients were admitted with a diagnosis of malignant growth, or were found to be so affected.

The original sites were: Stomach, 4 cases; intestines, 4 cases, 1 colon, 1 cecum (lympho-sarcoma), 2 rectum; testis, 2 cases; face, 4 cases, 1 mouth, 1 lip, 1 ear, 1 submaxillary gland; generalized sar-

coma, 3 cases. (General metastases were present in all sarcoma cases.)

Three of the four stomach cases were fatal. Two were operated upon in other hospitals for ulcer of the stomach, one three years and four months before admission, the other only four months previous to admission. A posterior gastroenterostomy was performed on each. Though the ulcer was noted as of large size, no attempt was made to excise it, in either case. The patient operated upon four months prior to admission was found to have metastatic masses in abdomen and X-ray-bismuth-meal disclosed cancer. He was discharged to his home at his own request as inoperable. The two patients operated upon here presented striking contrasts in behavior. One patient, W. J. C., age 50, a veteran, was admitted suffering from dehydration, as a result of pyloric obstruction. He complained only of vomiting after meals. Vomiting after meals began in 1918, but became regular during the past year. He was operated upon some 12 days after admission when X-ray-bismuth-meal showed complete obstruction of pylorus. A well-defined tumor was palpable just inside of pyloric ring, but it was thought his condition was too bad to stand a partial gastrectomy. A posterior gastroenterostomy was done. The patient was too weak to survive the operation and died next day. The growth proved to be a typical adenocarcinoma, obstructing pyloric opening, with no visible or demonstrable metastases. Could this patient have been operated upon sooner, and a partial gastrectomy performed before he became so dehydrated, he would have had a good chance of several years of life.

The history of the second patient is in striking contrast. He stated that he began to vomit some two weeks previous to admission and that he had noticed his stools were tar-colored. There was no pain complained of. He was extremely anemic. There was a vague history of gastric distress some four years ago. He continued to have hematemesis and melena while in hospital. Exploratory laborotomy, 23 days after admission, disclosed a large cancer on posterior wall of pyloric end of stomach, with metastatic lymph nodes in lesser omentum and gastrohepatic omentum. Anterior gastroenterostomy was done. The patient survived operation 13 days. He lived only about six weeks after onset of hematemesis.

The malignant new growths of the intestine present a much happier picture in that two of the four, the rectal cases, are alive and apperently in good health. Both were operated upon in other hospitals. One received a Kraske and, aside from partial incontinence of feces, is free from symptoms or metastases after five years. The other underwent a colostomy as growth was considered inoperable. He was given radium emanations and X-ray exposure. He

gave a history of obstruction of rectosigmoid which began about five years ago. This obstruction was first realized as constipation, relieved by enema and cathartics. The colostomy was made August, 1923. He is now in apparently excellent health save for colostomy and the tumor at recto-sigmoid junction. A note in his record by the chief of the surgical service, of May, 1924, is of interest: "Clinical picture to date can not be reconciled to that of carcinoma of the rectum. It may be, however, that this is one of the rare cases in which radiation has brought about an apparent cure. A diagnosis was made by 'biopsy' at St. Lukes Hospital, New York, August 2, 1923. It should be allowed to stand in the record as a case of carcinoma of rectum."

Patients with rectal cancer are notoriously long-lived, for malignancy of the gastrointestinal tract, once a colostomy is done and the rectum put at rest, whether they receive radium and X ray or not. The relative comfort of the Kraske and colostomy openings are beautifully illustrated in these two men. The melancholia of the man with the Kraske in spite of a five-year freedom from recurrence, was in marked contrast to the cheerfulness of the patient with the colostomy. The first was continually battling, and unsuccessfully, with partial incontinence of feces, while the second manages his colostomy both easily and cleanly and has fair sphincter control.

The two teratomas of the testes are good examples of their kind and present interesting subjects for comparison and speculation in methods of treatment. The first patient, C. G. B., a veteran, age 50, was admitted with diagnosis of carcinoma of stomach. His condition proved to be the result of a metastatic cancer of the retroperitoneal and mesenteric lymph glands from a teratoma of the right testis. This testicle was removed for a swelling in March, 1923. He received no radium or X ray. Enlarged inguinal glands were removed November, 1923, from the same side as the affected testicle. He died May, 1924, some 14 months after removal of testicle.

The second case was admitted about the same time. He complained of a swollen right testicle. Testicle was found swollen and hard, not painful, nor did he complain of pain. The swelling had been increasing for about a year. The condition was considered malignant after exhaustive tests, and removal recommended. The swollen right testicle was removed May 4, 1924. He was discharged to Veteran's Bureau, wound healed, with recommendation that he be hospitalized for necessary radium and X-ray treatment. The radical operation in which the inguinal glands and the glands along the iliac and great abdominal vessels are removed was not done, as

the inguinal glands were not found enlarged. The microscopic diagnosis of sections from the testes and enlarged metastatic lymph nodes was teratoma.

The cancers of the face admitted for treatment were all different in locality and kind. Two were found not to be cancer. They were due to syphilis. One case proved syphilitic had been carried under the diagnosis of "epidermoid carcinoma" and given a treatment of radium emanation. He was hospitalized here for a second radium treatment when investigation disclosed the true nature of the disease—gumma of the soft palate and nose. He was greatly improved under antiluetic treatment, the inroads of the process stopped, and the patient much improved in general health. The submaxillary gland case proved to be syphilitic and responded splendidly to antiluetic treatment.

The patient shown in the illustration had a four plus Wassermann which was reduced to two plus after two complete courses of antiluetic treatment without any check on the disease. The extent of the growth is shown some eight years after its commencement as an ulcer on the lower lip. This is considered true epithelioma, squamous type. Two courses of radium and X-ray exposure have been without appreciable benefit. The first was given six years after onset and the second a year later.

Sarcoma has proved more insidious than cancer. Of the three cases cared for during the year all were of the generalized type when first seen. One of the patients died in the hospital with generalized metastases. The history definitely pointed to a pigmented mole on back as the primary growth. This mole was excised and the patient given a thorough course of radium and X ray. It was not sufficient to stop metastases but evidently greatly slowed up their growth. Sarcomatous tumors appear to fairly melt away under thorough X-ray and radium exposure. This disappearance is misleading; it is only a strategic retreat that it may attack elsewhere, months later, and eventually kill.

Discussion.—1. MacCarty's rule that all gastric ulcers of 2.5 centimeters or more are cancerous is an excellent working rule and can well be followed in practice. Not to do so invites the fate of the two cancer of the stomach cases, who died of metastases after gastroenterostomy.

2. The two patients with cancer of the stomach operated upon here were both too far advanced to survive operation. The first case could in all probability have been saved by a gastrectomy and repair, after the manner of Polya or Billroth, could he have been operated upon earlier.

3. Cancer of the rectum is the most favorable from the standpoint of removal and relief of pain of the malignant tumors of the large

bowel. Inoperable malignant rectal growths do not kill for two or three years, frequently if a colostomy only is done. Crile does not recommend preliminary radium exposure. He does urge colostomy as the first stage in the operation for removal of the growth and reports a mortality of about 12 per cent as a result. Lymphosarcoma is prone to attack in the adolescent period as well as in childhood. The intestinal type, owing to the nature of the growth, early metastases to lymph nodes, tendency to intestinal obstruction, etc., causes several diagnoses as a rule to be made before laparotomy discloses the true state of affairs.

4. Teratoma of the testes is frequently fatal in spite of surgery and radium. It forms metastases rather rapidly and finds a fertile field in the lymph glands of the iliacs and great vessels.

5. The diagnosis of cancer is in great part elimination of benign tumors of various origins. W. S. Bainbridge points out how the term cancer included all tumors for hundreds of years and that gradually leprosy, tuberculosis, syphilis, actinomycosis, etc., were ruled out as malignant new growth per se. The two cases considered malignant, but proved to be syphilitic and the process stopped by antiluetic treatment show this elimination must still be carried on even in this age of numerous mechanical and chemical aids.

6. Sarcoma still leaves us rather dazed and hopeless for ultimate cure. X rays and radium apparently do wonders, the growths under the skin melt away like snow in the sun, when suddenly the patient is again stricken in another part of his body. Surgery is of little or no value. Two patients are now hospitalized here and their lives prolonged in this manner.

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CLINICAL NOTES

SEVEN NEPHRECTOMIES

By G. F. Cottle, Lieutenant Commander, and J. A. Topper, Lieutenant, Medical Corps, United States Navy

In no field of surgery has the need for definite anteoperative information been found more valuable than in the field of urology. Surgical diseases of the kidney may be suggested by the usual history and examination, but the surgeon's right to interfere with the kidney is seldom clear until the urologist brings to bear upon the case the information obtainable by means of cystoscopy, ureteral catheterization, the pyelogram and determinations of kidney function. Information as to the sound kidney is of as great, if not greater, importance than information as to the condition and probable pathology of the diseased kidney. The seven cases reported herewith well illustrate the dependence of the surgeon upon the urologist for success in kidney surgery. The cases are reported as a tribute to the wisdom of the Bureau of Medicine and Surgery in training medical officers in this field of diagnosis.

Case I.—Hydronephrosis: W. E. E., 27 years of age, a beneficiary of the United States Veterans' Bureau, was admitted October 9, 1923, to the United States naval hospital, Brooklyn, N. Y.; diagnosis undetermined. Family and past history were negative except for appendectomy in 1914. For five years he had suffered from pain in the right iliac fossa and right lumbar region and had been unable to work continuously as a chauffeur because of this. The pain varied from dull to sharp and had been practically continuous, unfitting him for work and necessitating several admissions to hospitals both in France during his period of Army service and in the United States since his discharge. Three weeks prior to admission he had been cystoscoped and a diagnosis of tuberculosis made. After the cystoscopy, the pain became more severe and sharp in character, radiating from the right lumbar region to the umbilicus. There were no urinary symptoms. He denied venereal disease. Examination showed a pale, fairly nourished young man, 140 pounds in weight, whose best weight had been 172 pounds in 1917. His face was that of a man who carried the burden of pain. The abdomen was markedly tender in the right lumbar region and in the right iliac fossa.

There was a scar, right rectus, of the appendix operation. Sputum and urinary sediment were negative for tubercle bacilli. The Von Pirquet was plus 1, Wassermann negative. There was moderate anemia. R. b. c. 3,995,000. Blood chemistry was normal. Urine was normal except for a few leucocytes. After a month of observation in the hospital, during which period the temperature and respiration remained normal, the guinea pig inoculated from the urinary sediment was killed and showed no signs of tuberculosis.

Urologist's examination: Right kidney palpable with a decided sense of resistance in that area. Pain over right kidney and in right costo-vertebral angle. Left kidney not palpable. Cystoscopy was done and catheters introduced to each kidney. Urea estimation: Left, 14 mg. per c. c.; right, 5 mg. per c. c. P. S. T., appearance time, left, 3½ minutes; right, 6½ minutes. Thirty-minute estimation, left 71 per cent; right, too small to estimate. The pyelogram shows hydronephrosis, right kidney. Exploration of the right kidney was recommended and on November 16, 1923, the dignosis was changed to hydronephrosis, right. On December 12, 1923, right nephrectomy done, from which convalescence was uneventful. The kidney was found to be twice normal in size. A hydronephrotic sac with a small amount of kidney substance, perhaps one-eighth the normal amount, was found. No cause for the condition was demonstrated.

Pathologist's report: Specimen is that of a kidney 12 by 6 by 5 centimeters, nodular, grayish-red in color. There is a tear in the cortical substance and capsule about 1 centimeter long near the upper pole. On section pelvis is dilated, compressing the cortical substance to a thickness of one-half centimeter, and contains a small amount of urine. Fibrosis of ureteral wall near the uretero-pelvic junction. Nine months' post operative the patient feels well, has no pain and is able to be at work.

Case II.—Infected hydronephrosis: R. R. R., F. 2c., United States Navy, 21 years of age, admitted August 5, 1923, as a stretcher case to the United States naval hospital, Brooklyn, N. Y., with a diagnosis of acute appendicitis. His pain and tenderness were in the upper right quadrant radiating to the right lumbar region. There was tenderness over the upper right rectus and definite but moderate rigidity. There was a history of two similar attacks one year ago. The present attack began four days before admission with nausea and vomiting, temperature was 99, pulse 68, respiration 20, W. B. C. 10,800, neutrophiles 79, lymphocytes 20, mast cells 1. There was a history of pain in the epigastrium on eating meat and a frequency of urination and occasional nycturia. Urine showed 15 leucocytes per field and was evenly cloudy with trace of albumin. Venereal

disease denied. He had been treated for lumbago. R. B. C. 3,950,000; hgb. 80 per cent; weight, 158 pounds. X-ray examination of chest was suspicious of old fibrotic changes in both lungs, but physical examination of chest was negative except for a slight irregularity in the cardiac rhythm. The diagnosis of acute appendicitis was not sustained by the findings. Duodenal drainage suggested that the gall bladder might be responsible for his symptoms. His youth and presence of pyuria, however, led to a delay in operative procedure directed at the upper abdomen until a complete urological examination could be undertaken. Due to certain personnel factors the complete urological examination was delayed for about a month and a half, during which time the temperature ranged from 99 to 100, and the diagnosis remained in doubt.

Urologist's examination: Neither kidney palpable. There is a feeling of resistance over right kidney. Pain exists over right kidney and in the costo-vertebral angle. Cystoscopy: P. S. T., appearance time, left 1½ minutes; right 13 minutes. Fifteen-minute estimation, left, 66 per cent; right, too small to estimate. Urea estimation, left 5 mg. per c. c.; right 1.5 mg. per c. c. Culture of right showed bacilli and cocci. Pyelogram showed a hydronephrosis of right kidney. In view of the above findings, nephrectomy was recommended, and the diagnosis changed to hydronephrosis (infected). On November 21, 1923, nephrectomy right side was performed followed by an uneventful convalescence.

Pathologist's report: Gross—Enlarged kidney contains cystic cavities in cortex, dilated pelvis, thickened atrophied cortex, thickened capsule, pelvis filled with cloudy urine. Microscopic—Fibrosis of capsule. Round-cell infiltration and destruction of cortical substance. Diagnosis, pyonephrosis. Eleven months after the operation the patient reports that he has recovered from the kidney condition.

Case III—Hydronephrosis: J. P. N., 35 years old, beneficiary of United States Veterans' Bureau, was admitted March 18, 1924, to the United States Naval Hospital, Brooklyn, N. Y., diagnosis psychoneurosis and left inguinal hernia. Six years ago, while serving in the United States Army in France, he sustained a shrapnel wound of the soft tissues and bones in the left thigh and inguinal region. After treatment in several hospitals in France he was able to return to duty, but during the years that have since elapsed, he has suffered from pain in this region. A dull aching pain is constantly present, also intermittent attacks, once or twice a year, of sharp excruciating pain in the left hypochondrium radiating to the left testicle, groin, and shoulder. At times there has been frequency of urination and nycturia. On several occasions he has passed small stones and states that the urinary symptoms would be relieved for

a time after the stones were passed. Because of the pain and urinary symptoms, he has been frequently hospitalized and has often sought treatment from private physicians and Government dispensaries. In 1922 he spent five weeks in the Flower Hospital, New York, because of fever. In 1923 he was admitted to the United States Naval Hospital, Brooklyn, N. Y., for nephrolithiasis, where after X rays were negative for stone, he passed a small kidney stone, with relief of symptoms. For a five-month period he was hospitalized for psychoneurosis without definite lessening of pain. The many periods of hospitalization, visits to dispensaries, etc., definitely reduced his industrial efficiency. Examination showed a robust healthy-appearing man, weight 181 pounds, with no evidence of disease except the complaint of pain in the region of his old wound, out of proportion, however, to the apparent extent of the injury. The left inguinal hernia which has been present for two months was the reason for his present admission to the hospital. After operative repair of his hernia, he was referred to the urological department for thorough investigation of the urinary tract.

Urologist's examinations: Patient came to urological department complaining of pain in the left kidney and in left costo-vertebral angle. Cystoscopy was done and ureteral catheterization. No obstruction of the ureters. P. S. T. showed, 15-minute estimation, right 20 per cent and left 1 per cent elimination and urea estimation showed 17 mg. per c. c. on right and 12 mg. per c. c. on left. Culture showed a gram positive diplococcus on left side. Pyelogram showed hydronephrosis of left kidney with dilitation of the ureter. On May 23, 1924, left nephrectomy was done. The kidney removed was large, nodular, and the fatty capsule so densely adherent that much of it was stripped free from the kidney in lifting it from its bed. The pelvis was dilated and contained about 20 small calculi, varying from fine gravel to millet seed in size. Recovery was uneventful except for right otitis media.

Pathologist's report: Gross—Left kidney about normal in size, somewhat nodular in a appearance; ureter slightly enlarged and not obstructed; capsule somewhat adherent; cortical substance of normal thickness except in one or two places where the calices were somewhat dilated; kidney pelvis itself about four times normal size; measurement 12 by 6 by 4; weight, 170 grams. Four months postoperative the patient is entirely well and has returned to work.

Case IV.—Hydronephrosis: R. H., age 22 years, boatswains mate, second class, United States Navy, admitted March 13, 1924, to the United States Naval Hospital, Brooklyn, N. Y., diagnosis pyelitis. Past history was negative except for gonorrhea in 1918, prior to entry into the service. On two occasions during the past year he had been seized with a dull, sickening pain in the right lumbar

region, radiating downward toward the bladder. The first attack lasted three days and the present attack, which has precipitated his hospitalization, began the day before his admission. Urine, negative except for a few leucocytes and red blood cells. Temperature 101, pulse 100, which after a few days in bed subsided but recurred from time to time during the period of ante operative observation. Examination showed a robust, healthly-looking young man without physical signs of disease.

Urologist's examination: Patient admitted to hospital complaining of dull, sickening pain in region of right kidney radiating toward the bladder. Condition had existed, at times, for about one year. Examination showed tenderness over right kidney and in the right costo-vertebral angle. Cystoscopy was done and ureteral catheterization. P. S. T., 15-minute estimation, showed 28 per cent elimination on left and none on right. Urea estimation was 10 mg. per c. c. on left and 2 mg. per c. c. of urine on right. The pyelogram showed dilatation of the major calices and blunting of minor calices. At operation exploration of the right kidney showed it to be normal in size but the pelvis was greatly distended, the size of a hen's egg. The kidney vessels were displaced upward by this pelvis and there was a large aberrant artery and vein which entered the lower pole. A decision was made at time of operation against the palliative procedure of dividing this aberrant artery and leaving the kidney, because of the size of the kidney pelvis, and the evidence of infection. Right nephrectomy was performed. Convalescence uneventful.

Pathologist's report: Kidney already opened, measured 10 by 5 by 4 cm. Weight, 100 grams. Surface, nodular and irregular. Cortical substance varies from 3 to 10 mm. in thickness. Pelvis was thinned, in places transluscent. Pyramids flattened but still show their radiated appearance. In places the pelvis shows whitish areas suggestive of inflammation. Four months after operation the patient is entirely well.

Case V.—Atrophic kidney, calculus, tuberculosis: P. O'B., 27 years old, a beneficiary of the United States Veterans' Bureau, admitted to the United States Naval Hospital, Brooklyn, N. Y., February 25, 1924, diagnosis pyelonephritis. Four years ago a surgical exploration of the left kidney was performed. The patient stated that at operation the left kidney could not be found. For five years he had complained of urgency every half hour with severe pain in the bladder when he resisted the frequent desire to urinate. At times he had passed blood and mucous, especially at the end of micturition. Examination of the bladder showed a capacity reduced to 65 c. c. and ulceration of the mucosa apparently tuberculosis. Forced dilation of the bladder over a period of three months, grad-

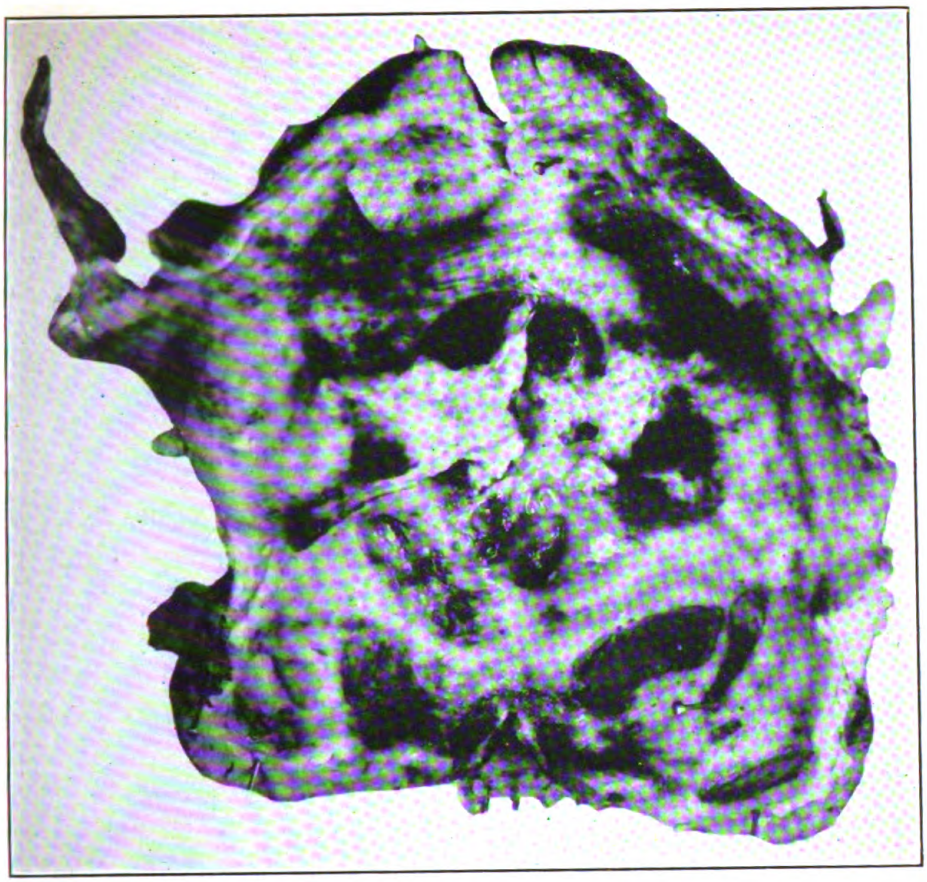
dally increased the capacity to 250 c. c. and reduced the frequency. Physical signs and X-ray examination of the chest suggested the presence of moderate fibrosis, possibly a quiescent tuberculosis. Urine, amber, cloudy, acid, 1020. Moderate amount of albumin, no sugar, many leucocytes, abundant epithelium, negative for tuberculosis. Guinea-pig inoculation, negative. Culture, a gram negative diplococcus, a gram positive bacillus. Examination showed a slightly pale, fairly robust young man with a chronic marginal blepharitis without evidence of disease, except as stated above.

Urologist's examination: Patient admitted to the hospital with a bladder capacity of 65 c. c. Bladder markedly irritable and cystoscopy showed a large number of tuberculous ulcers around the left ureteral opening. Complete cystoscopy was done and ureters catheterized. P. S. T., 15-minute estimation, showed right kidney elimination 9 per cent; the left, none; no appearance on left side in 18 minutes. Urea estimation, right, 12 mg. per c. c.; and left, 7 mg. per c. c. of urine. Pyelogram showed left kidney small and contracted with calcification of upper major calyx and two small areas below, dilated pelvis and unfilled calices probably tuberculous. The left ureter was dilated. Diagnosis, tuberculosis of left kidney. On May 28, 1924, the left kidney was explored through the old kidney incision and a small, one-third normal size, firm, nodular kidney was delivered. Palpation revealed a hard calcareous area occupying the upper third. Nephrectomy was done and the kidney, when opened, revealed a large branched stone filling the upper two calices and the upper third of the kidney pelvis. During convalescence the wound broke down and healed after a few weeks of ultraviolet therapy.

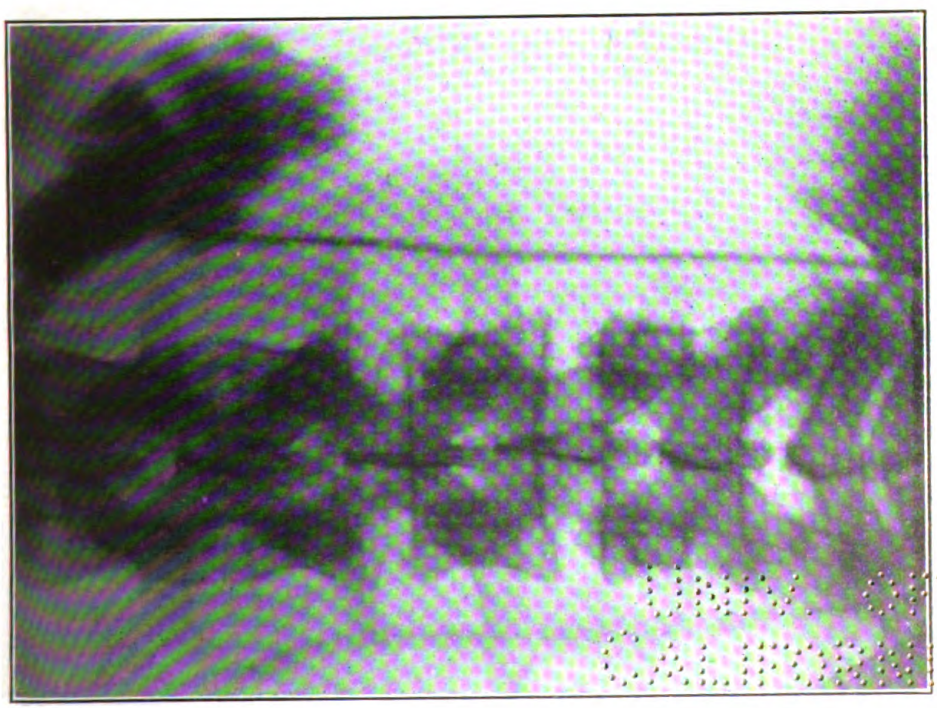
Pathologist's report: Kidney, gross, 7 by 5 by 3 cm. Already opened. Nodular in appearance. Pelvis dilated calices flattened. Pelvis is said to have contained a calculus. Capsule stripped with difficulty. Cortical substance irregular mostly, with atrophic kidney. Microscopic, on section. A few areas of inflammation in wall of pelvis and cortex. Thickened blood-vessel walls; no tubercles seen. Diagnosis: Pyelonephritis. Atrophy due to calculus. Probable tuberculous kidney.

Two months after operation the patient was well except for frequency of urination which, though improved by dilation of bladder, is still present.

Case VI.—Closed renal tuberculosis: H. P. K., lieutenant (j. g.) United States Navy, was admitted December 28. 1923, to the United States Naval Hospital, Brooklyn, N. Y., diagnosis undetermined, complaining of urinary frequency every hour, and nycturia 3 times, and a slight feeling of malaise. The symptoms began about three weeks before admission. Except for a history of mild attacks of



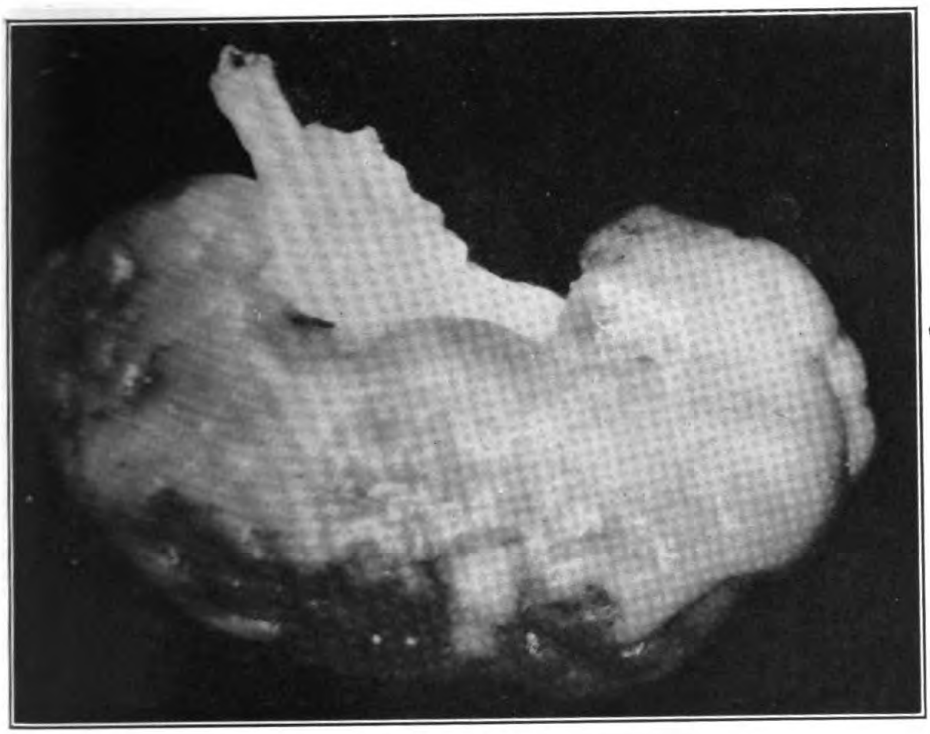
Case 1.—Kidney of hydronephrosis



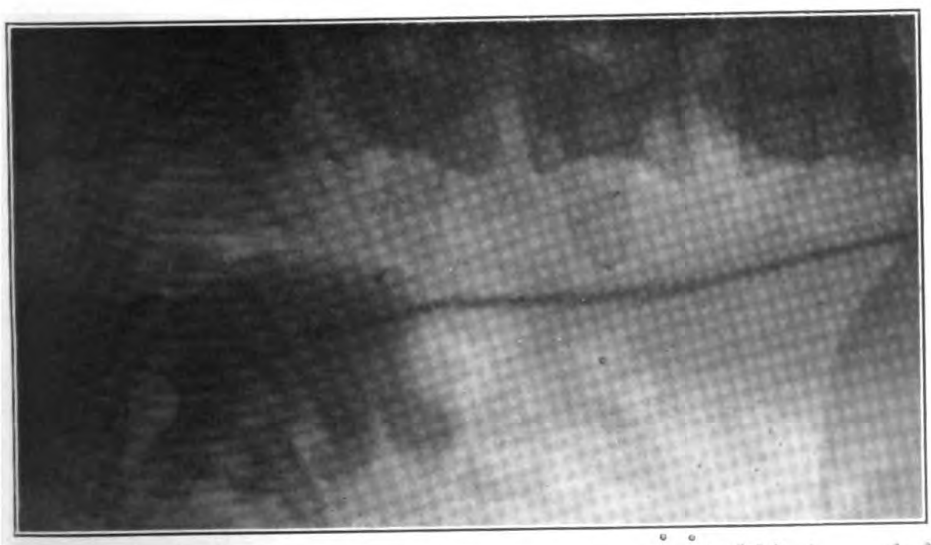
Case 1.—Pyelogram of hydronephrosis

Case 2.—Infected hydronephrosis

Case 2.—Infected hydronephrosis



Case 3.—Hydronephrosis



Case 3.—Pyelogram

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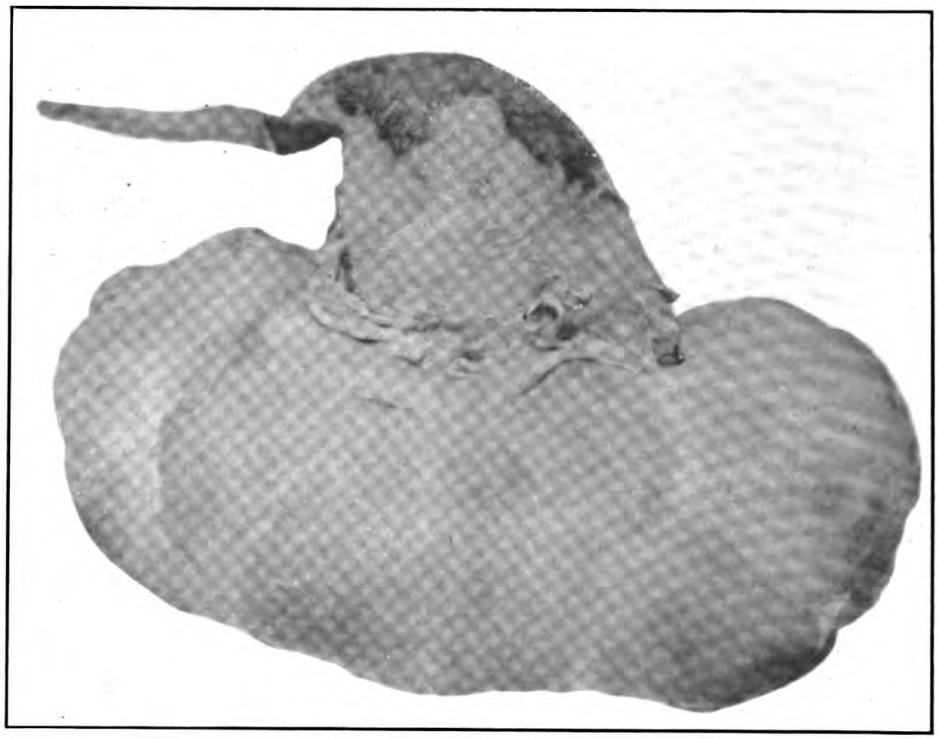
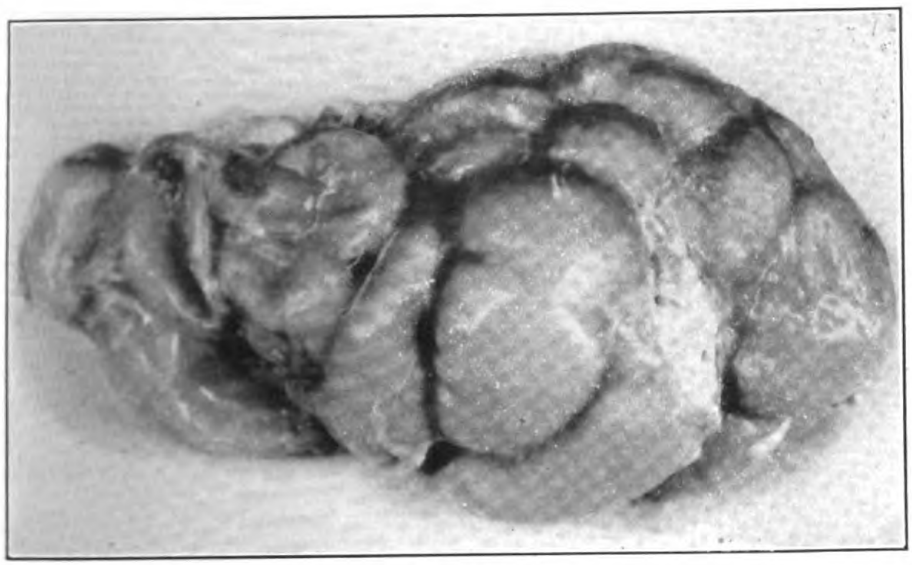


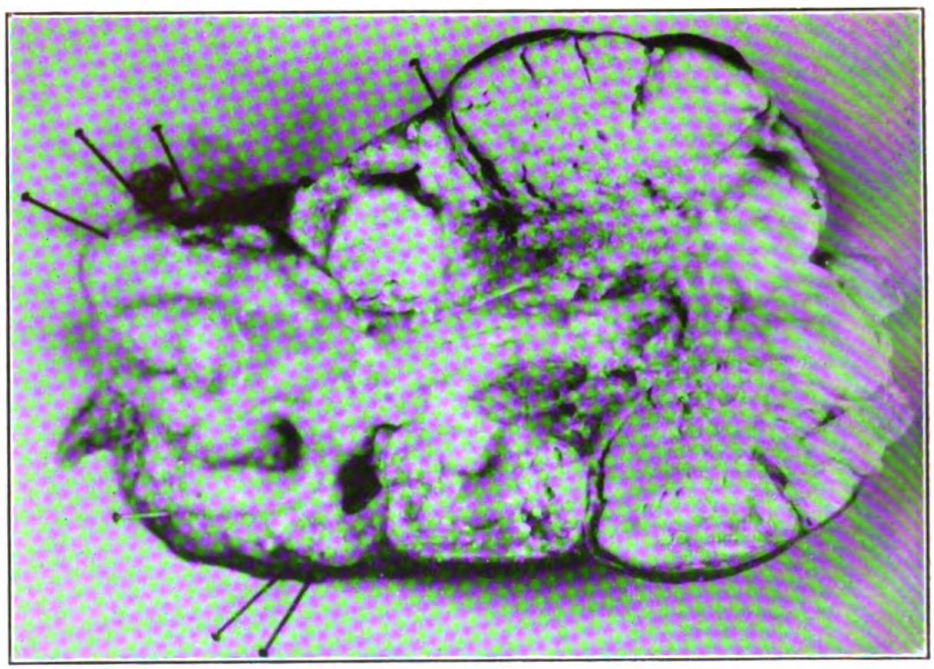
Case 4.—Hydronephrosis

Case 5.—Atrophic kidney; calculus; tuberculosis



Case 6.—Closed renal tuberculosis

Case 6.—X-ray findings



Case 6.—Entire kidney substance replaced by caseous tuberculous substance

Case 7.—Pyelonephritis, tuberculous, with mixed infection

tonsillitis and of a kick of a horse in the right testicle, which kept him in bed two weeks, 10 years ago, his past history was absolutely negative. Examination showed a fairly well-developed, well-nourished, slender young man 26½ years of age, weight 150 pounds, who appeared to be in good health. The right kidney was palpable, slightly tender, apparently enlarged and dispaced downward. There was a slight enlargement of the globus minor of the right epididymis, not nodular or tender, and there were physical signs suggestive of a nonactive, probably tuberculous, condition of the lungs. The temperature ranged daily from 99 to 100. There was a slight elevation of the pulse rate 80 to 94. X-ray examination of chest showed slight haziness of the right upper lobe. X-ray examination of kidneys, right kidney enlarged, lobulated, calcified, R. B. C., 3,984,000. Hgb. 85 per cent leucocytes 8,150, neutrophile 65, lymphocytes 34, eosinophiles 1. Urine, dark amber, clear, alkaline 1.025, no albumin, no sugar, a few leucocytes, and abundant epithelium and uric-acid crystals. Sputum, repeatedly negative for tubercle bacilli; blood chemistry, normal. Wassermann, negative.

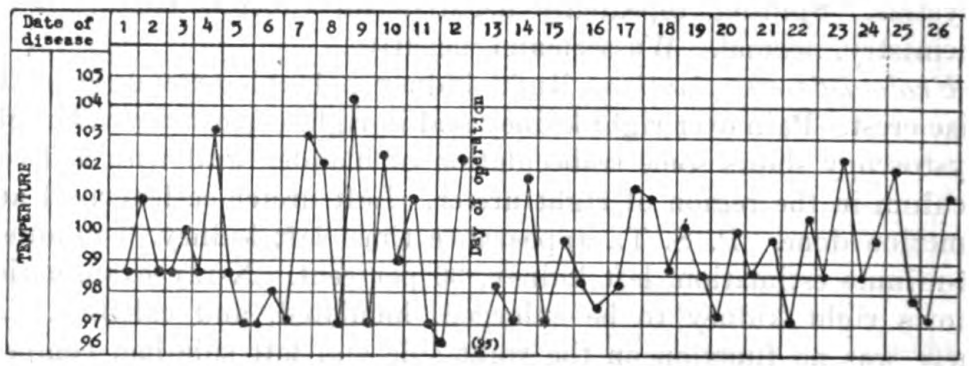
Urologist's examination: Right kidney palpable extending to the iliac crest. Pain over right kidney and in right costo-vertebral angle. Cystoscopy shows some trabeculation of bladder wall with a diverticulum in the region of right ureter. Left ureter catheterized and function done. P. S. T., appearance time, left kidney, 3 minutes; 15-minute estimation, left kidney, 30 per cent. X-ray examination shows right kidney to be enlarged, lobulated, and calcified. As there was no function on the right side and left side had compensated, right nephrectomy was recommended. On December 16, 1924, nephrectomy, right side, was performed, followed by a smooth and uneventful convalescence.

Pathologist's report: Gross—Kidney, 12 by 6 by 8 cm. Caseous material seen on section. Practically no kidney substance. Replaced by soft white caseous substance, containing calcium salts. Fibrous capsule averages 3 mm. in thickness. Several septa running from capsule into kidney about 1 cm. Microscopic—Capsule composed of fibrous tissue with a degree of round cell infiltration. One of the septa slightly thicker than capsule shows several areas of large mononuclear cells surrounded by round cell zone, and containing degenerated cells and débris in center: Diagnosis, closed tuberculosis.

Nine months after operation the patient is well, temperature and pulse normal. Weight has returned to normal. Feels able to return to his duty in the Navy. Now before the retirement board to determine whether he is to be returned to duty or not.

Case VII.—Pyelonephritis, tuberculous with mixed infection: J. T., admitted November 26, 1923, to United States Naval Hospital,

Brooklyn, N. Y., from Veterans' Bureau; diagnosis, cystic tumor right kidney. Of Italian parentage, he was born in Brooklyn, N. Y., and, except for his Army service (December, 1917, to January, 1919), always lived in New York. The family history was negative. At the age of 14 years he was sick for two weeks with pneumonia, otherwise no illness until 1916, when for a few weeks he had pain in the bladder, and the passage of bloody urine. A suprapubic cystotomy for stone in the bladder was done at that time, but he was told that there were no ulcers in the bladder. Shortly after he entered the United States Army, in 1917, he complained of bloody urination. Cystoscopic examination was then made and a cystic right kidney diagnosed. Following the cystoscopy, pain in the right kidney developed. A detailed history of his course and treatment in the Army was not taken on admission, because he was very ill and his mind was none too clear on dates and exact sequence of events. It was clear, however, that because of pain, weakness, and fever, he had dragged



Temperature chart of case 7

through six years since his first cystoscopy, unable to work, an invalid, a burden to himself and to his family. One month before admission he had been treated in a civilian hospital for right-side pleurisy with effusion, and there a diagnosis of cystic kidney was made. Upon admission it was evident that he was a very sick man, skin sallow, muddy, sclera yellow, facies dull, dejected. During the first 24 hours he had a chill, a sweat, and his mental state varied from dullness at one time to low delirium, and these intervals were followed by brief intervals with a brighter attitude of mind, temporary periods of clearing of the mental state toward normal. There was nycturia 3 or 4 times, frequency 8 to 10 times, and no pain except vague right lumbar pain. Temperature, pulse, and respiration varied. There was a palpable, slightly tender, large mass in the region of right kidney. There was a small area of dullness and diminished breathing at the base of the right chest where aspiration had previously been performed. The blood showed W. B. C. 16,300, neutrophile 81 per cent, lymphocytes 18 per cent, mononuclears 1 per cent, nonprotein nitrogen (mg. per 100 c. c.) 43, urea nitrogen

(mg. per 100 c. c.) 22, uric acid (mg. per 100 c. c.) 5, creatinine 1.2, sugar 131. Blood cultures were negative. Urine was dark in color, odoriferous, cloudy, with heavy sediment, straw colored, alkaline 1.005, trace of albumin, no sugar, many leucocytes, no R. B. C., few epithelial cells. X-ray examination of chest was suggestive of tuberculosis. Nephrectomy was believed to offer the only chance of a life-saving procedure. X-ray examination of chest showed a high right diaphragm, indication of abdominal pathology. Pleurisy at right base with infiltration.

Urologist's examination: Palpable kidney, right side, with tenderness over kidney and in costo-vertebral angle. Urine loaded with microscopic pus. Culture showed gram positive diplococci and spore-bearing bacilli. Cystoscopy: Interior surface of bladder shows a scar from previous cystotomy. A few petechial areas on the posterior surface of the bladder. Ureters catheterized and urine obtained for urea estimation, bacteria, and culture. Very little function noted on right side. Urea estimation, right, trace; left, 20 mg. per c. c. P. S. T., right, trace; left, 6.6 per cent; time, 15 minutes. Smears: Right, gram positive bacilli, gram negative bacilli in large numbers; left, negative. Diagnosis: Pyelonephritis, right; immediate operation recommended. During the 12 days of observation before the decision to operate was reached the clinical picture of acute sepsis was maintained, daily chills, sweats, delirium, mental dullness, and up and down fever. On the day of operation, December 7, 1923, the temperature was 102.8, pulse 118, respiration 28; patient's mind was clouded and wandering. Right nephrectomy was performed. Two large clamps were left in position on the pedicle because the patient's condition forbade any prolongation of the operative procedure. At the end of the operation the pulse was recorded as 160. The postoperative course was extremely interesting. After four days of struggle with tympanites this condition cleared and then began a return of fever and later chills, sweats, delirium, alternating with mental dullness. After two months of this, during which his life was despaired of many times, his temperature, pulse, and respiration gradually became normal. He began to gain weight rapidly and is now cured. During the postoperative course, no cause for the continuation of his sepsis could be found either in the wound, the blood, the lung, in fact in any organ in the body. The left kidney was suspected of harboring an infection similar to that of the right but the final picture of cure would seem to indicate at least that if such were the case recovery of the left side has occurred.

Pathologist's report: Gross—Specimen is that of a kidney about 15 by 8 by 7 cm., somewhat nodular in appearance. Capsule is adherent in several places. On section kidney is seen to be composed of several sacs containing inspissated caseous material. Small amount

of kidney substance remaining. Diagnosis: Pyelonephritis, tuberculous. Ten months after operation the patient is in robust health, a remarkable and striking contrast to the acutely ill and septic condition present before operation.

Discussion.—Case IV was the only one of the four cases of hydronephrosis in which operation disclosed an apparent cause for the condition. The greatly dilated kidney pelvis, almost the size of the kidney itself, had pushed the pedicle, with its vessels, upward toward the upper pole and there was a large abberant artery entering the lower pole. So normal in appearance was the kidney except for its thinned and greatly dilated pelvis that the palliative measure of cutting the abberant artery and leaving the kidney in situ, was considered. Nephrectomy was decided upon because infection was already known to have taken place.

Case V was diagnosed tuberculosis prior to operation. For such a diagnosis there was ample indication; a long history of urgency, frequency and periods of bloody urine, a reduced capacity of the bladder to 65 c. c., and ulcerations of the bladder mucosa, clinical evidence and X ray, of a quiescent pulmonary tuberculosis, X-ray evidence of calcareous material in the kidney and a pyelogram outline characteristic of tuberculosis, and absence of kidney function on the diseased side. Operation disclosed a shrunken atropic organ, the upper third of which felt hard as stone. Microscopic examination showed some evidence of tuberculosis but the calcareous deposit, a large branched stone, was not typical of tuberculosis.

Case VI needed no more than the X-ray picture of the uninfected kidney and the finding by the examining hand of a palpable tumor, to warrant exploration but it required the urologist's examination to give information of the presence and good function of the opposite kidney. Nephrectomy in this case removed a tumor, once a kidney, that had by disease become an inert mass of cheesey tuberculous deposit contained within its fibrous capsule.

Case VII clearly shows the danger of permitting a patient with definite kidney symptoms to go for years, incompletely examined and incompletely treated by surgery. That the life of this man was finally saved is an index of the ability of the body to withstand prolonged tuberculous and septic infection. The present-day urologist, by making earlier diagnosis, often prevents the occurrence of these desperately ill cases by bringing nephrectomy to them before such serious damage has occurred.

Conclusion.—The operation of nephrectomy, which removes one of a pair of organs necessary to life, is too serious a procedure to be approached without good and sufficient cause, and should be performed only when necessary to bring about a cure. Seldom will the history, clinical signs, and course of a case, give sufficient indication

for this operation. If these signs alone are considered, death, chronic sepsis, extension of disease to other parts of the body, or to the healthy kidney, may be the result of delay or watchful waiting. Surgical exploration and palpation of the kidney, even when combined with delivery from its fatty capsule, seldom give the surgeon definite evidence of the real underlying pathology or a definite indication for nephrectomy, unless the urologist has brought to bear upon the case, prior to operation, the combination of cystoscopy, ureteral catheterization, chemical determination of kidney function, and information obtainable from the X ray and pyelogram. The successful outcome of these cases can not be attributed to the comparatively simple procedure of nephrectomy. It belongs rather to the urologist and his expert and exact anteoperative modern diagnostic methods.

A CASE OF ACROMEGALY

By M. E. Wonders, Lieutenant (j. g.), Medical Corps, United States Navy

The patient, a Grecian machinist, age 29, was referred to the hospital by the Veterans' Bureau for the surgical repair of an inguinal hernia and hemorrhoids. His facies and extremities presented striking acromegalic changes and it was decided that his condition was worthy of report from the standpoint of acromegaly. The patient complained of (1) persistent headaches, (2) weakness in hands, (3) inability to properly chew food, and (4) marked sensitiveness of the eyes to light.

History: About six years ago, in the spring of 1918, the patient was incapacitated for work because of rather mild, but persistent, frontal headaches. These headaches were aggravated by the use of his eyes and were not relieved by ordinary medication. In July, 1919, upon discharge from the Army, the patient's attention was called by his friends to his enlarged cheek bones. In 1920 the patient noticed that his fore arms and legs were becoming weaker and that his vision was decreasing in keenness. In 1921 there was a period of three months during which he was almost free from headaches and felt much better. For five months in 1922 he worked at rough labor but was compelled to quit because of severe headaches and inability to pick up small objects. At the present time the patient states that his headaches are located on the top and sides of his head and occasionally radiate to the back of the head. The headaches are persistent and do not permit restful sleep. The fact that his teeth have become separated and that his lower jaw protrudes beyond his upper in such a manner as to interfere with mastication greatly disturbs the patient. He further states that his tongue has become larger; that he sweats more readily and more profusely than formerly; and that there has been a noticeable in-

crease in the growth of hair on his lower extremities. Five years ago the patient weighed 146 pounds; two months ago he weighed 200 pounds; at the present time he weighs 182 pounds. In 1917 he wore size 8 shoes, size 7 hat, size 13½ collar; he now wears size 10 shoes, size 7¼ hat, and size 16 collar. The patient had pleurisy when 11 years old; he denies venereal infection and has had no noticeable decrease (or increase) in his libido. The family history was negative.

Physical examination: The physical examination revealed an ambulatory man, 5 feet 7 inches in height, appearing older than the stated age, and of rather compact body build. His skin appeared dark and somewhat thickened, the hair was coarse. The orbital margins, malar processes, and lower jaw were prominent. (See Fig. I.) The teeth of the lower jaw were separated (one-third millimeter) from each other and protruded about a centimeter in front of the upper teeth. (See insert, upper left, Fig. I.) The nose was thickened and broadened, especially at the tip. The eyes appeared to be negative except for slight subnormal vision. (Perimetric and ophthalmoscopic examinations were negative.) The thyroid was not palpable. There was no kyphosis of the upper dorsal vertebræ. The thorax and abdomen were negative. On the lower left side of the abdomen was observed an area (about 4 by 5 inches) of disseminated simple pigmented nævi. The genitalia appeared normal. The extremities were enlarged, the hands more strikingly than the feet. (See Fig. II.) The circumference of the middle finger of the hand was 8.2 cm.; the circumference of the hand was 24.7 cm.; and water displacement of the hand was 700 c. c. Examination of the reflexes revealed no abnormalities although the knee jerks were somewhat decreased. The patient was apparently quite rational mentally and although somewhat perturbed over his condition he cooperated very willingly and answered questions intelligently. The pulse was 78, respiration 20, and temperature 98.6.

Laboratory and X-ray findings: Routine examination of the urine was persistently negative for sugar and albumin. Upon testing for alimentary glycosuria (100 gm. dextose) the urine showed a trace of sugar within two hours. On a general diet the uric acid elimination in the urine was 186, 140, and 162.3 mg. per 100 c. c. for three days; on a low purin diet the uric acid elimination was 119, 143, and 117 mg. per 100 c. c. for three respective days. The blood count (2+) was: Red blood cells, 450000; hemoglobin, 85 per cent; white blood cells, 8000, with polymorphonuclears, 55 per cent, and lymphocytes, 45 per cent. The blood Wassermann was negative. The basal metabolism rate was 43.8 calories per hour per square meter body surface. The X-ray examination disclosed shortened and thickened hand bones. Examination of the chest for persistent thymus was

Fig. 1.—Showing coarsened features in acromegalia. Upper left, teeth spaced. Upper right, patient 8 years ago.

Fig. 2.—Hands of acromegalic patient compared with normal hands

Fig. 3.—X-ray plate showing thickened bones, enlarged sinuses, and eroded sella turcica

negative. The X-ray report on stereoscopic plates of the skull was as follows: "There is thickening of the bones of the vault, elongation and thickening of the mandible, enlargement of the bony sinuses, some increase in vascular markings, and premature closing and obliteration of the suture lines. Pineal gland is calcified. Sella is enlarged in anterior-posterior and vertical diameters with thinning of the walls and marked absorption of the posterior clinoid processes. There is no evidence of increase in the convolution markings. Conclusion: Tumor of the hypophysis cerebri." (See Fig. III.)

Résumé of embryology, physiology, and anatomy: Acromegaly, first described by Marie, of Paris, in 1886, was observed by this authority to be associated with tumors of the pituitary body (13). This association of tumor of the pituitary body, especially of the anterior lobe, with the condition acromegaly has since been confirmed by many observers. For this reason our interest centers around this gland with its relations, functionally and structurally, to other parts of the body.

In brief résumé, it will be recalled that the pituitary gland is commonly considered to consist of three principal parts, namely, the anterior or glandular lobe, the pars intermedia, and the posterior or nervous lobe. The anterior lobe develops as an ectodermal evagination of the roof of the oral cavity and grows upward to lie adjacent to the posterior lobe. The latter lobe develops downward from the floor of the midbrain and carries with it a thin layer of epithelial cells, the pars intermedia (8).

The anterior lobe is supposed to elaborate a hormone which has an important rôle in the regulation of skeletal growth including bones, cartilage, and connective tissue and in addition possibly influences metabolism in conjunction with other glands of internal secretion. The posterior lobe and the pars intermedia apparently form a physiological unit and furnish one or more hormones which seem to affect the tone of smooth muscle, the secretory activity of the kidney, the sugar metabolism, and the normal development of the reproductive organs.

The pituitary gland lies in the sella turcica of the sphenoid bone which gives it a bony wall anteriorly, inferiorly, and posteriorly. In addition to its bony encasement the gland is surrounded by a dural envelope which bridges over the lateral and superior bony deficiencies. Above the gland and just anterior to its stalk lies the optic chiasm; below is the sphenoidal sinus; to either side is the cavernous sinus, with the sixth nerve and the carotid artery in its lumen, and the third, fourth, and ophthalmic division of the fifth nerve in its outer wall (8).

Discussion of salient features of the case: From our brief review of the embryology, physiology, and anatomy of the gland it will be

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seen that a tumor growth might give rise to varied symptoms if it altered the function of the gland or if exerted mechanical pressure on surrounding structures. The symptoms due to mechanical pressure in this case seem to be only the persistent headaches. These are caused by the stretching of the dural envelope (which surrounds the gland) by the enlarging tumor growth (9, 8). (The tumors are largely adenomata (6, 8)). Such common symptoms (4) as bitemporal hemianopsia or homonymous hemianopsia, or palsies of the neighboring cranial nerves such as often caused by encroachment of growing tumors (especially supra-sellar tumors) are absent in this case. It would seem, judging from the enlarged sella (18 mm. deep, 23 mm. anterior-posterior) shown by the X ray and from the absence of marked pressure symptoms, that we are dealing with a tumor which is intra-sellar and which causes symptoms mainly through alteration of function of the gland. Thus to altered function is attributed the enlargement of the bones and the soft parts of the face and extremities.

According to Dercum (12) the essential underlying nutritional changes which attend pituitary enlargement are those of increased and persistent overgrowth of bone and a hypertrophy of the connective tissue of the skin and subcutaneous tissues. The spade-like hand, the thickened nose, and the prognathic jaw of this patient are striking evidences of disturbed skeletal growth. Less prominent are certain symptoms which occur in many cases of acromegaly and which are accredited to involvement of the posterior lobe of the gland. Among such findings are diabetes insipidus, increased or decreased sugar tolerance, changes in the genitalia and libido. These are not apparent in this case and might serve as negative evidence that the posterior lobe has not been seriously affected.

The uric acid elimination (in the urine) of the patient on a general diet was high but was reduced on a low purin diet. This result is contrary to several cases cited by Falta wherein acromegalics on low purin diets materially increased their elimination of endogenous uric acid (2,10). It is possible that pituitary disturbance affects the metabolism of the proteins in such a way as to cause variations in the elimination of their products.

The patient showed a trace of sugar on test for alimentary glycosuria. Whether this is caused by local involvement of the pituitary gland or by altered function in the other endocrine glands is speculatory. Hewlett is undecided whether this tendency to glycosuria is due to a perversion of the gland's internal secretion or is to be interpreted as a manifestation of a disturbance of nervous centers in or near the gland (11).

The basal metabolism rate was slightly higher than normal. It is possible that the increased protein metabolism (as indicated by the

uric acid elimination) is responsible for such a finding. Associated hyperthyroidism might also be a cause, although, according to Anders and Jameson, hyperthyroidism is more commonly associated with acromegaly (5). Furthermore, there were no findings of hyperthyroidism in this case.

The blood showed no evidences of lymphatic luekemia as sometimes occurs in acromegalics (7, 10).

The pigmentation of the lower abdomen had been present since birth according to the statement of the patient. Such pigmentation is sometimes important from the standpoint of pluriglandular disturbances which may at times create a variety of symptoms. For example, Timme may be quoted: "If the adrenals are drawn into compensatory hypoactivity to lessen a blood pressure caused by hyperpituitarism originally, then they will by virtue of this diminished activity also produce pigmentation of the skin. Heretofore the cause of such a pigmentation had been assigned solely to adrenal disease, but we can now readily understand how it might be the sole evidence of a pluriglandular disease originating in the hypophysis. This simple instance will suffice to show what complexity the integration of the clinical manifestations of internal glandular disturbances may assume (14)."

Diagnosis, prognosis, and treatment: The diagnosis of acromegaly is made on the basis of the clinical symptoms and findings mentioned above and upon the changes in the sella turcica as revealed by the X rays. The differential diagnosis should consider hypertrophic pulmonary osteoarthropathy, familial hyperplastic and deforming osteitis, osteitis deformans, hemihypertrophy, syringomyelia, exophthalmic goiter, and myxedema (15). The differential diagnosis will not be discussed in detail in this paper.)

The prognosis is admirably given by Bassoe: "With exception of the transient and incomplete acromegaly sometimes observed in pregnancy the condition is an indelible one. However, the active processes may cease at any stage and the condition remain stationary without any material discomfort and shortening of life. Remissions lasting for many years may also occur. Acceleration of the disease may follow pregnancy, trauma, or fright. The duration of the disease is from a few years to 50 or more. In a general way, the later and more gradual the onset, the more benign the case is likely to be (15)." In event of operation the prognosis would be affected by (1) massive intracranial extension of the tumor; (2) operative accident; (3) postoperative pituitary toxemia; (4) postoperative pneumonia; (5) in transsphenoidal operations, septic infection (1).

The treatment at present may consist of (1) glandular feeding, (2) radiation, (3) operation (3). The former, especially in cases of apparent hyperfunction, has proved valueless. Radiation has

been used with some success, singly and in conjunction with operative procedures. Operation has been the most successful method so far devised. The many methods of surgical attack which have from time to time been devised may be regarded as falling into two groups: The extradural, embracing the transpalatal, nasal, and paranasal operations; and the dural, comprising the temporal and frontal (1). Of the intradural operations, the temporal is little used except when general decompression is indicated. The frontal operation (of Frazier) is an approved route (1, 6), especially for suprasellar tumors. For tumors which apparently lie completely in the sella turcica (as in our case) the transnasal routes are usually preferred (3). This operation in the hands of an experienced surgeon does not possess a high mortality. In the case under discussion it would then seem advisable to first observe the results obtained by a thorough course of X-ray treatment. In event this procedure failed to relieve the symptoms (especially the headache) then operation by the transsphenoidal route would appear to be indicated.

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NEUROSYPHILIS

WITH A REPORT OF TWO EARLY CASES

By H. E. List, Lieutenant (j. g.), Medical Corps, United States Navy

It is still a much debated question as to whether or not syphilis existed among the civilized races prior to the time that the New World was discovered by Columbus. Investigators of this question have presented much evidence on both sides in support of their respective contentions. There can be found, however, no account concerning the interrelation of syphilis to the nervous system which antedates Leoncino's description of a hemiplegia due to syphilis, reported by him in 1497. In the early years of the sixteenth century, Grunbeck, Emser, and von Hutten described syphilitic paralyses. The same century saw further contributions on the subject, in which syphilitic meningitis, syphilitic neuralgias, and syphilitic arthropathies were included. It was in 1610 that general paresis was first observed as an entity, but the first authentic description of it did not appear until 1672. During this century many valuable works were written, but progress was temporarily checked when, in 1787, John Hunter stated that syphilis never involved the internal organs, including the brain. This statement was, however, definitely disproved a few years later by Ricord. Lallemand in 1834 conclusively demonstrated syphilis of the brain and meninges.

The nineteenth century marked the dawn of the modern era in the study of this disease, the most noteworthy contributions being those of Virchow, Nissl, and Alzheimer. But it was not until the year 1905 that the etiological organism of syphilis was isolated and demonstrated by Schaudinn. And although it had been suggested for many years that paresis and tabes were frequently, if not always, syphilitic in origin, it was never conclusively proven until 1913, when Noguchi and Moore found the treponema in the brains of paretics. This was followed by the development of serological technique, which brings us up to the present-day methods of diagnosis, prognosis, and treatment.

Among other phenomena noted in nervous syphilis is a tendency toward the absence of cutaneous manifestations, and in this connection White's work (1) is of unusual interest. Of 500 tabetics he found only 18, or 3.6 per cent who presented clinical evidence of cutaneous involvement, and of 178 paretics, only 2, or 1.72 per cent. This phenomenon is not satisfactorily explained, although it is proposed by some that the nervous system is invaded by one or more specific strains of treponema to which the skin is entirely resistant. Much work has been done in attempting to isolate various strains and to demonstrate their affinity or predilection for certain tissues. This was first noted by Nichols (2) in 1913 in rab-

bits. He and Reasoner (3) were able to show among 20 strains of spirochætes studied, several with characteristics sufficiently obvious to serve as a ready means of identification and differentiation. This may very well be true in the laboratory, but on the other hand, Nonne cites a case where 3 friends had intercourse with a syphilitic girl in succession on the same night. All went through the primary and secondary stages, and later on, one developed tabes and the other two paresis. Heubner also sites a case where one member of a married couple had nervous syphilis and the other visceral syphilis. Thus, the question as to specific strains of treponema invading nervous tissue is still a matter for further investigation.

We may then well ask what are the factors governing the time and method of the invasion of the treponema into the central nervous system? Neisser (4) has shown that the bone marrow, spleen, and satellite lymph nodes are already infected by the time the chancre is clinically evident. Weigeldt states that the entire organism is invaded by spirochætes a few days previous to the time of the skin symptoms, if any be present. He thinks that the internal organs at this time are undergoing certain changes which are not clinically demonstrable. Quincke, Nonne, Kafka, and others also maintain that spirochætes reach the nervous system at the time of the eruption and add that the more violent the exanthemata and ulcers, the less likely the later occurrence of neurosyphilis. It is generally concluded that during the development of the initial lesion, the treponema are actively engaged in multiplying in various portions of the body. There occurs a sudden dissemination of them, a septicemia as it were this being known as secondary syphilis. Fordyce (5) has shown that the central nervous system is invaded in a high per cent of cases at this time. An evidence of this is the pleocytosis which may appear very early in the course of the disease. Ravant found it two months after infection. This may be the first symptom with regards to central involvement, and it may be as long as two years before any neurologic symptoms appear. This pleocytosis has usually been attributed to a meningitic process, and that, when vascular disease is more marked than meningeal, the spinal fluid may reveal nothing abnormal. Others, however, contend that it is due to a periarteritis as well.

In considering the method of invasion with its primary and secondary etiological factors, the relationship of alcohol to syphilis must always be remembered, firstly, because alcoholism is very frequently found in combination with syphilis, and secondly, because of the debilitating effect of alcohol on the nervous system, making it an easy prey for spirochætal invasion. Oppenheim maintains that in a subject with syphilis who is an abstainer, but who for some reason engages in alcoholic excesses he thereby facilitates the occur-

rence of cerebral syphilis. Some even go so far as to say that syphilis plus alcohol equals paresis.

Other factors which have been offered as the more common contributory causes are (*a*) a toxemia of some other kind, (*b*) some intercurrent infection, (*c*) lead poisoning, (*d*) trauma, as a blow on the head, (*e*) neuropathic heredity, (*f*) faulty treatment of the infection in its early stages, and (*g*) intellectual strain or over-activity.

The frequency of luetic involvement of the nervous system is a matter of interest. It is stated (6) that about four-tenths of 1 per cent of all medical cases have nervous syphilis, about 1.5 per cent of all nervous cases have syphilis, about 8 per cent of all syphilitic cases have involvement of the nervous system, and about 2 per cent of all cases of syphilis have paresis. Others, notably Quincke, Nonne, and Kafka, present data in which their figures are even higher. They have found that the nervous system is involved in 20 to 40 per cent in early cases and that the spinal fluid is demonstrably pathological in 50 to 70 per cent of cases. There may be pathological spinal fluid without marked nervous symptoms, and vice versa. They state that, in most cases, the spinal fluid may become normal later on, persisting in only about 10 per cent of the cases, 2 per cent as cerebrospinal syphilis, 3 per cent tabes, and 5 per cent paralyses.

It is with reference to this early demonstrable invasion of treponema into the nervous system that the following cases are presented. For the sake of brevity, only the pertinent points will be given:

Case I.—J. S. M., age 29, white, single, Ph. M. lc., was admitted to the hospital on November 21, 1923, with a complaint of excruciating pain in both temporal and frontal regions. His family history was irrelevant. An inquiry as to his past personal history revealed the fact that a primary chancre appeared on his penis August 1, 1923. A blood Wassermann taken on August 14 was 3 plus and secondaries appeared on August 15. He was given a course of eight injections of neoarsphenamine, and a subsequent blood Wassermann was negative. He stated that during the month prior to his admission his efficiency had decreased very perceptibly. His present illness had begun two weeks previously to being admitted.

Physical examination of the patient was entirely negative for pathology except that 2 impacted wisdom teeth were found on X ray, that the patient was very irritable, that the reflexes showed inconstancy, and that there was considerable pain and some spasm of the postcervical muscles.

November 30th, spinal puncture. Fluid under slight pressure. Spinal Wassermann 4 plus. Cell count 722. Globulin increased. Colloidal gold curve 1355544320.

Antiluetic treatment of neoarsphenamine and mercury was instituted immediately. A week later his spinal fluid showed a positive gold curve 444333221 and his cell count was 50. On November 13th the blood Wassermann was 4 plus.

The last spinal fluid taken showed a gold curve 5555555544 and the spinal Wassermann was 4 plus. His pains and headaches subsided under treatment and finally disappeared entirely and he was discharged to duty under treatment.

Case II.—L. T., age 27, white, single, W. T. lc., was admitted to the hospital on July 16, 1924, with a complaint that he previously had had "fits."

Family history: Mother and father age 84 and 85, respectively, living and well. No history of insanity, epilepsy, tuberculosis, or specific diseases. Father was formerly an inveterate drinker but stopped five years ago.

Past personal history: No history of convulsive seizures or other nervous or mental disturbances. Habits: Beer and tobacco in moderation. Blood Wassermann in 1920 and 1922, negative. Repeated blood Wassermann in 1923, negative. A primary chancre appeared on the penis in October, 1923, the incubation period of which is unknown. He denied having had a previous venereal lesion. A blood Wassermann one week following the appearance of the chancre was 4 plus, and at this time antiluetic treatment was instituted, which consisted of 8 neoarsphenamine and 10 mercury injections. At no time were any cutaneous manifestations present.

Present illness: About three months prior to admission, while on the U. S. S. *Scorpion*, patient had just completed a continuous strenuous duty for three days and nights without rest. On the evening of the third day, he sat down to drink a cup of coffee, and this is all that he remembered. The following morning, he was told that he had had a fit, and that all attempts to restore him had failed. This was news to him, as when he awakened, he was feeling perfectly normal. About one and one-half days later, patient had another seizure. Patient has had no attack since that time.

Physical examination: Entirely negative for pathology except that the tonsils were slightly enlarged, thyroid was palpable, and pulse was 124. There was a slight tremor of the hands, a general glandular enlargement, and an old specific scar on the meatus. Neurological pathology was not found in examination, except the tremor.

A tentative diagnosis of epilepsy was therefore made.

July 22: Blood Wassermann, 4 plus. Diagnosis charged to syphilis. Antiluetic treatment was then instituted.

August 7: Blood Wassermann, 3 plus.

August 9: Spinal fluid examination. Wassermann, 4 plus. Marked globulin increase. Gold curve 345555543.

August 20: Neurological examination. Right pupil slightly larger than the left, but both pupils normal in size and shape, with a normal response to light and accommodation. Consensual reflex present in both pupils. No nystagmus or strabismus. Patellar, ankle, triceps, biceps, as well as superficial reflexes normal. No ankle clonus. Muscle tonus normal. Rhomberg slightly positive. Slight fibrillating tremor of the extended fingers. No muscle spasms or paralysis. Gait normal. Response to questioning prompt and intelligent, no drawl or hesitancy in speech being noted.

August 25: Course completed.

August 26: Blood Wassermann, 1 plus.

September 4: Spinal fluid Wassermann, 4 plus. Marked globulin increase. Gold curve 4555543300.

September 11: Blood Wassermann, 4 plus.

September 15: Antiluetic treatment resumed.

September 17: Patient complained of severe headaches.

September 22: Headaches disappeared. Patient felt perfectly well.

Discussion: In the first case reported, the time interval between the appearance of the chancre and the positive spinal fluid findings was about three months. In the second one, the time interval was 10 months. We should therefore realize the gravity of every case of early syphilis and always consider the possibility of central invasion. The ramifications of syphilis are great, and no organ or tissue in the body is spared. It therefore behooves us to find out just where we stand when a case of syphilis presents itself, so that should positive evidence be found of brain or cord involvement, or both, we are able to give proper treatment. These patients should be impressed so forcibly with the idea that repeated examinations are indispensable to their welfare that they submit themselves to them regularly and voluntarily. These routine examinations should include a review of the patients' activities since the last examination, and a testing of the chief reflexes, special attention being given to the pupillary reflexes. Observation for tremors and disturbances of coordination should be made. The Wassermann reaction with the blood serum and a complete cerebrospinal fluid examination should be obtained. This should be done every six months, or a year at the most. In this way we will be able to find these early cases, and, with proper treatment, minimize the per cent of paretic and tabetic cases which help to fill our asylums and sanitoria.

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CASE OF MULTIPLE EXTRAGENITAL CHANCRES

By J. C. Parham, Lieutenant Commander, and C. F. Behrens, Lieutenant, Medical Corps, United States Navy

Private S. M. reported to the sick bay for treatment for two ulcers situated on the distal phalanges of the second and third digits of the right hand. He gave a history of the ulcers resulting from blisters sustained while working in his company galley in Santo Domingo a few weeks previously. A further disclosure obtained after the diagnosis was made was to the effect that he had been in the habit of manipulating the genitals of a prostitute prior to having sexual intercourse with her. Upon reporting there was nothing suggestive of syphilis, but within a week's time both lesions increased in size and acquired the characteristic features of chancres. Wet dressings of normal salt solution were now applied and daily search for the causative organism was begun. After two days the organisms were demonstrated in both lesions and the diagnosis established. The Kahn precipitin test was also performed with positive results.

Specific treatment was started at once, and though he remained but a short time aboard, noticeable improvement was observed.

PLASTIC REPAIR OF "SADDLE NOSE" DEFORMITY BY AUTOGENEOUS CARTILAGINOUS GRAFT

By C. B. Camerer, Lieutenant Commander, Medical Corps, United States Navy

S. R. S., Corporal, U. S. M. C., admitted as with "Deviation, nasal septum, No. 508," with a history of injury to nose sustained over a year ago while playing hockey, at which time he was struck on the bridge by a hockey stick, causing extensive "saddle nose" deformity. Under general anesthesia a suitable section of the cartilage of the sixth right rib was resected subperichrondially, the soft tissues of the nose were carefully undermined, exostoses resulting from original fracture were freely removed, and the properly prepared and shaped cartilaginous graft inserted. The small semicircular 2 c. m. wound at the nasion was closed by horsehair sutures. An excellent postoperative result was obtained, wound being entirely healed and stitches out within six days. The accompanying cuts show the condition prior to operative interference and the cosmetic result.

Multiple chancres

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Fig. 1.—Saddle nose deformity before operation

Fig. 2.—After operation

NOTES AND COMMENTS

SAFETY RECORD AT THE NAVY YARDS

In the October, 1924, issue of National Safety News, Mr. Stewart J. Owen, safety engineer, United States navy yards and naval stations, Navy Department, discusses the Navy's record of accident prevention at navy yards. The article which is quoted in full is as follows:

"While the Navy Department of the United States has always maintained a deep interest in the safety of its employees and has been active in adopting measures for their protection, it was not until the fall of 1917, after a general safety survey of the Federal establishments had been completed by the United States Employees Compensation Commission, that safety engineers were assigned to the navy yards and naval stations. This survey was instituted by the United States Employees Compensation Commission, and was carried out by a group of men prominent in safety work. Among those most prominent in this work were R. M. Little, commissioner, United States Employees Compensation Commission; Charles W. Price and L. R. Palmer of the National Safety Council; Arthur H. Young, director of the American Museum of Safety; and John S. Love of the Pennsylvania Rating Inspection Bureau.

"The survey found conditions to be far from the standards in use by the larger industrial organizations and the several States. With the exception of two or three plants, the arsenals and navy yards visited had less than 50 per cent of the mechanical hazards covered by efficient guards. In two of the plants less than 10 per cent of the hazards were guarded. No efficient organization for the promotion of safety among the workmen existed and there was little evidence of the intensive educational work which has come to be recognized as indispensable in developing and maintaining a real safety interest among the workmen.

"In justice to the commandants and other department heads, it should be said that the above conditions were not due in any way to a lack on their part for the proper consideration of the safety of their workmen. On the contrary, it was found that practically all of the commandants, department heads, and foremen were sincerely interested in protecting their men from injury. The con-

ditions found were due largely to the fact that the Government plants were not subject to safety inspection such as is made by insurance companies and the several industrial States.

"To eliminate the unsafe conditions that prevailed in the navy yards and naval stations, and to improve the working conditions of employees of the Naval Establishment, the Assistant Secretary of the Navy assigned, on October 15, 1917, a safety engineer to each of the major navy yards. Each of these safety engineers performed his duties under the direction of the commandant of the navy yard to which he was assigned. These safety engineers did valuable work in the establishment of safety standards, the installation of needed safeguards, and the promoting of safety in general among the workmen. Complete records of the good they accomplished are not available, as there was no central directing agency for safety work.

"To provide for a central control of the safety work, the Assistant Secretary of the Navy, on June 6, 1921, assigned two safety engineers to direct the safety work of the Naval Establishment. One, with headquarters at the Washington Navy Yard, was assigned the navy yards and stations on the east coast, and the other, with headquarters at the Mare Island Navy Yard, was assigned the navy yards and naval stations on the west coast. These two safety engineers were familiar with the safety work at the navy yards and naval stations within their respective districts and made periodic safety engineering inspections.

"Much good was accomplished by the establishment of the two central safety agencies, but to bring about a more central controlling safety agency, the Assistant Secretary of the Navy established an office of safety engineering at the 16 major navy yards and naval stations and on July 28, 1922, the safety engineer for the navy yards and naval stations on the east coast was assigned to the office of the Assistant Secretary of the Navy to direct the safety work among the workmen of the Naval Establishment.

"The safety engineer attached to the office of the Assistant Secretary of the Navy is held personally responsible for the department's activities in safety work. He prepares, for the information and guidance of the navy yards and naval stations in this safety work, various safety standards, safety instructions, data covering the causes of accidents, the amounts of compensation paid because of accidents, and articles on safety in general. He also formulates the necessary specifications for safety appliances of various kinds, including protective clothing and head and eye protectors, and from time to time makes inspections of the navy yards and naval stations.

"The offices of safety engineering at the 16 major navy yards and naval stations, are, in most instances, under the direct supervision of the industrial manager of the navy yard or naval station and under

the general administrative supervision of the office of the Assistant Secretary of the Navy, and the commandant or commanding officer of the navy yard or naval station. To each of these offices, there is detailed, by the commandant or commanding officer, a medical officer and such other personnel as is necessary for the performance of the duties required. Briefly, the duties of these offices of safety engineering are as follows:

"(*a*) To inspect all shops as often as practicable, paying particular attention to all conditions which might cause injury or disease.

"(*b*) To recommend necessary safety and sanitary measures and appliances, both inside and outside the shops and buildings, as well as throughout the yard or station in general.

"(*c*) To follow up each accident or disease which may occur with a view to determining whether such accident or disease was preventable and to make suitable recommendations for the prevention of similar accidents or diseases.

"(*d*) To carry on a safety educational campaign among the employees, by means of safety posters, lectures, pamphlets, motion picture displays, etc., with a view to enlightening the employees in matters relative to personal hygiene, accident preventions, and the like.

"(*e*) To keep suitable records of all accidents and illnesses among the employees and to submit to the proper officials, all routine and special reports in connection with accidents and illnesses, including all of the compensation forms, notices of injury, and such other forms as are required to be forwarded to the United States Employees Compensation Commission.

"At many of the navy yards and naval stations a general safety committee and shop safety committees are established to assist the office of safety engineering and to stimulate interest in safety.

"The general safety committees consist of not less than three members especially interested and qualified in safety work, one of whom is of the highest supervisory rating. These committees meet at frequent intervals to review and pass upon as to practicability, the inspection reports, safety recommendations, and safety suggestions made by employees. They also study and analyze the causes of all accidents or near accidents for the purpose of devising methods of eleminating such dangers.

"The shop safety committees consist of from one to three representatives from each shop, one of whom is a leadingman or a quarterman, and the others shopmen. The personnel of these committees is changed every two or three months, generally by rotation, so that eventually all supervisors and employees will have served on the committees. The personnel and duties of the shop safety committees are made known to all employees and detailed procedure is prescribed by the industrial managers as to how those duties shall be

performed. The shop safety committees observe and call attention to employees concerned and their supervisors, any failure to use the protective devices furnished, violations of the safety rules, or any unsafe practices which are liable to endanger the safety of the employee himself or others and report unsafe conditions to their supervisors for correction.

"These safety committees also assist the master mechanics and foremen but each supervisor is held strictly responsible for accident prevention within his jurisdiction and holds his assistants strictly responsible for accident prevention within their jurisdiction.

"Master mechanics, foremen, and their assistants are all required to assist in safety work by enforcing strictly all safety rules and oral instructions, etc.; insuring that new employees as well as old, are properly instructed as to the hazards of their work, the danger of unsafe practices, and the proper use of protective devices through the use of safety bulletins, printed rules, oral instructions, etc.; investigating all accidents or near accidents in their shop, reporting causes and giving suggestions for preventing a recurrence; making frequent safety inspections of their shop and submitting to their superiors such safety suggestions as may be necessary.

"At each navy yard and naval station a well-equipped medical dispensary is maintained. These dispensaries are under the direct supervision of the senior medical officer of the navy yard or naval station. All employees are required to report at once to their supervisors any injury, no matter how trivial, then to go to the dispensary for medical treatment. After treatment is given the dispensary makes a written report of the case to the office of safety engineering, stating the facts, whether it is an injury or illness, and whether or not the injury or illness is due to employment. The medical officers attached to the various dispensaries are always on the alert to do all they can to relieve an injured or sick employee's suffering and to cooperate in every possible way in the prevention of accidents and disease. Much has been accomplished through the hearty cooperating of these medical officers.

"The value of an efficient safety organization as stated above, is clearly demonstrated by substantial reductions in accident frequency and severity. In 1922, the frequency of compensated accidents per million hours worked by the employees of the 16 major yards and stations was 21.8 against 18.6 per million hours worked in 1923, a reduction of 14.7 per cent.

"In 1922 the total amount of compensation because of accidents to employees of the Naval Establishment reached the sum of $599,585.22, an average of $387.33 per case. In 1923, the total amount of compensation because of accidents to employees of the Naval Establishment was but $386,229.41, or $266.37 per case. This is a decrease

of $213,355.71, or 35.6 per cent, less than 1922. It is also a decrease of $120.96, or 31.2 per cent, per case.

"The compensation per million hours worked in 1922, in the 16 major navy yards and naval stations was $8,559.39 against $5,263.03 per million hours worked in these yards and stations in 1923. This is a decrease of 38.5 per cent. If the compensation per million hours worked in 1923 had remained the same as in 1922, it would have been $538,627.77, or $207,433.44 more than the actual compensation, which was $331,194.33.

"It is expected that offices of safety engineering will eventually be established at all of the shore establishments of the Navy. The Navy Department fully realizes the importance of the safety of its employees and is doing all it can in this respect, with such funds as are available."

LEAD POISONING AT THE PHILADELPHIA NAVY YARD

During the summer months of 1924 a number of cases of lead poisoning occurred among civil service employees of the Government at the Philadelphia Navy Yard engaged in scrapping the *Delaware*, *Michigan*, *South Carolina*, and *Kansas*. About 90 men were employed cutting up the steel construction with oxyacetylene torches. Of this number 27 showed definite symptoms of lead poisoning. The paint was chipped off with a chipping hammer in places where the oxyacetylene flame was to be applied. Goggles with absorption lenses for protection to the eyes from the ultraviolet rays of the oxyacetylene flame and LaFrance aluminum respirators with sponge filters were worn by the men. Because of the intense heat produced by the flame the lead in the paint for a considerable distance from the line of cutting was volatilized with resulting poisoning in spite of the respirator employed by each workman.

In September a carbohydrogen flame was substituted for the oxyacetylene torch as it was believed that the former gas which generates much less heat would reduce considerably the production of lead fumes. The LaFrance respirator was modified so as to contain layers of cotton, soda, and lime and bone charcoal in addition to the regular sponge which, in all probability, would remove all lead from the air inspired by the workmen.

THE PREVENTION OF MALARIA

The association of epidemics of malaria with military campaigns in tropical and subtropical countries has been well known for many

centuries. The natives of malarious regions possess in the unhealthiness of their climate a means of defense more potent than the scientific weapons of modern warfare, and that unless vigorous action is taken against the insidious and ever present menace of disease the accomplishment of the mission of any expeditionary force will involve an expenditure of life and health out of all proportion to the aggressiveness of the enemy. Many a campaign has been doomed prior to its inception by failure to realize these facts, and through lack of appreciation of the terrible potency of this most protean of diseases. Armies have been sent to a fate as inevitable as it should have been obvious.

In recent years events have made it evident that a campaign in a malarious country would be a success or failure according to the thoroughness of the steps taken to protect the combatants from malaria. Thus, in Salonica during the first malaria season encountered during the late war, there were over 30,000 cases among the British troops, and in subsequent years the number increased rather than diminished. In Palestine, after the advance from the Auja line, the army was decimated by malaria; while in East Africa from January to November, 1917, there were 21,000 cases. The recent successful occupation of Santo Domingo and Haiti by a Marine Corps expeditionary force was possible only because of the antimalarial measures instituted by the naval medical officers serving with the marines.

The Parkes memorial prize essay on the "Principles of the prophylaxis of malaria," by Capt. J. S. K. Boyd, R. A. M. C., was published in the August and September issues of the Journal of the Royal Army Medical Corps. The principles outlined closely parallel those followed by American naval medical officers in the West Indies.

The following comments on this essay appeared in the Lancet of October 25, 1924:

"Captain Boyd lays down four lines of prophylaxis: (1) The reduction or elimination of the reservoir of infection in infected persons; (2) the reduction of the mosquitoes by antilarval measures; (3) the protection of men from mosquitoes; (4) quinine prophylaxis. He advises concentration on one line, carefully choosing the most hopeful of the four, as it is scrupulous attention to detail that brings success. The methods he adopts for each of the four systems of prophylaxis are as follows. For the first system it is essential to keep infected natives at a distance, especially at night, and to give 10 grains of quinine daily to all malaria carriers, thus reducing their infestation, particularly in regard to gametocytes, and so lessening their chance of infecting mosquitoes. Captain Boyd remarks that some medical officers tempt men to come regularly for their doses by double rations, light duty, or the like. The second system of

prophylaxis is good in cantonments, but is almost impracticable on active service. To work on this costly principle demands, as a preliminary, exact and expert investigation on the spot. For example, *Anopheles stephensi*, breeding in wells, is easily mastered, but *A. maculipennis*, breeding in swamps, and A. *maculatus*, in streams, require quite different treatment, so it must be decided what species is to be attacked first. The third system consists in the provision of mosquito nets or repellents; the latter require frequent reapplication, as they are volatile, and are not effective for more than a couple of hours. Fourthly, quinine prophylaxis is carried out by the administration of a dose of 5 or 10 grains of the drug daily, usually at about 6 p. m. This treatment is of value where mosquitoes are not very numerous, and where administration can be rigidly controlled; but it is not so good on active service, unless the mortality from malaria is high. Captain Boyd further indicates certain considerations which must be borne in mind by the War Office when a campaign is projected in malarial districts, if the health and efficiency of the troops is to be kept at a maximum. The War Office should aim, he states, to plan the campaign for the non-malarial season, probably December to May, inclusive, and should use, if possible, seasoned troops only, whether native or white. Mosquito nets must be provided, particularly bivouac nets, with a 10 per cent surplus for each unit for replacement. Malaria diagnosis units, as in Palestine, will be needed, in numbers varying with the extent of the area, not with the number of the troops. On the headquarters staff of the expedition there must be an antimalarial officer to deal with local problems. Screened huts will be needed for dining and recreation rooms. Base hospitals should be established at the outset, followed as soon as possible by hospital accommodation on the lines of communication. If a native village is heavily infected and near a camp, then the village must be removed. The medical officer of each unit must interest the troops in the prevention of malaria, and see that the scrub round the camp is cut. Care must be taken to keep the mosquito nets in serviceable condition and in nightly use."

POISONOUS SNAKES IN PANAMA

According to Dr. Thomas Barbour of the School of Tropical Medicine of Harvard University, who has recently been engaged in studying the poisonous snakes of Panama, the venomous snakes of that country are among the most poisonous in the world and include four varieties of true coral snakes, the small palm viper, the bush master, and the *fer de lance*. There is one variety of rattlesnake

known to exist on the Isthmus. A sea snake which is frequently seen on the Pacific adjacent to Panama is exceedingly poisonous. The country possesses one variety of poisonous toad, the *Dendrobates tinctorious*, a small creature about 2 inches in length, almost black in color, with bright green markings on its back.

THE PROPER CARE OF ALUMINUM

The Modern Hospital of September, 1923, contains the following comment on the care of aluminum.

"The increasing use of aluminum in hospital dietary departments has naturally developed the question of the proper care and cleaning of this metal. Aluminum to-day is used not only for cooking utensils and serving trays, but for many of the larger pieces of fixed equipment, such as coffee urns, steam-jacketed kettles, and other utensils. Methods that were formerly successful in the cleaning of ironware, copperware, tin, and other utensils, do not satisfactorily solve the problem of cleaning aluminum. Each utensil must be cleaned with that type of cleaner best adapted to the metal of which it is made.

"There is no heaven-sent formula which solves any cleaning problem. Every type of cleaning requires a certain amount of mechanical work, the application of sufficient 'elbow grease' to accomplish the results. Iron must be scoured to be kept in proper condition. Copper, to be presentable, must be treated with vinegar and salt or some abrasive. To preserve aluminum ware in the proper condition, it should be rubbed with steel wool and soap.

"Do not make the mistake of cleaning aluminum only at rare intervals. Fully one-third of your time and energy can be saved by cleaning such utensils daily. Every time an aluminum utensil is washed it should be rubbed with a nonalkali abrasive of some kind so as to remove discoloration, stains, deposits or burned spots which may have developed. With daily attention, very little rubbing is necessary. In other words, each utensil is kept clean and not permitted to reach that state of neglect requiring long and arduous scouring.

"Kitchen authorities are agreed that the best abrasive to use on aluminum is a No. 0 and No. 00 steel wool with the addition of soap. This can be bought in bulk or in small packages, either combined with the soap or bought separately and rubbed on the soap while being used. Do not make the mistake of not using plenty of soap, as this makes it much easier to clean the surface of the metal.

"Aluminum trays present a special cleaning problem. Almost every hospital executive has had experience with the smudgy discoloration which rubs off on uniforms, aprons, tray covers or linens.

While it is practically impossible to entirely eliminate this difficulty, much can be accomplished through proper cleaning. Special care should be used in the cleaning of serving trays. Use plenty of clean hot water and a high-grade soap which contains a negligible per cent of free alkali. After the trays have been thoroughly washed in this manner and rinsed in clean hot water, they should be carefully dried before they are stacked. This will do more than anything else to do away with the discoloration.

"At least once a week the trays should be scoured with a good cleaner or with '00' steel wool and a soap that will make a good lubricant. After being thoroughly scoured, they should be washed and rinsed in clean hot water, and should not be nested until after they are thoroughly dry.

"Many superintendents have found that unusually good results follow if the trays are washed in water containing a 5 per cent solution of sodium silicate, commonly known as water glass, and a small amount of good soda. The application of the soda and sodium silicate upon the metal results in a slight reaction which forms a protective coating over the metal and largely prevents the formation of the greasy smudge generally found."

HOSPITAL NOTES

The medical supply depot has recently ordered a large number of nail brushes of the so-called Tampico fiber, which are much cheaper than the nail brush heretofore issued by the naval medical supply depot. It has been found that these brushes are entirely satisfactory, being in use in a number of civil hospitals. It is not expected that the life of these brushes will be equal to that of the higher-priced article, but even if used a few times and then discarded they are proportionately much less expensive.

There has been recently installed a complete X-ray laboratory for the testing of tubes and other materials received on X-ray contracts at the Naval Medical Supply Depot. This laboratory has been found very valuable in eliminating poor tubes. It has also been useful in testing out tubes sent in from various stations for repair. It should be noted that in several instances tubes sent is as useless have been found to be good. This would indicate that the officer surveying these articles either had not inquired into the matter carefully or lacked the necessary knowledge as to whether the tube was properly functioning.

NAVY NURSE CORPS

DEFENSE DAY ROLL CALL

The roll call of nurses made by the Red Cross was indeed an inspiration, and binds tighter the bonds of loyalty and cooperation for the services of our country. The fact that 90 per cent of the nurses enrolled in the Red Cross responded, and the further fact that a Navy nurse was the first on the list will interest readers of this section.

Miss Noyes writes: "You will be interested, I am sure, to know that the first nurse to respond was a Navy nurse. We particularly appreciate the promptness with which the reports were submitted by the Chief Nurses in the Navy."

The question has been asked, "Why is it necessary for a Navy or Army nurse to respond to the Red Cross roll call?" It is not absolutely necessary except to weld together the nursing force of this country. We of the service are proud to be in the first line of defense and we are all proud also that we can affiliate with an organization, such as the Red Cross, that gives so much to the human individual needs.

We who are nurses, loving our profession for the service to mankind we are able to render, thereby carrying out the Christ spirit in our everyday lives, realize better than other people what the "Spirit of the Red Cross" does mean. Their motto, "I serve," thrills the truly sincere.

The following article, and totals compiled by Miss Noyes, make us proud of this sister organization. It was a splendid demonstration of the spirit of service and patriotism.

On Defense Day dreams were realized and hopes justified, for there was tangible proof that the spirit of service of the Red Cross nurses stands firm and true. Whatever may be believed in the secret places of the heart, it is infinitely more satisfactory to be shown that such faith is actually founded on fact. And it was so on September 12. Long before noon that day, cable responses from far distant lands, telegrams from all parts of the country, and letters poured into national headquarters indicating the fact

that all over the world, wherever they were, Red Cross nurses could be relied upon. For what was true of Washington was true to a far greater extent of division headquarters and nursing committee officers in every part of the United States, to which the bulk of individual replies went. Of the 41,000 enrolled Red Cross nurses, about 28,000 are on the active status list and 24,916 answered; that is, a return of approximately 90 per cent. In addition to this number there reported through the Red Cross nursing service 6,217 nurses not enrolled, 1,902 student nurses, 463 practical nurses, 141 home-defense nurses, 59 nurses' aides, 50 male nurses, and three dietitians, making the total response through national headquarters the splendid figure of 33,751.

Not only was the spirit of Red Cross nurses demonstrated beyond shadow of gainsaying but the efficiency of the nursing service was proved as great a fact. In this connection the Surgeon General's words as expressed by Maj. Julia C. Stimson, superintendent of the Army Nurse Corps, will interest all nurses:

> The Surgeon General has asked me to express to you his very great gratification and delight at the splendid response to the Defense Day test that was made by the reserve nurse force of the country. He took particular pains to tell General Pershing in person of the remarkable result of the roll call of Red Cross nurses. Once more the Army has been shown the preparedness and loyal patriotism of the nursing profession. We have had one more demonstration that when the need comes nurses can be depended upon, and our great expectation and confidence has not been disappointed.

Just what the individual spirit was may be seen from these extracts of typical replies sent in by Red Cross nurses. Miss Alice G. Carr, an American Red Cross nurse assigned to the Near East Relief and now in Corinth, Greece, wrote to Miss Noyes:

> We overseas do not know the extent of the force of all these things but our hearts are aching with the thought that we are not there with you on the great day that is to tell the story of our devotion and willingness to help in any way possible to make America all we would have it. Please let me send a message of congratulation to you and all the Red Cross workers for the standard of hope and blessing that this wonderful organization is bearing. I hasten to express the hope that Defense Day will by its message of strength and firm union implant in the heart of every individual the solemn spirit of our great congregation. . . . Be assured again of the great desire in my heart to further the cause of the mother organization we are all so proud of and love so dearly.

Miss Clara G. Finnerty, American Red Cross Nurse, Simsbury, Conn., thought only verse would do justice to the occasion and after beginning in delightful fashion, "My dear American Red Cross," went on:

Here I am, as you will see,
Ready for duty in Simsbury,
To serve the U. S. A. to-day
On this first National Defense Day.

To the Stars and Stripes, ever loyal and true,
Whatever you ask of me, I will do,
To defend "our country" and each "human life"
Is the work of "our nurses," whatever the strife.

The Red Cross nursing committee served nobly. Exact returns are not available for every division, but the Washington division committees are in direct contact with national headquarters and those are accessible. Here, of 67 nursing committees, but two failed to report. Miss Noyes has written the division directors asking them to express to the committees in their territory "my very deep appreciation of the work which they rendered in connection with this movement. We realized that we were calling upon a group of very busy women at an unfavorable time of the year to perform a piece of work, much of which must have seemed like repetition to them, and I am most anxious that they shall know not only the gratifying results of their effort but also how deeply we appreciate the fine work they accomplished."

Those Red Cross nurses who assembled at national headquarters before leaving to take part in the great defense test parade reviewed by the President, symbolized their colleagues everywhere participating in fact or in spirit. On a sunlight afternoon with shadows dappling the spectators beneath the spreading trees, a procession taking an hour and three-quarters to wend its way marched past the zero milestone of the United States, circled and wheeled on to the ellipse before the White House grounds, where the speeches were made. Among these thousands and thousands of khaki-clad men of the Regular Army—including the world flyers who had made air history and who had soared their globe-girdling way into Washington but two days or so before—the blue-garbed marines, the dark-coated civilians, the white-clad corps of women from Government departments and elsewhere, the band of Red Cross nurses with their distinctive red-lined blue cloaks over plain white uniforms stood out in colorful relief. A symbol indeed.

Division reports	Student nurses	Male nurses	Nurses' aids	Dietitians	Enrolled Red Cross nurses	Not enrolled	Home defense nurses	Practical nurses
Central	54			2	5, 931	1, 257		15
New England					2, 063	9		
Pacific			59		2, 804	124		
Southern	400				1, 026	608		152
Southwestern		39			1, 903	1, 156		93
Washington	1, 448	2		1	9, 505	2, 262	149	203
Total	1, 902	41	59	3	23, 232	5, 416	149	463
Foreign nurses					206	16		
U. S. Veterans' Bureau		4			668	465		
U. S. Public Health Service		5			194	130		
U. S. Navy					238	64		
U. S. Army					231	126		
No. 2 cards at headquarters pending transfer					147			
Grand total	1, 902	50	59	3	24, 916	6, 217	149	463

Application blanks reported as issued to date, 1,540.

INSTRUCTION OF HOSPITAL CORPSMEN IN THE NAVAL HOSPITALS

By Helen S. Wood, Nurse, United States Navy

The aim of classroom instruction of the Hospital Corps is increased efficiency in practical work. Any theoretical course, however imposing on paper, will prove detrimental if it does not produce this result. It is poor policy to give a man the theoretical knowledge that will enable him to pass his rating examinations unless at the same time he is awakened to a greater interest and pride in his practical work and a keener sense of responsibility. Obviously, classroom instruction can not accomplish this unaided. Success will depend chiefly on the policy of the hospital administration toward the Hospital Corps and interest and cooperation of the medical and nursing staffs. It will take a long pull, a strong pull, and a pull together, to bring the Hospital Corps to maximum efficiency.

The classroom instructor must make a constant endeavor, not only to present theory in an interesting manner, but to drive home its practical application. Coaching the average corpsman until he can write an examination paper on the isolation of infectious cases, is an easy task compared to convincing him that a gown does not afford magical protection, in spite of unwashed hands. The only remedy for this state of affairs (or of mind) is to bring classroom instruction and ward practice into as close relationship as possible. This is the goal we are striving toward at the naval hospital, San Diego,

Calif. Our theories and methods may be of interest to those who have similar aims.

All hospital corpsmen, below the rate of pharmacist's mate, second class, attend three classes weekly. Men on night duty are excused. Two of these classes are devoted to nursing subjects and one to anatomy and physiology. The men also attend four lectures a month by medical officers. Each class is divided into four sections. The class period is 30 minutes and there is a 15-minute interval between sections. During this interval the men who have been to class report back on duty, relieve those of the next section, and the roll call is checked as the men report. This arrangement takes only one-quarter of the men from the wards at one time, and makes the classes small enough to allow of individual recitation. The period, though short, is concentrated. The short time that men need be absent from their details reduces the necessary absence and tardiness to a minimum. Penalties incurred by the careless have almost abolished the unnecessary.

Last year the same work was given in all four sections, as all rates had about an equal preliminary training. This year two sections are used for pharmacist's mates, third class, and two for hospital apprentices, first and second class. All but 5 of the 50 pharmacist's mates have made their ratings at this station and since the first of last January. This year these men are being given advanced work, and repetition, except incidental review, avoided. A pharmacist's mate would not be rated if he did not have a theoretical knowledge of the elementary nursing procedures. If his methods of carrying out these procedures are not satisfactory, ward supervision will be required to correct them. A repetition of theory will not improve his technique and will lessen, not increase, his interest. This type of corpsman is satisfied with his own methods, and contemptuous of advice or criticism. On the wards there remains a chance of convincing him by the demonstration of actual results; in the classroom he can only be interested by entirely new subject matter. Fortunately, extremes of this type are rare. The majority of corpsmen are anxious to advance in rating, if not in knowledge. A few are serious students.

In the other two sections are 45 hospital apprentices, only 9 of whom have tried for a rating and failed. Failure in most of these cases was due to lack of general education. About 9 out of 10 of the apprentices are graduates of the Hospital Corps Training School, and have an elementary theoretical knowledge of nursing. Here the problem is to give classroom demonstrations that will best illustrate actual conditions on the wards, and so aid the men in applying their theoretical knowledge to the tasks at hand. The theory of a bed bath sounds simple. The patient with a fractured hip or the inflam-

matory rheumatism case makes it anything but simple in practice. The disillusioned beginner, unless carefully supervised, soon develops a theory of his own. Classroom teachings are useful for the passing of examinations but of little use otherwise. Corpsmen are not altogether to blame for this attitude, often it has been forced on them by circumstances. There is an unfortunate custom in some hospitals of detailing the inexperienced men to the more difficult wards—acute medical, contagious, etc. This is a poor policy. If there are any older men on these wards they are seldom efficient. The experienced and efficient men invariably have acquired "pull" enough to secure a more desirable detail. The nurse in an acute ward with 50 or more patients has little time for the personal supervision of individual corpsmen. The inexperienced new arrivals are bewildered. They do not know how to handle such patients and there is no one to teach them. Bewilderment changes to despair and then to indifference. Soon their one idea is to escape as much work and responsibilty as possible. Some of these men become permanent slackers. Others improve gradually when transferred to another detail. All have had their standard of accomplishment permanently lowered.

The details of students in the civilian training schools are rotated systematically. If this were done in naval hospitals the gain in efficiency and morale would more than compensate for the extra thought needed to plan the Hospital Corps detail. Every corpsman, before receiving the rate of pharmacist mate, third class, should have worked on medical, surgical, and contagious wards, and done at least one month's night duty. One half the men detailed to any ward could be changed monthly without disorganizing the ward. A study of our weekly efficiency reports shows that the large majority of corpsmen deteriorate in work and conduct if left for more than three months on one ward. This is especially true of the men who do long terms of night duty. If it were generally realized that a broader experience for each man would mean increased efficiency everywhere, and that the policy of as few changes as possible is a mistaken one, the problems of progressive Hospital Corps instruction would be greatly simplified.

Meanwhile the question is, how can the instructor's time be used to best advantage under present conditions? Real accomplishment can not be gauged by the number of classes held or the subjects covered. It will be indicated by gradual improvement in ward work and a keener interest in advancement. We believe that instruction and supervision on the ward give results that fully justify the time and effort expended. It forges a strong link between the ward and the classroom. Last year the instructor at this hospital spent an average of 12 hours a week on the wards. This time was not laid out by

schedule, but given as occasion arose, where it could be used to the best advantage. Corpsmen were assisted in the care of very ill patients, treatments were supervised, or a man on a new detail aided in systematizing his work. An hour's work *with* a corpsman will accomplish more in the training of that corpsman than 10 hours of classroom lecture or demonstration. Aside from any gain in dexterity is the psychological effect. He has helped to do a difficult task instead of watching some one else play at doing it. He has seen the value of theoretical knowledge reduced to practical terms, and will accept it the more readily the next time. On the other hand, the instructor has learned something. She has found out what is remembered and what is not, where there have been chances for misunderstanding, and knows better where to place emphasis in future lessons.

There are other ways in which an instructor's presence on the wards may prove of value. It can be used to help standardize the wards. With the cooperation of the ward nurses, procedures can be carried out in the same manner on all wards and as they have been taught in the classroom. A variety of methods, though equally good, leads to confusion. The corpsmen protest that "Miss So and So does not do it that way," and privately conclude that if three ways are right, any way is right enough. Where only one method is used they naturally accept it. Ether beds, thermometer, sick-call, and other trays, as well as the routine duties of the corpsmen, can be made uniform. We experimented with a standard list of treatment trays. This was prepared by the instructor, revised by the chief nurse and medical officers, and a copy placed on each ward. The list included the articles needed for simple treatments, as eye and ear irrigations, serum injections, etc., as well as chest aspiration, abdominal and thoracic paracentesis, intravenous infusion, hypodermoclysis, lumbar puncture, and catheterization. A paragraph on the technique of catheterization was needed. These lists have saved time in the setting up of trays and the checking of supplies needed, and have made it easier for the corpsmen to set up a tray or give a treatment as they have been taught. This list is used as the basis of classroom lectures. Lessons on the preparation of patients for operation, admission of patients, etc., are also based on ward standing orders.

No one profits more from the time spent in ward supervision than the instructor. It keeps her in touch with the entire hospital. She is able to judge the corpsmen by other than classroom standards, and to discover where her teaching is producing results and where it is not. The "why" of failure may lie in classroom methods or in other conditions. It will also supply her with the local illustrations necessary to emphasize important points. Any unusual case is discussed

among the corpsmen, and they are apt to bring questions concerning it to class. This interest can be turned to valuable account. The planned lesson may be neglected and the subject of special interest given entire attention. An instructor who is in touch with the wards is prepared to utilize whatever occurrences arouse interest. Men who possess special knowledge, by reason of their details, as laboratory, X ray, surgery, etc., are referred to whenever questions concerning such work arise in class. Valuable suggestions come from this source at times. A pharmacist's mate in the laboratory proposed that pictures taken after a barium enema be used in illustrating the lesson on enemata. X-ray plates always arouse interest, and where they are applicable make a deeper impression than do charts or textbook illustrations.

Lectures, demonstrations, blackboard notes and diagrams, as well as the oral quiz and written examinations, are used in class work. During the last 10 months 83 men have taken written examinations for advancement in rating; 13 failed to make a grade of 3.00 in nursing, and 19 in anatomy and physiology. "Review classes" are held for corpsmen who, due to illness, night duty, or other causes, have been absent from class. These classes are devoted to demonstrations, work not easily made up outside of the classroom.

The new handbook has proved of great value. A third of the men own copies. Those belonging to the hospital are kept in the classroom and issued by the instructor. They were formerly in the general library. Since the change of location their circulation has doubled.

The instructor keeps a card record of every corpsman below the rate of pharmacist's mate, second class. On this are recorded the date of arrival and previous station, all changes of detail, weekly efficiency reports from the nurses, class standing, examination grades, changes of rating, and any other facts or comments of interest.

PRACTICAL NURSING FOR HOSPITAL CORPSMAN

By Elizabeth M. O'Brien, Nurse, United States Navy

During the fourth school month at the Hospital Corps Training School, Mare Island, Calif., every class devotes two weeks to the study of demonstrations in practical nursing. A ward is equipped for this purpose. The members of the class lend themselves to illustrate the work. Divided in pairs, they gain some knowledge of the simple procedures by practicing on one another. On account of the number of subjects to be covered there is seldom time for repetition of demonstrations. Facility in handling patients and treatments only comes from practice, and the men who are sent from the school

to the hospital ward must unavoidably present an awkward performance in the discharge of their initial duties. The short, rushed school period can not impart the skill and ability that are necessary for the proper execution of the work assigned to a Hospital Corpsman. Men are innately opposed to much of the work demanded in nursing, therefore require more time in teaching than the school allows. The promise of a higher rating is an artificial stimulation of interest, which holds them to the tasks that are involved in the care of the sick. Only the unusual student readily adapts himself to hospital work. This unusual student will almost invariably show his adaptability during his two weeks' study of practical nursing.

Temperature, pulse, and respiration are the first procedures taught. Nearly all of the men experience taking temperature and pulse before reaching the last class. The mercury of the thermometer seems to excite sufficient interest to impel a desire for correct reading. However, each man must prove his efficiency in and understanding of the work. Except when there are sick patients in the ward, a class will be passed on without practical knowledge of any except the normal conditions of these vital functions. Their first introduction to the abnormal will undoubtedly cause some definite reaction.

Bed making presents difficulties to almost every student. Fixing a tight bottom sheet, and arranging corners on beds calls for a certain ability that is uncommon in men. That a sheet has a top and a bottom and certain fixed arrangements is new and uninteresting material to cope with. It requires considerable repetition with attention in order to make a bed neat and correct. A man will pass high in theoretical work and entirely fail in mastering the set of a bed spread. Many of the Hospital Corpsmen will classify bed making with the uncongenial tasks that must be avoided if possible.

Baths are an easy subject. The men in the school bathe every day, therefore this procedure fails to be very impressive, although the students carry out the routine required on a patient who has been neglected or deprived of bathing facilities.

Giving hypodermics is an interesting but often a terrifying experience. These men who unthinkingly punch one another in the face, or stamp on one another in a football game, exhibit marked tenderness when they have to insert a needle into the husky arm of a classmate. Some are ready to faint when they begin to prepare the hypodermic. After they have once given a hypodermic their courage is bolstered and their fear somewhat mitigated. This is perfectly normal behavior. Almost every nurse can remember the dull sinking feeling that accompanied her first thrust of a needle into soft, resisting flesh.

Making an ether bed, arrangement of pillows, lifting and turning a patient are demonstrated for every class. It is impossible for the

men to remember all the details that round out this lesson, unless they are transferred to a surgical ward as soon as they leave the school. If they are detailed elsewhere most of this instruction is lost.

The manner in which to proceed when giving a hot pack or a cold pack is displayed by pantomime. Giving the actual hot pack to one of the class, means that he must remain in bed at least one-half of the day to avoid a possible cold. These healthy young men react to a pack much more satisfactorily than does the serious kidney case where we are eagerly looking for beneficial results of this treatment. The cold pack, too, holds a student too long in bed.

Eye, ear, nose, and throat irrigations are given. Members of the lower classes are sometimes ordered to the ward for one of these treatments. When this occurs the class has an opportunity to recognize the reason for the nursing procedure, and the manner of carrying out the treatment is fixed in their minds. The delicate nature of these organs does not permit the students to practice on one another, and some of the fine points in technique are soon forgotten.

Making out charts requires practice in printing. The men who have had a course in lettering in high school make excellent charts. Those who do not take much interest in learning to print do poor work. Anyone can master printing by a small amount of persistency in practice. There is no time in the last class for this practice, and the instructor must be content if the men grasp the principle of making clinical notes.

Practical dietetics is always a pleasant class. A knowledge of the simple liquid and soft diets is obtained. The men are permitted to eat what they cook. Being real boys they consider this a treat. After preparing the different foodstuffs they know how an eggnog or a poached egg should be served to a patient. They learn how to combine the ingredients for orange albumen, how a cup of cocoa should be made and the preparation of a single serving of gelatin. Other liquids and different ways of preparing eggs are taught. This class also embraces the care of the diet kitchen, cooking utensils, and washing dishes. Washing the dishes naturally somewhat dims this otherwise perfect class.

Some time is spent in viewing operations. This is not possible for every class. The pharmacist mates occupy all the available space in the operating room during their period of practical instruction. The junior operating room gives the class an opportunity to see how tonsils are removed. The operator explains the operation and the instruments used. This is very impressive and gives them an idea of the skillful work. Many of them express a wish to be surgeons, or at least to know something more about surgery. Very seldom does this feeling persist.

Dressings are made for the hospital either in the school ward or in the hospital dressing room. Folding gauze is a simple but often a monotous procedure for the practical class.

The morning sick call which is held for all students of the school, offers a variety of nursing instruction. The doctor explains anything of interest in medicine and treatments. Boils are incised, ingrown toenails treated, compresses applied, medicines ordered, temperatures taken, and bandages applied. Laboratory and X-ray slips are made out. Patients with slight illnesses are ordered to bed, and the students carry on bedside nursing. All very ill patients are immediately transferred to the hospital.

This completes the two weeks' work. Sometimes a holiday cuts into the classes and a couple of subjects are lost. The students do not, however, miss any of the more important procedures that will confront them in whatever ward the detail assigns them.

For the most part the men who are sent from the training station to the school are good material. They are recruited principally from the Northern and Middle-Western States. Most of them have had something of a high-school education. They are not so very different from women who are beginning training except that women are more adapted to the work. The serious import of caring for the sick is not so indelibly stamped on their senses as it is on the probationer. The young nurse placed in a large hospital has before her a mirror of the great tragedies of life and can not fail to receive impressions that are different from those which a Hospital Corpsman receives when placed in a ward where youth is flagrant and the possibilities of recovery beyond stating.

Hospital Corpsmen are criticized mostly for their attitude toward nursing. Complaints reach the school of their qualifications in this line of work. The school can not possibly give these men any more than a ground work for further study. If after four months' school work they are detailed outside of a hospital ward, their school work is lost. If they are detailed outside a ward before they have complete knowledge of bedside nursing their instruction is lost. The object of training Hospital Corpsmen is lost if it be forgotten that in the event of a great national calamity every detail which he occupies could be filled by a hastily recruited civilian, except that of caring for the sick. Only he can do this work and according to his ability will precious lives be saved or lost.

The nursing problem will always intrude more or less in the making of a Hospital Corpsman. His inherent traits will form a defense that is difficult for either him or his instructor to overcome. By keeping in mind his difficulty in attaining facile technique, the nurse who receives these men from the school can lead them on to some realization of the serious work that nursing entails.

BOOK NOTICES

Publishers submitting books for review are requested to address them as follows:

The Editor,
U. S. Naval Medical Bulletin,
Bureau of Medicine and Surgery, Navy Department,
Washington, D. C.

For review.

APPLIED ANATOMY. THE CONSTRUCTION OF THE HUMAN BODY CONSIDERED IN RELATION TO ITS FUNCTIONS, DISEASES AND INJURIES, by *Gwilym G. Davis, M. D., late professor of orthopedic surgery and associate professor of applied anatomy in the University of Pennsylvania.* Revised by *George P. Muller, M. D., professor of clinical surgery in the University of Pennsylvania; surgeon to the University and Misercordia Hospitals.* Sixth edition. J. B. Lippincott Co., Philadelphia, 1924.

This new edition of Doctor Davis' masterpiece, appearing after a hiatus of six years, is welcome. The choice of a successor to carry on the work of the original author was wisely made, for few men are so well equipped with the combination of anatomical knowledge, surgical experience, and literary ability as Doctor Muller. Mr. Erwin F. Faber, the artist, who produced the illustrations from Doctor Davis's dissections for the previous editions, continues his admirable work in this revision.

The object of the book is not to teach plain anatomical facts nor is it an operative surgery, but it attempts to teach surgical principles through the medium of anatomical relations and to show the relation of structure to function. "Anatomy made interesting" might truthfully be used by the publishers as a blurb in advertising the book.

In the pages descriptive of factures of the skull and injuries of its contents there is an example of brevity, clearness, and accuracy that might well be studied by other writers of medical literature. Fractures, dislocations, herniæ, ligation of vessels, fasciæ and bursæ, amputations, and the anatomy of the neck are also particularly well covered both in text and illustrations.

Some defects are present and they are the sort one would look for in a hastily prepared first edition rather than a leisurely revision. Typographical errors are quite numerous; several illustrations have

incorrect legends, for example, Figure 77, and one suspects that Figures 66b and 66e should be transposed. There are occasional misspelled words, grammatical errors, and faulty spelling of foreign proper names. These few minor faults were found in the course of many hours' study of the book and they do not, in any way, impair the usefulness and accuracy of the edition.

For many years the reviewer has kept this Applied Anatomy always close at hand and has used it almost daily for quick reference in emergency, in preparing for examinations, and working out the details and technic of operations. The new edition is recommended as superior to its predecessors.

A Textbook of Surgical Handicraft, by *J. Renfrew White, M. S., F. R. C. S. (Eng.), assistant surgeon and surgeon in charge of the orthopædic department, Dunedin Hospital, New Zealand; tutor and assistant lecturer in clinical surgery, University of Otago, New Zealand; lecturer in the Dunedin Hospital School of Physiotherapy; active member of the British Orthopædic Association.* The Macmillan Co., New York, 1924.

This book was compiled for the use of junior students, to assist them in grasping the reason for and the details of their daily work in the wards and operating room.

It covers the details of asepsis and antisepsis, sterilization, surgical materials, bandaging and adhesive strapping, hemorrhage, knots, ligatures and sutures, operative technic, postoperative treatment, use of heat and cold, and treatment of wounds.

This is a very practical manual, done very much in the British manner. Many of the materials and methods have names that are practically unknown in this country. But, even with this handicap, it should prove useful to students, internes, and ward officers.

The Clinical Examination of Surgical Cases, by *J. Renfrew White, M. S., F. R. C. S. (Eng.), assistant surgeon and surgeon in charge of orthopædic department, Dunedin Hospital, New Zealand; tutor in surgery Otago Medical School, New Zealand; active member, British Orthopædic Association.* The Macmillan Co., New York, 1924.

The twofold purpose of this little book is to help make the examination of cases more rapid, thorough, and systematic, also to aid in working out the diagnosis of obscure cases.

It opens with an outline of the general method of investigation and record of surgical cases and then takes up the method of investigation and record of various pathological lesions as ulcer, fistula, joint derangements, and enlarged glands. Lesions and injuries in different parts of the body are then considered; among them are head injuries, fractures of the long bones, injuries of the back, and lesions of the face, lips, and jaws. Other outlines cover the investigation of special symptoms, such as dysphagia, dyspnoea, hematemesis, and jaundice. In all, 67 outlines for methodical investigation are given.

This book should prove useful to students, internes, and ward officers, as well as to teachers of clinical surgery.

A CRITICAL EXAMINATION OF PSYCHO-ANALYSIS, by *A. Wohlgemuth, D. Sc., London.* The Macmillan Company, New York, 1924.

In this iconoclastic volume the scholarly author attempts to show in a convincing manner the numerous fallacies of the so-called "psychoanalysis" of Dr. Sigmund Freud. The author claims that "nowhere in the whole of Freud's writings is there a shred of a proof, only assertions, assertions of having proved something before, but which has never been done, and mysterious reference to inaccessible and unpublished results of psychoanalyses. Almost complete ignorance is manifested everywhere of the literature and the results of modern psychology, of experimental method, and of logic."

Dr. Wohlgemuth states: "I did not approach the subject years ago as an unsympathetic critic who had his own axe to grind. On the contrary, I took to it rather favorably, especially after the difference of the latent dream thoughts and the manifest dream content appeared clear to me. Only after my suspicions had been aroused by the Gradiva analyses did I begin to look critically at the subject and realize my awful mistake.

"That I have not written this criticism before has its reason in this: For psychologists, in general, psychoanalysis was stillborn and has ever been as dead as a doornail. Only when, owing to the propaganda of psychoanalysts in the press, the general public began to take an interest in the subject, but especially when I saw that some medical men and, worse still, educationists, appeared to be taken in by the psychoanalytic confidence trick, did I decide to warn the unwary."

In the first chapter of his book the author states the most elementary facts of psychological teaching in order that the non-psychological reader may be enabled to follow him in his criticisms. He points out that psychology is literally the "science of the soul," and by the term "soul" the psychologist means nothing but the sum total of the psychic phenomena. He refers to the view that all introspection was retrospection, and contends that the opposite is really the fact, viz, that cases of so-called retrospection are but cases of introspection of revived mental processes. In dealing with the Freudian "unconscious" he endeavors to show its absurdity, pointing out that it is a contradiction in terms.

In the second chapter is given a short account of Freud's doctrine of psychoanalysis, which, according to Dr. Wohlgemuth, is not what the literal meaning of the word purposes to convey, namely, an analysis of the psyche or soul. In psychoanalysis there is not even a pretense of an analysis of mental processes as understood by the

psychologist. It means searching for so-called repressed ideas which are unconscious and unable to become conscious in the ordinary way, yet which influence or determine an individual's thought, speech, or action. In the words of one of Freud's exponents, "Psychoanalysis is a scientifically grounded method devoted to neurotic and mentally deranged persons, as well as to normal individuals, which seeks by the collection and interpretation of associations, with the avoidance of suggestion and hypnosis, to investigate and influence the instinctive forces and contents of mental life lying below the threshold of consciousness."

In his chapter on "Dreams" the author points to the strangeness of the procedure of Freud's followers in requiring their critics to disprove the correctness of the Traumdeutung. The fact that they do so shows, in his estimation, that they are, if only dimly, aware that they have not been able to prove their doctrine. Numerous examples are given in the author's exposition of Freud's way of "reasoning." He says that Freud "makes an assertion, defends it on the ground of its plausibility, and then on the next page he refers to the assertion as a 'fact,' or, 'as I have shown or demonstrated, etc.' For instance, he asserts that the dream is a wish fulfillment. The objection that there are dreams which apparently are not so, he meets with another assertion that such dreams are distorted, that the manifest dream content is something wholly different from the latent dream content. This for him constitutes a proof, and he refers to it henceforth as 'the fact of dream distortion.' Most of Freud's 'proofs' consist of this argument in a circle. Another way he adopts is to answer imaginary critics of his assertions. Thus, e. g., objections to his method of arriving at the latent dream content he refutes, apparently to his own satisfaction. But if these answers are dissected and examined, as I have done, they are invariably found to be meaningless, or to be false, or to be valueless. Thus, his defense of his dream analysis I showed to contain five points, every one of which was invalid.

"The paradoxical statement that 'the dream is the protector of sleep and not its interrupter' is amusing in so far as it shows the utter absurdity of the Traumdeutung.

"A third kind of 'proof' Freud adopts is by way of a simile, or reasoning by analogy. But this is invariably faulty; he generally assumes in the simile as present the very thing he ought to prove, and if, as I have done, the simile is modified so as to contain not any more factors than are present in the argument he wishes to illustrate by the analogy, then Freud is beaten with his own weapon.

"All this distortion, condensation, displacement, and whatnot are merely devices to give Freud greater latitude for his interpretation. The same remark refers to the statement that the effect may be in-

verted from the latent to manifest content; this is, as I said, a case of 'heads I win, tails you lose.' 'Secondary elaboration' is still another nostrum to the same end, as is also the importance attached to the dream being retold in different words by the dreamer."

Freud's conclusion that the dream is a "wish-fulfillment" is rejected by Wohlgemuth because Freud makes unrestrained use of symbolism, because of unwarranted license in interpretation, and because "of the total absence here, as everywhere else in his writings, of any proof whatever."

Says Wohlgemuth:

"It is not the ordinary conscious unfulfilled wish that is realized in the dream, such a wish as a child would realize in his play, e. g., to be a soldier, if a boy, and a mother, if a girl. It is a repressed, or unconscious, wish. Freud holds 'that only then can a conscious wish become the originator of a dream when it is possible for it to rouse a corresponding unconscious one with which it can strengthen itself.' 'The wish that presents itself in the dream must be an infantile one.' 'The dream is a piece of the past life of the infantile soul.' 'As long as the sleep lasts we know as surely that we dream as we know that we sleep,' says Freud. This has a truly Delphian sound!

"If the patient is told by the psychoanalyst that he, the psychoanalyst, has been successful in unmasking, in unearthing, an infantile wish—the unsympathetic critic says concocting, fabricating—then there are two possibilities: The patient may admit that he may possibly have had such a thought, remembering or not remembering it, or he may deny that he ever had the wish, or that even the thought ever occurred to him. If then he admit it, there is the proof; if he deny it, this very denial indicates a resistance, and the stronger the denial, or resistance, the greater the proof of the exactness of the analysis. Therefore the analysis is correct in every case. Q. E. D.!

"When the psychoanalyst is very hard pressed, he generally falls back upon the great number of dreams analyzed, as a proof of the correctness of the psychoanalytic doctrine. Thus Stekel boasts that he has analyzed thousands of dreams. But this is just as much a proof of the ease with which one can concoct anything out of a dream, or out of anything else for all that, by the psychoanalytic method. Surely it is no proof whatever that a dream has a particular meaning."

Chapter IV is devoted to "symbolism," which plays such a paramount part in dream interpretation, since the manifest dream content is said to consist of symbols expressing the latent dream thoughts. The author devotes minute inquiry to the serpent as a symbol in dreams, and he shows how first of all the serpent became a symbol of longevity and then of immortality. From this de-

veloped the symbolic meaning of divinity, health, health giving, or healing art, and wisdom, in turn, and not at all as held by psychoanalytic writers, as a symbol of phallic significance. He also gives several examples of representations of manifest erotic scenes where other phallic and kindred symbols were given, but the serpent was conspicuous by its absence. Many of Freud's "symbols" are held up to ridicule.

Chapter V is devoted to the so-called "Œdipus complex," by which Freud understands "an incestuous desire of the child for the parent of the opposite sex, accompanied by jealousy toward the parent of the same sex, and by the wish, mostly unconscious, to get rid of him, or her, by killing. This 'complex' is said to exist not only among neuropaths, but to be common also with normal persons." We are told that the interpretation of dreams furnishes us with examples of this complex. Wohlgemuth, however, claims that there is no proof whatever of this, and that this supposed symbolism depends entirely upon the mental make-up of the interpreter. "If the mind of the latter is perverted, permeated with filth, he will construe the most innocent dreams into expressions of the most revolting ideas. . . . The interpretation of dreams is the *via regia* to the unconscious of the psychoanalyst!" The author concludes that there is no evidence whatever in the normal individual for the existence of the Œdipus complex.

Chapter VI is devoted to the assertion of Freud's that all men, normal men not excepted, have homosexual tendencies. The author states that in the paper by Freud from which he took this dictum there is not a shred of proof. "In fact, Freud states distinctly that he 'supplemented' the patient's pollutions 'by homosexual phantasies that remained unconscious!' Unconscious ideas are, as I have explained repeatedly, to say the least, simply nonsense. Undismayed, however, I decided, with a perfectly open and unbiased mind, to ascertain the truth and to experiment upon myself and introspect." The experiment is described, which turned out negatively. Wohlgemuth claims that Freud's assertion relative to the homosexual tendencies of all men is absolutely groundless, and he is inclined to believe that "the majority of men, doubtless also of women, are normally heterosexual, and without a tinge of the stigma of homosexuality."

"I expect, of course, that Freud and his followers will retort by saying that my experiments merely prove that no homosexual tendencies are conscious in me, but that by psychoanalytic technic they would be able to unravel them in my 'unconscious.' This, of course, would be a quite gratuitous assertion, as their psychoanalytic method merely discovers in the patient what the psychoanalyst has been putting there himself."

Chapter VII is devoted to the psychoanalytic method and suggestion. In this and preceding chapters Wohlgemuth points out that the psychoanalytic method was evolved out of Breuer's "cathartic method," that nowhere has Freud ever furnished any scientific proof for his theories, and that those theories are reduced to absurdity by applying them to the interpretation of dreams with respect to a person other than the dreamer.

With respect to the claim of the Freudians that their numerous cures which have been effected by means of psychoanalysis constitute an undeniable proof of the correctness of their doctrine, Wohlgemuth asserts that "it seems beyond doubt that cures have been effected by the psychoanalytic method. It is also evident that those points wherein the different schools of psychoanalysis, Freud, Adler, Jung, etc., differ can not possibly be of any consequence, since all claim to have obtained good results by their respective methods, and doubtless have done so. Thus it appears rational to assume that a common factor is active in the various methods of procedure, psychoanalytic and otherwise. And this common factor I hold to be *suggestion*, pure and simple, and nothing else. I know the psychoanalysts are up in arms against such a view, and contend that the procedure in suggestion is the exact opposite of that of the psychoanalytic method."

A quotation from Ernest Jones, a pro-Freudian, is given wherein it is stated that "a criticism sometimes made of the psychoanalytic treatment that its brilliant (*sic*) results are brought about merely by suggestion betrays a complete ignorance of what actually happens."

Says Wohlgemuth:

"I am afraid the 'complete ignorance' is on the side of the psychoanalysts, at least with reference to the meaning of suggestion. If I want to cure a man of constipation with castor oil, it is idle to pour it over him; I must get him to swallow the stuff. If I want to cure a man of some hysteric stigma, I must get him *to accept the suggestion*. If it can not be done by telling him, whether in hypnosis or otherwise, that the stigma will disappear, or *a la Coue*, by his incessant repetition that he is getting better, I may, perhaps, be more successful in making him believe that he is suffering from some 'complex,' and then 'discover' it by the psychoanalytic method. I must get him to *accept* the suggestion, and this is the *sine qua non*. The hypnotic suggestions were not accepted by Ernest Jones' patients, whilst the suggestion that some rediscovered forgotten memory was the cause of certain symptoms *was* accepted. That's all."

Additional comment is made by the author on the various theories of hysteria and other neuroses, and their treatment by suggestion

and psychotherapy. Kraepelin is quoted as saying that "hysteric troubles have a tendency to diminish and disappear with age; it is rare that they last for decades." The author states that inasmuch as "suggestion is the principal factor operative in psychoanalysis and pithiatism (curing by persuasion) is avowedly practiced, it is only natural that cures can and have been affected by psychoanalytic treatment. On the other hand, cases which have resisted suggestive treatment have yielded to a methodical occupation therapy with planlike arranged deviation of the attention and a strict injunction to the patient not to speak of the past experiences. But very great harm may be often done by the recalling of old memories. 'An emotional storm may be unloosed, the results of which are quite incalculable. Not only may pathological phenomena be increased, but new ones produced.'"

There is not much of importance in the last three chapters of Wohlgemuth's book. The author holds up to ridicule Freud's comparison of himself with Copernicus and Darwin, asserting that "Darwin discovered 'the descent of man,' and Freud discovered that there wasn't a decent man. Darwin was for 20 years dreaming of the 'origin of species,' but Freud presented us in a shorter time with a specious origin of dreaming."

The flavor of polemics is pronounced throughout the book, and the impression is made of a book written under the stress of emotion. Had it been written with something more of restraint and reserve, it is believed that the effect would have been greater.

THE DIVISION OF PREVENTIVE MEDICINE

Lieut. Commander J. R. PHELPS, Medical Corps, United States Navy, in charge

Notes on Preventive Medicine for Medical Officers, United States Navy

A FATAL CASE OF ACUTE POISONING BY NEOARSPHENAMINE—COMMENT

A death occurred at the naval proving ground, Dahlgren, Va., October 21, 1924, about one hour after an intravenous injection of neoarsphenamine. The post-mortem findings were similar to those which have been found in carefully studied cases in the United States, Canada, and Europe, where death has followed shortly—in a few hours to three or four days—after the intravenous injection of a therapeutic dose of salvarsan, arsphenamine, or other acid arsenobenzol preparation. In fact, if a mistake had been made in this case and an unneutralized solution of arsphenamine had been injected, the result, death in one hour, or after a few hours, might well have been expected in view of the recorded results of such accidents.

The unfortunate mistake has been made often enough in this country and abroad to lead to the accumulation of a sufficient number of adequately studied cases to give a picture of what usually happens when the acid salt is introduced directly into the circulation. There is a profound effect upon the vasomotor system; the patient develops symptoms similar to those of surgical shock, with or without vomiting and diarrhea, and after death there is found intense engorgement of the tissues of the gastrointestinal tract and brain with punctate hemorrhages.

In this case, according to the label on the ampule, 0.9 gram of neoarsphenamine was injected intravenously with due care and proper technic. It is the first instance of a quickly fatal accident, with neoarsphenamine in the United States Navy, and so far as can be ascertained only one other apparently well-authenticated case has occurred in the United States with death following an injection of neoarsphenamine within a few hours. In that case death followed the intravenous injection of 0.9 gram neoarsphenamine in 8 hours and 45 minutes. The cause of death, as signed by the coroner's physician in Chicago, was shock following the injection of the drug associated with status lymphaticus. The autopsy re-

vealed congenital absence of the right kidney, a small stone in the left kidney, evidence of miliary tuberculosis of the apices of both lungs, and tuberculous lesions in the spleen and liver. The victim was 27 years of age at the time of his death, September 26, 1919.

One case was recorded in the Navy in 1920 in which death occurred 11 hours and 50 minutes after the second dose (0.6 gram) of novarsenobenzol (Billon). That case, which was reported from Constantinople, Turkey, is described with others below.

Data of varying completeness and value have been secured for several cases in which death has occurred in from 48 hours to a few days after the administration of neoarsphenamine. While such cases possibly represent the same kind of poisoning by the arsenic-containing compound the clinical picture is different when the manifestations of poisoning are delayed.

The history of the case at the naval proving ground, Dahlgren, Va., is as follows: A fireman, first class; white; age, 28 years and 6 months at the time of his death. He was first admitted to the sick list with syphilis in the secondary stage May 13, 1921. At that time he was treated for five weeks at the United States naval hospital, Chelsea, Mass., receiving while in hospital six injections of arsphenamine, 0.6 gram each, and six injections of salicylate of mercury, 0.1 gram each. After some further treatment on board the U. S. S. *Murray* he was transferred to the United States naval hospital, Norfolk, Va., October 24, 1921, and treated in hospital until December 6, 1921. During that period he was given mercury and neoarsphenamine injections as listed.

Oct. 24, 1921—Succinimid	grain	1/5
Oct. 26, 1921—Neoarsphenamine	gram	0.6
Oct. 28, 1921—Succinimid	grain	2/5
Oct. 30, 1921—Succinimid	do	3/5
Nov. 2, 1921—Neoarsphenamine	gram	.9
Nov. 4, 1921—Mercury oxycyanid	grain	1
Nov. 7, 1921—Mercury oxycyanid	do	1
Nov. 10, 1921—Neoarsphenamine	gram	.9
Nov. 11, 1921—Mercury oxycyanid	grain	1
Nov. 14, 1921—Mercury oxycyanid	do	1
Nov. 17, 1921—Neoarsphenamine	gram	.9
Nov. 18, 1921—Mercury oxycyanid	grain	1
Nov. 21, 1921—Mercury oxycyanid	do	1
Nov. 23, 1921—Neoarsphenamine	gram	.9
Nov. 25, 1921—Mercury oxycyanid	grain	1
Nov. 28, 1921—Mercury oxycyanid	do	1
Nov. 30, 1921—Neoarsphenamine	gram	.9
Dec. 2, 1921—Mercury oxycyanid	grain	1
Dec. 5, 1921—Mercury oxycyanid	do	1

October 24, 1921, his blood serum gave a strongly positive Noguchi test. While at the Norfolk hospital he was given six injections of

neoarsphenamine, 0.9 gram each; three intramuscular injections of mercury succinimid, one-fifth, two-fifths, and three-fifths grain, respectively; and 10 injections of oxycyanid of mercury, 1 grain each. He was discharged to duty, improved, with a negative Noguchi reaction, December 6, 1921. His second enlistment expired March 2, 1922.

He reenlisted June 28, 1922, having had four years and two months previous service. His record does not indicate that he received any treatment for syphilis thereafter for about two and one-half months when he applied for treatment stating he had contracted the disease about a year and a half before and that he had been without treatment for about nine months. His blood serum gave a positive 4 plus Wassermann reaction and he was transferred to the United States naval hospital, Philadelphia, Pa., September 15, 1922.

In hospital it was noted that he had a severe reaction to neoarsphenamine October 12, 1922. Neither the dose given nor the character of the reaction was described. The record does not state what treatment was given subsequently. It is noted under date of October 19, 1922, that he had no active symptoms and gave a negative Wassermann test. He was discharged to duty that day with the recommendation that treatment be continued with iodide and mercury.

His health record does not indicate that he received any further treatment for syphilis until October 7, 1924, at Dahlgren, Va., after the lapse of about two years.

In testifying before the board of inquest, which met after his death on October 21, 1924, the medical officer who treated him stated that he was first seen about six weeks before the fatal injection. At that time he complained of nervousness, insomnia, anorexia, and loss of weight. He was treated for about three weeks without specific remedies when his condition began to grow worse. He had also developed an ulcer in the pharynx. He was then put on antisyphilitic treatment. October 7, 1924, he was given 0.45 gram of neoarsphenamine by intravenous injection without reaction. He was also put on mercury rubs, 1 gram each day for five days, with a steam bath following the fifth rub. One week after the first injection he was given, October 14, 1924, 0.9 gram neoarsphenamine without reaction. At that time it was noted that he had improved considerably and that he had regained several pounds of the 18 or 20 pounds he had recently lost. He stated that his appetite, nervousness, etc., were better and that he felt better than he had for months. The treatment was continued.

A week later, October 21, 1924, he reported at the dispensary for his third injection of neoarsphenamine at about 1.30 p. m. He seemed to be in good physical condition. The injection of 0.9 gram

neoarsphenamine was given at 2 p. m. with the same technic used for the previous injections. Within a few minutes after the injection which took approximately 10 minutes, the patient complained of nausea, commenced to vomit, and perspired freely. His pupils were seen to be dilated. His skin was cold and clammy. Presently, a severe diarrhea began. His pulse was rapid, weak, and thready. He had no pain. The symptoms suggested severe shock, and emergency treatment suitable for shock was begun at once. He was placed in bed; the foot of the bed was elevated; and he was surrounded with hot-water bottles. Salt solution was given by rectum and hypodermic injections of strychnine and adrenalin solution were given. All treatment was without effect and he died at 3.10 p. m., one hour after the injection of the arsenical compound.

The neoarsphenamine was of the same lot as given in the two previous injections. It was from the same package which had been obtained from the United States Naval Medical Supply Depot, Brooklyn, N. Y. Both before and after the solution was made up, it had the same appearance as that used for the previous administrations, which, as noted above, were not followed by unpleasant reactions. The lot was not outlawed as to age. There was no reason of any kind to believe that the injection would prove dangerous. The technic used was the accepted standard technic. No difficulty was experienced. It was injected slowly and during the administration there was no change in color or indication of sediment or anything whatever that might cause a careful observer to believe that it was not all right in every way. The medical officer himself prepared the solution, injected it, and supervised all preparations for administering the dose.

No arsephenamine had been used at the station and there was no ampule of the same there. No neoarsphenamine had been obtained from any source other than the naval medical supply depot. The label belonging to the fatal dose and the empty ampule were saved. The unused ampules were labeled "neo" and the contents were normal in appearance. The possibility of a mistake either at Dahlgren or at the medical supply depot would seem to have been eliminated. There is little or no likelihood of mislabeling at the factory, and again, two ampules from the same package were used without causing reactions.

A complete autopsy was performed about 24 hours after death by Lieut. R. M. Choisser, Medical Corps, United States Navy, pathologist for the United States Naval Hospital, Washington, D. C., and instructor in pathology at the United States Naval Medical School. The report of the autopsy was as follows:

REPORT OF AUTOPSY

White male, apparently 30 years of age, well developed and nourished. Color of hair, dark brown. Color of eyes, blue. Pupils dilated and equal. Teeth well preserved. No foreign body in nose or throat. No external evidence of violence. Rigor mortis well developed throughout the entire body. Two minute wounds 1 centimeter apart are on the dorsal median surface of the right upper arm, apparently the result of hypodermic injections. In the left arm, in the antecubital space, a minute wound is noted surrounded by a small area of discoloration.

The usual midline incision extending from the manubrium sterni to the symphysis pubis reveals a good amount of adipose tissue. The color is more of an orange yellow than normal. The muscles are well developed and reddish brown. The peritoneum shows a slight congestion but this does not appear to be of inflammatory origin. No free fluid found in the abdominal cavity. The pericardial sac shows nothing unusual; contains about 150 c. c. clear straw-colored fluid. The walls are white and glistening.

Heart: Normal in size for the individual. Weight 245 gms. It is covered with a normal amount of epicardial fat; no evidence of pericarditis noted. The tricuspid valve shows nothing unusual, circumference 12.5 cm. The right ventricular wall is quite thin measuring 2 mm. in thickness. The pulmonary cusps appear normal; 8.5 cm. in circumference. The mitral and aortic valves show no pathological changes and measure 10 and 8 cm. in circumference, respectively. The left ventricular wall shows nothing unusual and measures 1 cm. in thickness. The endocardium of the entire heart is dark red in color and is diffusely marked with minute petechial hemorrhages.

Pleural cavities: Both the right and the left show almost complete obliteration, being filled with dense fibrous adhesions. This was more marked on the left side which rendered the delivery of the lungs difficult.

Lungs: Description common to both. Dark red in color with a soggy feel on touch. Some superficial emphysema noted over the anterior surface of the lower lobes. No areas of consolidation. Cut surface very moist and dark red in color. Dark fluid oozed freely from the cut surface. Sections floated on water.

Weight of right lung	700 gms.
Weight of left lung	600 gms.

Abdominal cavity: Nothing unusual noted on inspection except a few old adhesions in the region of the cæcum, liver, and spleen.

Liver: Surrounded and bound down by dense adhesions. Diaphragm adherent. Color is brownish red with some superficial

mottling. The gall bladder is enlarged and completely filled with stones. Cut surface of the liver is smooth, brownish red, with a diffuse mottled appearance. No gross evidence of congestion nor cirrhosis. Weight 1,650 gm.

Spleen: Firmly fixed by dense adhesions and removed with difficulty. Dark red in color and extremely friable. A large anemic infarct 2 by 2.5 cm. present on lower anterior surface. Cut surface is dark red and shows relative increase in the suppurative connective tissue. Weight 200 gms.

Adrenals and pancreas show no gross abnormal changes.

Kidneys: Description common to both. The capsules strip easily leaving a smooth mottled surface. Congestion is noted about the veins. Cut surface shows nothing unusual. The cortex is regular and measures 8 mm. in thickness. The pelves appear normal. Weight of left, 135 gm.; right, 140 gm.

Ureters, bladder, and prostate show no gross changes. The bladder contained no urine.

Stomach: Contained 200 c. c. of brownish red fluid. The mucosa throughout is swoolen and definitely corrugated. Marked congestion of the mucosa and submucous petechial hemorrhages are the outstanding features. The congestion is so intense as to produce a scarlet red appearance. No areas of ulceration found.

Small intestine: Slight congestion present with submucous petechial hemorrhages most marked in the duodenum. No areas of ulceration.

Colon: No gross changes noted.

Brain: Upon opening the dura a clear fluid spurted out indicating a definite increase in intracranial pressure. All of the vessels of the subarachnoid space show intense congestion and engorgement. Free fluid is present beneath the arachnoid. The congestion is so marked as to give a purplish red color to the outer surface of the brain. No superficial areas of extravasation of blood noted. Cut surface shows the ventricles dilated with definite congestion of all the smaller vessels of the inner brain. No hemorrhagic areas nor inflammatory changes found. Weight 1,385 gm.

ANATOMICAL DIAGNOSIS

1. Edema and congestion of brain and lungs.
2. Chronic fibrous pleuritis.
3. Congestion of kidney and spleen.
4. Acute congestion with submucous petechial hemorrhages of stomach and small intestines.
5. Subendothelial hemorrhages of the heart and great vessels.
6. Splenic infarct.
7. Cholelithiasis.

MICROSCOPIC FINDINGS

Brain: Congestion and edema. Sections show the vessels dilated and markedly engorged throughout. Small clear spaces are noted surrounding all the vessels. These were probably filled with edematous fluid. No area of inflammation, tumor formation, or hemorrhagic infiltration found.

Lungs: Congestion and edema. The vessels are dilated and engorged. The alveoli are partially filled with fluid. No evidence of pneumonia.

Kidney: Acute tubular nephritis. Section shows the glomeruli congested and a marked dilatation of Bowman's capsule. The convoluted tubules show extensive albuminous degeneration. This condition also exists in the straight tubules but is more extensive. The epithelium shows almost a complete degeneration in fully 90 per cent of the tubules.

Liver: Chronic hepatitis and cloudy swelling. The liver cells are swollen and show a grandular precipitate in the cytoplasm. Small round cell infiltration is found throughout, although more marked in some places than in others. This is particularly true about the areas of the portal vein and the bile ducts. No evidence of congestion or cirrhosis found.

Stomach: Chronic gastritis. The mucosa is hypertrophic and diffusely infiltrated with small round cells. This is more marked near the surface where an apparent autolysis has taken place.

Spleen: Chronic splenitis. The capsule is definitely thickened. This is intimately associated with a diffuse connective tissue proliferation of the pulp.

LABORATORY EXAMINATION

Chemical analysis of the stomach contents.

"Gutzeit method" shows a considerable trace of arsenic. The amount, however, was too small for a quantitative estimation.

Conclusion: Cause of death, edema and congestion of the brain and lungs associated with an acute tubular nephritis resulting from the toxic action of arsenic.

It will be noted that the outstanding features among the postmortem findings were the intense redness of the stomach with petechial hemorrhages throughout; intense congestion of the brain, edema of the brain, distension of the ventricles with fluid, and such engorgement of the capillaries of the brain and meninges as to indicate that they were at the point of rupturing and forming punctate hemorrhages; punctate hemorrhages in the endocardium; and congestion and edema of the lungs.

NATURE OF UNTOWARD REACTIONS FOLLOWING INTRAVENOUS ADMINISTRATION OF ARSENOBENZOL PREPARATIONS

Through the kindness of Surg. G. C. Lake, United States Public Health Service, of the staff of the United States Hygienic Laboratory, upon whom it falls among his other duties to collect and study all ascertainable information relating to the toxicity of arsenobenzol preparations licensed for interstate sale in the United States, the writer has been spared a prolonged search for literature bearing upon this subject. In this way a general idea as to the information which may be gathered from a review of American and foreign medical and public health literature, including British, French, Belgian, and German, was obtained without any great effort. While no pretense is made here of making a complete presentation of what is known regarding the liability of these arsenical compounds to cause untoward effects and the nature of the reactions which produce alarming symptoms and occasionally death, certain information has been collected that will assist medical officers to understand the recognized hazards that must be accepted in treating syphilis with arsphenamine compounds.

The hazards are generally thought to be somewhat greater with arsphenamine than with neoarsphenamine but that has not been proved. With the former, of course, there are more chances for errors in the technic of preparing the solution for administration. If all cases in which incomplete neutralization or other errors of technic have been responsible for alarming symptoms could be eliminated from comparison it might be found that arsphenamine is no more dangerous than neoarsphenamine.

The most complete and carefully considered review of this subject so far published in the English language is the 1922 report of the salvarsan committee of the British Medical Research Council, entitled, "Toxic Effects Following the Employment of Arsenobenzol Preparations," published by His Majesty's Stationery Office, London, England. The committee appears to have made a comprehensive review of American as well as European literature. The report closes with a general summary and statement of conclusions, as follows:

SUMMARY AND CONCLUSIONS

(A) GENERAL SUMMARY

"1. No special arsenobenzol preparation can be regarded as more likely than others to produce ill effects.

"2. Large series of cases of syphilis have been treated without the occurrence of any serious ill effects, although a small percentage of slighter reactions, chiefly vasomotor and mild skin reactions, is to

be expected in every large collection of patients treated with arsenobenzol compounds.

"3. Errors in technic can not account for more than a few serious accidents; fatalities have occurred even under the most careful control in large and completely equipped hospitals.

"4. The most important ill effects which may end fatally are:

(*a*) Encephalitis hemorrhagica.

(*b*) Acute yellow atrophy of the liver.

(*c*) Exfoliative dermatitis and its complications.

"5. In European literature, and especially in the very large German literature, encephalitis hemorrhagica is most frequently described. In Great Britain and America, however, exfoliative dermatitis and its septic complications have accounted for most fatal accidents. Acute yellow atrophy of the liver is difficult to place in order of frequency, being distinguished from the other serious ill effects by its peculiar liability to occur in localized outbreaks. Single cases however, are by no means unknown.

"6. Encephalitis hemorrhagica occurs within two to five days after an injection, and presents a very characteristic clinical picture. Its incidence is most frequent after the second injection, but it may ensue after any one of a series of injections. It must be considered as due to the arsenobenzol treatment.

"7. Disorders of the liver following treatment by arsenobenzol compounds may for convenience be grouped into:

(*a*) Early (benign) jaundice.

(*b*) Late (severe) jaundice.

(*c*) Acute yellow atrophy of the liver, commonly the sequel of late jaundice, and clinically and pathologically indistinguishable from the same condition occurring in the known absence of syphilis.

"Skin reactions following arsenobenzol are fairly common, and usually slight and transient. The one reaction of serious significance is exfoliative dermatitis.

"9. Vasomotor phenomena occur in a small proportion of cases even under the best conditions. Although alarming at the time they are rarely, if ever, fatal. They appear to bear no relation to enaphylaxis, and the use of this word in describing them is to be deprecated. Febrile disturbances, headache, diarrhea, and vomiting also occur, but are usually of slight moment.

"10. Certain other ill effects of arsenobenzol treatment, which may even end fatally, are met with only very rarely. These include acute renal damage, ulcerative enteritis, polyneuritis, and aplastic anemia.

"11. Certain lessons as regards dosage and frequency of administration have been learned from the experiences of the late war.

During the war period, following a definite military policy, the dosage and frequency were in some places increased over what would nowadays be recommended. The committee believes that both dermatitis and hepatic disorders may in part at least be due to excessive frequency and size of the dose.

(B) CONCLUSIONS

"In reviewing the ill effects which have been attributed to treatment with salvarsan, we may consider, in the first place, those of which the causal connection with the treatment is perfectly clear. In the case of these it is of interest to inquire to what extent they correspond with the known results of acute or of chronic poisoning by arsenic given in inorganic form, and to what extent, on the other hand, they must be attributed to the administration of the arsenic in the form of this particular organic complex. In making such a comparison it is not justifiable to assume that such ill effects of salvarsan as do not exactly correspond to the known phenomena of poisoning by arsenic are necessarily due to the action of the complex salvarsan molecule as a whole, and not at all to the arsenic which it contains. The method by which salvarsan is administered, its physical properties, special solubility relations, and the mode of its coming into action in the body, must all be taken into account. Acute poisoning by inorganic arsenic is familiar as the result of swallowing a single large dose, while chronic poisoning is seen as the cumulative effect of long-continued administrations of individually subtoxic doses. In the case of salvarsan administration we are dealing with parenteral administration of a series of doses, each sufficient to produce symptoms of acute poisoning if the arsenic it contained were injected in inorganic form, but holding it in the form of an organic complex which is only slowly decomposed in the body, so that the liberation of arsenic continues for some time after the administration is finished.

"If salvarsan as a poison, then, were to be regarded merely as a vehicle of arsenic, we should expect any bad effects which it produced to correspond rather to the chronic type, in spite of the relatively short period occupied by its administration. Further, since it is injected parenterally and not given by the mouth, we should expect that such of its effects as correspond to those of arsenic would be rather the general systemic effects of arsenic as a capillary poison, than the predominantly gastrointestinal effects seen in acute poisoning with inorganic arsenic administered by the mouth.

"When these considerations are borne in mind, certain of the ill effects which are recognized as being due to salvarsan may without hesitation be ascribed to the arsenic which it contains. The oc-

casional occurrence of gastritis and enteritis, for example, may be compared with the similar conditions which occasionally arise as the result of the introduction of inorganic arsenic into the system by parenteral routes, as when it is accidentally absorbed from a wound. With even more confidence can the effects on the skin, and especially the exfoliative dermatitis which we have seen to be one of the commonest of the serious ill effects of salvarsan treatment, be regarded as simply the result of poisoning by arsenic in specially susceptible patients. Poisoning of the capillary endothelium being the characteristic feature of acute poisoning by inorganic arsenic, it is possible that the condition known as 'encephalitis hemorrhagica,' being associated with excessive transudation and capillary hemorrhages, should also be classed as arsenical poisoning. Rarer effects of salvarsan, such as polyneuritis and damage to the renal epithelium, also correspond to well-recognized effects of arsenic.

"Of the ill effects which can, with certainty, be attributed to the administration of salvarsan, there remain those which sometimes follow immediately upon injection—the co-called 'crises nitritoides,' 'shock-effect,' or 'vasomotor phenomena.' Since these also are characterized by symptoms of capillary poisoning, it might seem reasonable to attribute them to acute arsenical intoxication. It has been seen, however, that there is much evidence connecting them rather with the physical properties of the drug—their association with rapidly precipitating solutions of old salvarsan, with imperfectly soluble specimens of neosalvarsan, and the record of their appearance in a violent and dangerous form in cases in which the old salvarsan has, through oversight, been injected intravenously in the acid state. (See p. 10 of first report of the salvarsan committee.) Such observations and the usually rapid evanescence of the symptoms, seem to show clearly that we are here dealing with a phenomenon which has no direct connection with the presence of arsenic in the molecule, but is the result of a disturbance of the colloidal condition of the blood. The now well-recognized association between the frequency and severity of such symptoms and the use of contaminated water, or other technical defects in the preparation of the material for injection, is also difficult to reconcile with the view that they are due to arsenical poisoning.

"So that, of the ill effects which can be definitely attributed to treatment with salvarsan, some can be regarded as due to arsenical poisoning, while others seem to be due rather to the peculiar physical properties and solubilities of the substances included in this group of remedies.

"There remain for consideration the important effects on the liver; the connection of these with salvarsan has been somewhat ob-

scured by the frequently long intervals elapsing between the end of the treatment and the appearance of symptoms of hepatic trouble, and also by the fact that similar troubles were observed as the result of syphilis in the presalvarsan era. This latter fact forbids the assumption that every case of severe jaundice or acute yellow atrophy of the liver arising during the treatment of syphilis by salvarsan is due to the treatment. On the other hand, there are weighty reasons against acquitting salvarsan of all share in the production of such cases.

"These reasons are as follows: (1) There is an increasing body of evidence that the arsenobenzol preparations produce a deleterious effect upon the functional efficiency of the liver, and that some degree of hepatic insufficiency is demonstrable three months after a course of the drug, thus furnishing at all events a groundwork for hepatic complications. (2) Evidence tends to show that jaundice and acute yellow atrophy have increased in frequency since the introduction of salvarsan, especially amongst the young adult male population, which furnishes the majority of recent syphilitics. (3) The relation in time between the occurrence of these accidents and the administration of a course of salvarsan is too frequent to be merely accidental. (4) There is evidence to show that the pushing of salvarsan treatment, with the object of effecting a speedy cure, has been associated with an increased liability to jaundice and acute yellow atrophy of the liver.

"Further, while these effects on the liver can not, like the dermatitis, for example, be brought into relation with known ill effects of inorganic arsenic, the organic portion of the salvarsan molecule has a sufficiently close relation to known organic liver poisons, such as toluylendiamine, to render plausible the supposition that the effects may be due to the action of the salvarsan molecule itself, or of some early derivative formed from it in the body, acting on an exceptionally sensitive individual.

"The chief difficulties in the way of the conclusion that the majority, at any rate, of the serious liver troubles following salvarsan treatment are due solely to a poisonous action of the drug, have been presented by the frequently grouped incidence of the cases, and the paucity of evidence of comparable effects produced by the experimental administration of salvarsan to animals. Exactly the same difficulties were found in attributing to simple poisoning by trinitrotoluene the cases of liver atrophy which occurred during the war among workers industrially exposed to that substance. The second objection, based on the failure of salvarsan to produce any pronounced effects on the livers of experimental animals, even when given in proportionally enormous doses, has recently been greatly weakened by the observation of Hooper, Kolls, and Wright, that in

the dog an extensive necrosis of the centers of the liver lobules is, in fact, a frequent result of the injection of salvarsan.

"The tendency of the cases of severe jaundice and liver atrophy in man to occur in the form of small outbreaks, localized to one or another hospital and restricted in time to a few months of its practice, has not yet received an adequate explanation. The committee has not found any evidence to support the suggestion that it is to be attributed to the use of specially toxic batches of the drug or to faulty methods of administration. There is, on the other hand, some evidence that unwise pushing of the dosage, both as regards size and frequency, may be a factor of some importance in causing an outbreak. This can not, however, by itself be regarded as a sufficient explanation of the tendency of severe liver affections following salvarsan, to occur in groups like small epidemic outbreaks, and we can not lightly dismiss the suggestion of a further local factor, acting with increased force upon a liver already damaged by salvarsan. As in the case of the similarly puzzling outbreaks of liver atrophy among workers in trinitrotoluene, the suggestion of an adventitious infection has been made. The most definite suggestion of this kind was made by Stuart McDonald, but the committee does not feel able to attach much importance to his post-mortem finding of a coliform bacillus in the affected livers, since post-mortem evidence of infection by such bacilli is notoriously misleading. Only blood cultures during life could afford the necessary proof, and evidence of this kind is entirely wanting. There is, however, one fact which may be of significance, namely, the association of 'salvarsan jaundice' with concurrent epidemics of catharrhal jaundice amongst the surrounding population; this association has been noted on several occasions, e. g., the Cherryhinton outbreak, the outbreak reported by Todd amongst the Rhine forces, and the observations of Stokes and Ruedemann in America. The cause of catarrhal jaundice is not certainly known, but its tendency to epidemic prevalence is suggestive of infection.

"As an argument against the infective character of liver atrophy after salvarsan is to be noted the opinion of Professor Turnbull, whose careful histological observations lead him to regard it as a toxic rather than as an infective process.

"A further parallel between these occasional later sequelæ of salvarsan treatment and those associated with the absorption of trinitrotoluene is provided by the cases of aplastic anemia, which have been observed as rare occurrences in both cases. The points of similarity are indeed so many—the occasional occurrence of severe jaundice and liver atrophy, often appearing months after treatment or exposure has ceased; the tendency of the cases to appear in localized outbreaks, naturally giving rise to the suggestion of an

associated infective cause; and the occurrence of much rarer cases of aplastic anemia—that it is difficult to avoid the suggestion that we are dealing with processes of a fundamentally similar nature. This view is strengthened by the consideration that salvarsan is an aminobenzene derivative, and that there is reason to associate the poisonous action of trinitrotoluene with a reduction of its nitro-groups to amino groups in the body.

"Upon the evidence before it, therefore, the committee thinks it probable that many of the ill effects of salvarsan may be attributed directly to its arsenical content; that others are due rather to its peculiar solubilities and the physical properties of its solutions; and that others again, in particular the effects on the liver, and possibly those on the bone marrow, are due to the chemical nature of the whole compound, as an aminophenol derivative, with the possibility that this type of poisonous action is dependent for its occurrence on the presence of adjuvant circumstances, of a nature as yet unknown.

"There is a consensus of opinion amongst those concerned with the treatment of venereal disease that the arsenobenzol preparations are more efficacious than any other drugs yet available for the cure of syphilis. Although it is true that even these preparations can not be guaranteed to effect absolute cure, except in the earliest stages of the disease, it is now well established that a considerably larger proportion of cures can be effected by salvarsan and its allies than by any other form of treatment.

"By 'absolute cure' is meant the complete eradication of the virus of syphilis from the body. To achieve such eradication it is necessary to administer the drug in doses as large as possible without undue risk, and a dosage which is large enough to be adequate, yet not so large as to endanger life or health except in a very small minority of patients, has been arrived at by the experience of 12 years.

"There are, and there will always be, certain exceptional individuals who will react to the drug more severely than others and in whom a dose, or series of doses, harmless to the average man, may set up dangerous or even fatal complications. The scrupulous physical examination of a patient enjoined upon the practitioner before administration of salvarsan or its substitutes is designed to eliminate cases in which danger might arise, so far as this is possible by human skill and care. But there will remain a few individuals in whom, either from congenital intolerance or from the presence of disease which can not be detected, such risk is unavoidable.

"The data which have been presented in this report afford some indication of the proportion of individuals in which this is the case. It would appear that, with skilled administration, the propor-

tion of fatal accidents should not be greater than 1 in 5,000 to 10,000 patients treated. If the accidents attendant upon intensive treatment in military hospitals during the war be disregarded it would seem that, with increasing experience, the proportion of fatal accidents is decreasing.

"The patient who is suffering from syphilis, and the doctor who proposes to treat him, have to choose between two risks. On the one hand is the more or less measurable risk attendant on the arsenobenzol treatment which offers the most hopeful prospect of cure; on the other, the risks that can not so accurately be measured, which may attend uncured syphilis. The latter risks may attach not only to the patient, but to his wife, his unborn children, and to the community as a whole. It is, of course, right that the patient should have the facts clearly before him and make his own choice.

"The committee has no doubt that, in the interests of the patient himself, no less than in those of the community, the choice should be in favor of arsenobenzol treatment. They believe that the very small number of unavoidable deaths due to this treatment are immeasurably outweighed by the deaths and disabilities which would arise if the older methods of treating syphilis were alone practiced. At the same time the facts which have been brought together in this report no less strongly emphasize the importance of the most scrupulous care in the administration of a drug which is necessarily employed in doses not far removed from the danger line."

From the information collected by the committee of the British Medical Research Council relating to cases which have occurred in England and on the Continent of Europe, and from the evidence thus far obtained in connection with the study of cases in the United States, where death has followed intravenous medication and the conditions and circumstances involved have been ascertained in sufficient detail to make the findings of value in attempting to account for unfortunate results following treatment with an arsenobenzol preparation, it appears that a considerable number of the deaths which have occurred must be charged without question to toxic action of the arsenical compound, properly administered, and belonging to a lot previously tested for indications of unusual toxicity, and from which other doses have been given without causing noteworthy reactions. In other cases, especially those in which death has not followed immediately or within a few days after the drug was administered, it has not always been possible to separate entirely the effects of the syphilitic infection from the effect of the drug. Perplexing questions have also arisen with regard to the cumulative effect of arsenic remaining in the tissues from previous doses and the possible effect of mercury given during and between courses of arsphenamine treatment. Another point which must be considered

is that of damage to vital organs, particularly the liver and kidneys, previously caused by syphilis, or by complicating infection, or by preceding doses of arsenic and mercury.

It seems worth while to divide the fatal cases into three groups:

(*a*) Cases in which death has followed within a few hours after the intravenous injection of a therapeutic dose of arsphenamine or neoarsphenamine.

(*b*) Cases in which death has followed the administration within from a few hours to a few days.

(*c*) Cases in which the drug presumably was the cause or an essential part of the cause of death but wherein death has been delayed for many days or weeks.

Certain striking phenomena seem to have been associated with the cases in which death has occurred quickly or within a few hours. These include clinical manifestations similar to those of profound surgical shock; vasomotor phenomena; and, as revealed by post-mortem examination, intense engorgement of certain tissues, punctate hemorrhages, edema of the brain, and, in general, damage to endothelial cells.

In such instances the practical conclusion must be that death was caused purely by the arsenical compound introduced. The next question—"How and why?"—has not as yet been satisfactorily answered. This, however, does not mean that speculation will not serve a useful purpose.

Perhaps the first point that should be dealt with is the tendency to use such terms as "anaphylactic" or "anaphylactoid" in describing such reactions as that which occurred in the case at the naval proving ground, Dahlgren, Va. The almost immediate and sudden onset of symptoms considered in conjunction with the post-mortem findings, of course give a picture more or less like that seen in recorded instances of fatal reaction to a foreign protein. The term, "nitritoid crisis" was used by Milian because of the similarity of the symptoms in one of his cases to those caused by amyl nitrite. French writers have described two types of such immediate reactions; the congestive type with redness of the face, and the syncopal type with pallor, usually accompanied by abdominal symptoms. The Dahlgren case would probably fall under the latter description, crisis syncopal without immediate loss of consciousness. Inasmuch as the records of cases available for study and comparison are so few it seems best at this time not to attempt much in the way of classification. The primary need at present is careful study of all cases in which severe reactions follow the administration of arsphenamine preparations with complete and accurate recording in order that cases may be properly compared and thus promote the synthesis of exact knowledge as soon as possible. The committee of the British Medical

Research Council has taken a proper stand, it must be agreed, in the following statement: "It seems, therefore, right to advise the avoidance of all such terms as 'anaphylactic' and 'anaphylactoid.' The acute vasomotor phenomena seen occasionally after the administration of arsenobenzol compounds should be described as such, without any reference to a doubtful explanation."

It is very doubtful whether a line of demarcation can be drawn between cases in which death follows the injection within a few hours and those in which alarming symptoms develop more gradually and death does not occur until the second day or even later. An important question to be settled is that relating to the effect of the arsenic contained in the benzol compound.

In seeking an explanation for the disaster which has befallen when death occurs within a few hours after the introduction of a therapeutic dose of an arsphenamine preparation it would seem that the effect of arsenic as inorganic arsenic must at least be taken into consideration. In the delayed cases where death can not be accounted for by lesions of syphilis, acute nephritis, acute yellow atrophy of the liver, etc., true arsenical poisoning must be regarded as the cause of death, and where there are lesions in the kidney and liver the question will arise, were they not also caused by arsenical poisoning. It seems clear enough that the more chronic lesions of the liver as well as skin lesions such as those seen in the dangerous and even fatal complication, exfoliative dermatitis, are simply manifestations of arsenical poisoning. Experience indicates that exfoliative dermatitis is likely to occur when too large doses are given or when moderate doses are given too frequently.

In connection with the immediate and quickly fatal reactions it may be recalled that in the literature of toxicology and medical jurisprudence references can be found relative to cases in which death has followed the ingestion of an inorganic salt of arsenic in an almost incredibly short time—less than three hours. Such cases have been described as the hyperacute or fulminating type and acute arsenical poisoning of the cerebral type. Thus, it may be noted that arsenic was known before salvarsan was used, even when taken by mouth, occasionally to cause death so quickly that the time could be expressed in minutes rather than hours, and that hemorrhagic and cerebral effects in character not unlike those noted in fatal cases after the administration of arsenobenzol preparations were described.

In reflecting upon the extent to which arsenic may be responsible for fatal poisoning in these unfortunate experiences with arsphenamine it is not necessary to assume that the compound has broken down. It is possible that the diamino-diphenyl compound of arsenic is in itself extremely toxic under certain conditions not yet under-

stood, and it may be that the arsenic still bound to the double benzine ring may under those conditions exert its own peculiar poisonous effect. The disastrous result of injecting the acid compound, arsphenamine, through error unneutralized, has been witnessed so many time now that certain phenomena following this accident can be quite definitely described. Alarming symptoms can be expected almost immediately. The symptoms and the post-mortem findings are not inconsistent with those which might be expected if a soluble inorganic salt of arsenic were introduced directly into the circulation. They are like those which followed the fatal injection of neoarsphenamine in the case at Dahlgren. Now, it is not known whether unneutralized acid arsphenamine when injected as such breaks down and sets free the arsenic to act as arsenic alone. But if the arsenic is not liberated it may be said that the whole molecule (the double hydrochloric acid diamino-diphenyl arsenic compound) acts immediately not unlike inorganic compounds of arsenic.

The difference between the neoarsphenamine molecule and the arsphenamine molecule is that in the neoarsphenamine molecule one of the amino groups, NH_2, is bonded only to the phenyl ring and has no other attachment, while the second amino group forms part of a considerable chain which includes the methanyl group with CH_2, secured through treatment with formaldehyde, along with the sodium-sulph-oxalate group. In the arsphenamine molecule both rings have the amino group NH_2, bonded each with one molecule of hydrochloric acid, HCl. The molecules are graphically represented as shown in the accompanying chart.

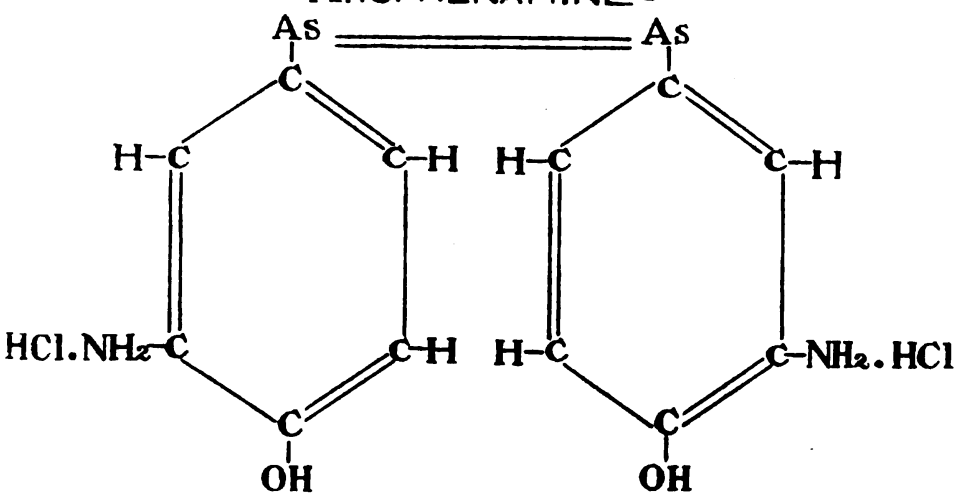
Thus, it will be seen the two compounds are alike with the exception that arsphenamine is stabilized by the molecules of hydrochloric acid bonded to the amino groups while, in the case of neoarsphenamine, stabilization depends upon the methanal and the sodium-sulph-oxalate groups bonded to the amino groups in one of the phenyl rings only.

Arsphenamine, according to the structure of the molecule, contains 31.57 per cent of As or 41.67 per cent of As_2O_3. Neoarsphenamine without allowance for the presence of inert compounds contains 32.17 per cent of As or 42.46 per cent in terms of As_2O_3. According to the 1921 edition of New and Non-Official Remedies, the drug neoarsphenamine, as marketed, owing to the presence of inorganic salts, contains only two-thirds as much arsenic as arsphenamine.

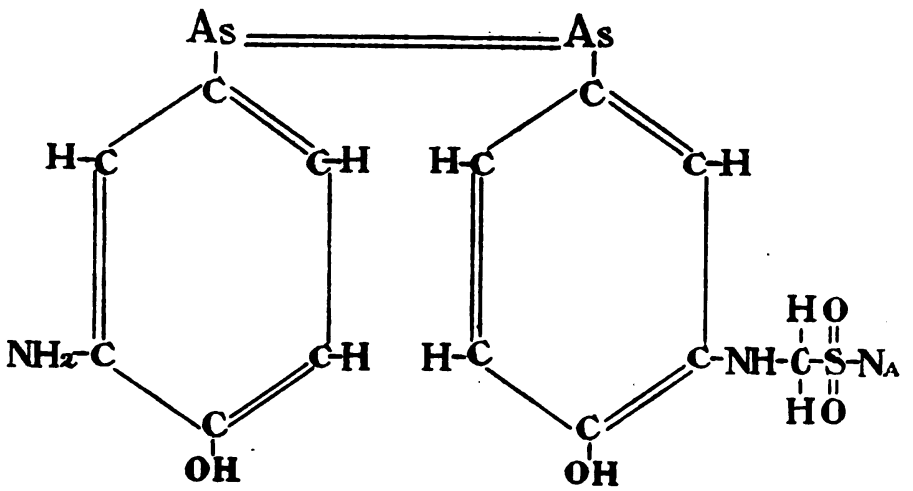
The maximum dose of arsphenamine is usually regarded as 0.6 gram and the maximum dose of neoarsphenamine as 0.9 gram. Half of the maximum dose of either contains more than enough arsenic to kill a susceptible subject if freed from bondage. Com-

parative safety in administering the full dose of neoarsphenamine depends upon the proportionate weight of inert inorganic salts in the ampule. Theoretically, the testing of each lot for toxicity on rats furnishes a guarantee against the presence of an unusually high percentage of arsenic as well as against instability. Practically, 0.9 gram of neoarsphenamine should be looked upon as possibly or probably containing more arsenic than 0.6 gram of arsphenamine.

ARSPHENAMINE



NEO-ARSPHENAMINE



The presence of free sulphur always contributes to the weight of arsphenamine so that actually the acid compound does not contain the full weight of arsenic indicated by the structure of the arsphenamine molecule.

A feeling among clinicians that neoarsphenamine is a very much milder drug than arsphenamine and that consequently it can be given in considerably larger doses and at more frequent intervals is cer-

tainly not justified. The difference in the chemical compound merely means that a simpler technic is required in preparing the solution of neoarsphenamine for intravenous administration, with elimination of the danger of incomplete alkalization which is liable to result in severe reactions, even when the deficiency in the sodium hydrate added for this purpose is comparatively slight. There is little difference so far as subacute and chronic poisoning by arsenic and the cumulative effects of repeated doses are concerned. With regard to accidents, if there be conditions under which arsenic is liberated from the benzol compound the result is likely to be rapidly fatal poisoning by arsenic whether the compound be arsphenamine or neoarsphenamine.

Neither the chemical changes ordinarily undergone by these compounds in the human body nor the possible changes which may occur are thoroughly understood, but the risk of acute fatal poisoning can be estimated approximately from accumulated clinical experience. With neoarsphenamine the risk of such an accident, so far as can be judged from the evidence now available, is that one inexplainable death may be expected from between thirty and forty thousand doses intravenously administered. That proportion is based on the assumption that the neoarsphenamine used has been properly manufactured, that it is of a lot from which samples have satisfactorily passed tests for undue toxicity, that the ampule and its contents appear to be in good condition and that the generally recommended precautions are observed regarding preparation of the solution and technic of injection. Deaths resulting from administration of the drug in cases where there are contraindications for its employment are not contemplated here.

It is generally believed that arsphenamine is more dangerous than neoarsphenamine. The evidence so far collected is insufficient in quantity and quality to settle that point. Probably more unexplained deaths occurring within a few hours or within a day or two have followed the administration of arsphenamine. However, figures are not obtainable to show the ratios of deaths to the numbers of doses of each administered in the past.

Before neoarsphenamine or neosalvarsan came into general use fewer doses per case treated were administered, and year by year the number of cases of syphilis treated with arsphenamine or neoarsphenamine has steadily increased. At present much more neoarsphenamine is used than the acid compound.

Lake's data to date include the reports of 13 unexplained deaths attributable to arsphenamine in the United States since 1918 and the same number attributable to neoarsphenamine. Without knowing the numbers of doses of each administered it is not possible to form an opinion as to which is the safer. The information obtained

in cases of this kind has usually been too incomplete even when reliable to permit any very definite conclusions to be drawn regarding the cause of death and the question as to whether there may have been some factor common to all the fatal cases. With regard to arsphenamine, some of the deaths were obviously caused by failure to neutralize, and possibly more of the deaths were due to that accident than the records show. If the arsphenamine deaths which can be explained in that way are subtracted from the total along with those known to have followed other serious violations of approved technic there remain very few really unexplained deaths. On the other hand, some of the deaths which have been attributed to neoarsphenamine probably were caused, if the truth could be known, by arsphenamine administered by mistake for neoarsphenamine. Certain instances in which the mistake was almost covered up suggest the possibility that the truth has been concealed in a certain number of cases in which death has been charged to neoarsphenamine. Therefore, at this time it is impossible to judge whether there is more or less danger of acute poisoning with neoarsphenamine than with arsphenamine.

With either, the question of dosage is probably important. While the reports of death indicate that fatal poisoning has followed the administration of considerably less than a maximum dose and even one-half of such a dose in three or four instances, as a rule, the fatal dose of arsphenamine has been 0.6 gram and the fatal dose of neoarsphenamine has been 0.9 gram. Various considerations beside death records justify the feeling that 0.9 gram of the latter is too large a dose to be administered in the absence of special indications that outweigh the probable risk. The cumulative effects of many moderate doses frequently repeated can not be overlooked either. They include a considerable variety of ill effects ranging from the manifestations of chronic poisoning by arsenic to death apparently caused by subacute and acute arsenical poisoning, delayed, however, for several or many days. The various types of cases as classified by the British Medical Research Council Committee are referred to below.

Before discussing that phase of the subject mention should again be made of the need for careful study with critical observation in all cases in which ill effects follow the administration of arsenical compounds. Fatal cases should be recorded in detail as to history, previous treatment, character of the reaction and post-mortem findings with the hope that if there be any concomitant causes which determine the fatal issue they will be recognized.

While mercury has probably been given in thousands of cases without accident along with arsphenamine, often between doses of

the latter given a few days or a week apart, it should be remembered that mercury is capable under suitable conditions of uniting with the phenol-benzol ring. Mercury, antimony, lead, bismuth, tin, and certain other metals are all capable of forming phenyl aromatic compounds by substitution in the benzine ring. Inasmuch as they all stand above arsenic in the table of avidity, or table of relative electric potential, presumably any one of these metals is capable under suitable conditions of liberating the arsenic wholly or in part from the diphenyl-amino-arsenobenzol molecule of the arsphenamine compound. With regard to mercury, it is conceivable that in rare instances conditions favorable for such substitution may be met with in the human body. At any rate that is something to think about. From the practical standpoint, if there be this danger, one would expect an accident to occur from the administration of metallic mercury more often than from the presence of an insoluble salt such as the salicylate of mercury. It will be noted in the case reported above that "mercury rubs" were given between doses of neoarsphenamine. Previously the patient had had intramuscular injections of soluble salts of mercury between frequently repeated doses of neoarsphenamine without accident at the United States naval hospital, Norfolk, Va., in 1921. The data pertaining to fatal cases of arsphenamine and neoarsphenamine poisoning so far collected in the United States, and so far as we know in other countries, do not include the necessary information to indicate whether or not close correlation has existed between the administration of mercury and the arsenical compound prior to the injection resulting in death in recorded instances.

The ill effects associated with the treatment of syphilis by arsenobenzol preparations are summed up with comment in the summary and conclusions reprinted above from the report of the salvarsan committee of the British Medical Research Council. The reader is advised to read that section thoughtfully. In the body of the committee's report the following summary is presented to set forth the main conditions requiring consideration:

"1. Immediate reactions, e. g., diarrhea, vomiting, pyrexia, headache, and also the vasomotor or so-called 'anaphylactoid effects'—'crises nitritoides' of French writers.

"2. Effects involving the nervous system. The most important of these is the fatal so-called 'encephalitis hemorrhagica.'

"3. Effects involving the liver. Clinically these may be grouped into:

"(*a*) 'Early jaundice' coming on a few days after an injection. This is usually mild and evanescent, but may occasionally be more severe and persistent.

"(*b*) 'Late jaundice,' occurring not earlier than several weeks after the end of a course of treatment. This is usually more severe and prolonged than the early jaundice.

"(*c*) Acute yellow atrophy of the liver, often supervening on 'late jaundice.'

"4. Exfoliative dermatitis, and slighter skin reactions. The former may be complicated by broncho-pneumonia or septicemia and end fatally.

"5. Various lesions reported much more rarely—acute hemorrhagic nephritis, ulcerative enteritis, aplastic anemia.

"In addition to these a number of complications may occur during salvarsan treatment which, although previously believed to result from the effects of the drug, are now generally regarded as relapses of the syphilis or as due to the toxins of the spironeme suddenly liberated by the action of the drug (Herxheimer reaction). These include affections of the nervous system such as deafness, cranial nerve palsies, and other forms of 'neuro-recurrence.'"

It would appear that no dividing line can be drawn between the cases of acute poisoning resulting almost immediately in death on the one hand and the various forms of acute, subacute, and chronic poisoning on the other with their different manifestations and various lesions.

From the foregoing considerations it will be appreciated that the standard instructions for the preparation and intravenous administration of arsphenamine and neoarsphenamine; adopted by a committee of the Army, the Navy, and the United States Public Health Service, are indeed well advised. The Bureau of Medicine and Surgery, Navy Department, requires adherence to those instruction. No statement made here is intended to make for timidity in the use of arsphenamine or neoarsphenamine. These compounds of arsenic have their place in the treatment of syphilis. In the Navy, as elsewhere, the questions when to administer, how much to inject, and how frequently to repeat the doses must be answered consistently in accordance with the views of the day in the medical world as generally concurred in by those sufficiently well qualified by training and experience to formulate indications and contraindications. It is not out of place, however, to point out that one should not allow familiarity to breed contempt for the potential dangers of arsphenamine compounds. There seems to be a tendency for medical men to look more and more lightly upon intravenous medication with neoarsphenamine. That is understandable. The technic has become so simplified that elaborate preparations are not required and the introduction of a needle into a vein is often not regarded as a surgical operation. After a few hundred doses have been administered and perhaps considerably less than 100 without accident

or any very alarming reaction the tendency is to feel that it is an entirely safe and simple procedure, and that it is only necessary to notify the patient when to appear, inject the dose, and dismiss him with the perfunctory advice to return if he has any serious symptoms.

The standard instructions require complete physical examination preliminary to administering arsenical treatment for evidence of renal, cardiovascular or visceral changes, in the presence of which arsphenamine preparations should be used cautiously. Weekly urinalyses are required during treatment. Any evidence of exfoliative dermatitis is an *absolute contraindication* against any further treatment with any arsenical compound. Jaundice is an indication for caution. In late cases the possibility that a Herxheimer reaction will follow a large dose must be remembered. This may be fatal should vital structures be involved. *Each patient should receive individual consideration.* The patient should be given a mild cathartic the night before and should eat no food within two or three hours before the injection. Only a light meal should be taken a few hours after the injection. Ambulatory patients should rest after the injection. *If large doses are being given, the patient preferably should be kept in bed until the following morning.*

The treatment of ambulatory patients with arsphenamine compounds should not be discouraged. The need for such treatment is undeniably great. However, due care is required. Preliminary examination of the patient and urinalyses should not be neglected, and, whenever conditions permit, the patient should be kept at rest under observation for a few hours at least after the injection. In no case should the patient be dismissed immediately without positive instruction to rest and without definite advice as to what to do in case unpleasant symptoms arise.

In hospital it is the natural thing for the patient to go to bed for a few hours. On board ship there are usually bunks available in the sick bay for all men injected on a given day so that they may be kept at rest and under close observation for several hours. At naval stations likewise patients may as a rule be kept in the dispensary long enough to make certain that early manifestations of poisoning have not arisen.

During the five-year period 1919 to 1923, inclusive, there were 14,662 admissions to the sick list for syphilis and there were 508 patients remaining on the sick list December 31, 1918, making a total of 15,170 cases of syphilis taken up on the sick list during the five-year period. In addition, an indeterminate number of cases originally admitted in previous years received treatment. During this period of five years 44 deaths were charged to syphilis as the primary cause of death. Of these, 14 were caused, in all probability.

by arsphenamine or neoarsphenamine without the disease, syphilis, playing any direct part. There do not appear to have been any borderline cases. That is, the remaining 30 deaths seem to have been caused by syphilis, by complications of syphilis, or by sequellæ such as paretic dementia.

The 14 deaths attributable to arsphenamine or neoarsphenamine occurred by years as follows: Three in 1919, two in 1920, four in 1921, four in 1922, and one in 1923. The names of four of the patients—all three of the 1919 cases and one of the 1921 cases—can not be traced with certainty at this time and therefore it is not practicable to make a search for the health records in question. However, these cases were properly catalogued for statistical purposes when the reports of death were received. All four deaths were charged to arsphenamine or neoarsphenamine poisoning. The evidence indicated that syphilis was not a direct cause of death, but it is not possible to describe these four cases or to indicate how much time elapsed before death after the last injection of the arsenical compound. Pertinent information relative to the other 10 fatal cases is given below.

Including all fatal cases attributed to poisoning by arsphenamine or neoarsphenamine, 14 in number, if the figure 15,170 closely represents the total number of cases of syphilis treated during the five-year period, it indicates that there was one death for every 1,083 cases of syphilis treated. That, of course, is not the true ratio, but it is not likely that there were as many as 50 per cent more cases representing those originally admitted previous to 1919 but still under treatment. Therefore, actually, there probably was one death attributable to arsphenamine or neoarsphenamine for some number between 1,083 and 1,500 cases treated. What total number of doses of arsenobenzol compounds were administered during the five years is a matter of speculation. The reader can make any estimate he thinks will most likely represent the average number of doses given per case of syphilis treated.

Table V, page 17, of the British Medical Research Council's committee report indicates that the German inquiry of 1917 showed 1 death to 3,788 cases treated or 10,984 injections of salvarsan compounds. Similar figures are given for three British military hospitals, A, B, and C. The figures for A were 1 death to 1,629 cases of syphilis treated or 13,000 injections. For B there was 1 death to 1,850 cases treated or 12,500 injections. The figures for hospital C indicated 1 death to 375 cases treated, but it was noted that some deaths should be deducted as having no connection with the treatment.

The ascertainable information for 10 of the 14 cases of fatal poisoning by arsenical compounds in the United States Navy, 1919–1923, is as follows:

Case I—1920.—W. S., private, marine. Enlisted December 10, 1918, to serve four years. Died at naval hospital, Washington, D. C., September 4, 1920. Age 20 years, 5 months.

Nothing noteworthy in medical history until April 23, 1920, when he was admitted to sick list with manic depressive psychosis. No history of venereal disease. Diagnosis changed to psychoneurosis May 1, 1920, and to constitutional psychopathic state June 14, 1920. He had pronounced mental symptoms off and on and was admitted to hospital August 3, 1920.

August 6, 1920—Positive Wassermann reaction. He denied having had venereal disease.

August 23, 1920—Mercury salicylate, 1 grain by intramuscular injection.

August 25, 1920—Arsphenamine, 0.6 gram.

August 30, 1920—Mercury salicylate, 1 grain.

Sept. 1, 1920—Arsphenamine, 0.6 gram.

This, the fatal dose, was given at 11 a. m. At 1 p. m., two hours after the injection, he was nauseated and vomited five times during the course of an hour. He had had no food since 9 p. m. the previous day. Six hours after the injection he stated that he felt well and asked for food. He was given tea and toast but was kept in bed. The following day he was granted liberty. He returned after liberty at 6 p. m., feeling well. The following morning at about 6 o'clock he got out of bed and told a Hospital Corpsman that he felt very peculiar and was afraid he might harm some one. Shortly after, he had a convulsive seizure which lasted for about one minute. At 10 a. m. he had another convulsion. During the rest of the day he did not appear to be seriously ill, but at 11.20 p. m. he had a series of convulsions from which he did not rally. Dyspnea supervened; he became very cyanotic and died at 3.30 a. m., 64 hours and 30 minutes after the injection.

Post-mortem findings.—Marked edema of the brain, active congestion with tendency to softening especially at the base. Acute congestion of the kidneys and spleen. The lungs were congested, emphysematous and edematous. The heart was somewhat more flabby than normal. The ventricles were practically empty. The liver was not described.

Here, apparently, the outstanding feature was acute encephalitis with death in a little over two and one-half days.

Case II—1920.—L. K., fireman, 3 c. Enlisted August 4, 1919, for two years. Died at Constantinople, Turkey, July 11, 1920. Age 19 years, 3 months.

Medical history.—June 18, 1920—Admitted to sick list with syphilis in secondary stage; open lesions of mouth, skin, and anus.

June 24, 1920—Neosalvarsan, 0.3 gram.

July 1, 1920—Novarsenobenzol (Billon), 0.6 gram. It was noted on that date that he had received 4 injections of bichloride of mercury, 0.02 grams each at weekly intervals.

July 10, 1920—Acute tonsillitis.

July 11, 1920—Novarsenobenzol, 0.75 gram at 9.15 a. m. Temperature was slightly elevated two hours later. At noon, temperature, 101° F., at 6 p. m., normal. At 7.30 p. m., or about 10 hours after the injection, the patient was restless and the pulse somewhat rapid. An hour later there was dyspnea and the pulse was rapid and feeble. He died at 8.55 p. m., 11 hours and 50 minutes after the injection.

An autopsy apparently was not performed.

Case III—1921.—M. M. M., yeoman, 3 c. Enlisted January 27, 1919, for minority. Died at naval hospital, Mare Island, Calif., February 5, 1921. Age 19 years, two months.

Medical history.—November 5, 1920—Admitted to sick list with gonococcus infection of urethra.

December 14, 1920—Wassermann reaction four plus positive.

December 17, 1920—Admitted to sick list with syphilis; early secondary stage with primary lesion still present. Treated with mercury salicylate, grain 1, weekly, by intramuscular injection.

December 22, 1920—Transferred to hospital.

The treatment given at the hospital was not recorded in chronological sequence. The health record indicates, however, that the patient was given 6 injections of arsphenamine between December 22, 1920, and February 1, 1921, when the last of the six doses was administered. The record also indicates that he was given 43 inunctions of mercury during that period. The first dose of arsphenamine was 0.3 gram; the other five doses were 0.6 gram each. On the morning of February 4, 1921, three days after the last injection of arsphenamine, the patient had convulsions and became comatose. He died at 12.45 a. m. February 5, 1921, three days and some hours after the last injection of arsphenamine.

Post-mortem findings.—Pale, degenerated, almost necrotic areas in the liver and spleen; congestion of both kidneys and necrotic areas in the right kidney. It is stated that there was no evidence of pathological changes in the brain.

Case IV—1921.—L. W., fireman, 3 c. Enlisted September 5, 1919. Died at United States naval hospital, Chelsea, Mass., June 8, 1921. Age 21 years and 8 months.

Medical history.—May 9, 1921—Admitted to sick list with syphilis, secondary stage; macular eruption; four plus positive Wassermann test; history of chancre.

May 14, 1921—Mercury salicylate, 1½ grains.

May 17, 1921—Arphenamine, 0.3 gram.

May 21, 1921—Mercury salicylate, 1½ grains.

May 24, 1921—Arsephenamine, 0.6 gram.

A few hours after that dose the patient had vomiting and diarrhea; purpuric hemorrhagic spots on extremities; and he was markedly shocked, but reacted favorably to stimulants. Two days later jaundice developed and there was bleeding from the mucous membranes of the nose and gastrointestinal tract. Urinary findings suggested destructive changes in the kidneys. The patient gradually became weaker and died at 7.27 p. m., June 8, 1921, 15 days after the last dose of arsphenamine.

Post-mortem findings.—Marked jaundice. The lungs were congested. The left pleural cavity showed adhesions of recent formation over the entire lower lobe of the lung. On the right side the entire pleural surface was covered with adhesions of recent formation. Both the right and left kidneys showed much hemorrhage into the perirenal fat. The kidneys were large and swollen and of a deep red color. Both adrenal bodies showed marked congestion and hemorrhage. The spleen was swollen and soft, and beneath the capsule there were several deep yellow bodies of a soft consistency. The pancreas showed many small hemorrhages. The liver was deep yellow in color and showed many small hemorrhagic areas. The liver tissue was very friable, and in the right lobe there was an area of softening. The intestines were dark in color and greatly distended. The interior of the gut showed a general hemorrhagic condition of the mucous membrane, and the intestines were filled with dark liquid bloody material. Apparently the brain was not examined.

Case V.—J. A. R., seaman, 2 c. Enlisted July 30, 1919, for two years. Died July 23, 1921, at United States naval hospital, Norfolk, Va. Age 19 years, 2 months.

Medical history.—July 9, 1921—Admitted to sick list with chancroid. There were three suspiciuos lesions on the penis with general glandular enlargement. Transferred to hospital same day.

July 11, 1921—Noguchi test positive. Macular eruption appeared on the body. Mercury oxycyanate, one-fifth grain.

July 13, 1921—Neoarsphenamine, 0.5 gram.

July 20, 1921— Neoarsphenamine, 0.8 gram.

Twelve hours after the injection the patient developed marked swelling of the posterior cervical lymph nodes, and his temperature rose to 106° F. He became delirious. There was small lymphocytosis. The urine was decreased in amount and contained albumin

and granular casts. His condition became progressively worse and he died at 4.55 a. m., July 23, 1921, three days after the second dose of neoarsphenamine.

Post-mortem findings.—The liver and spleen were mottled. The spleen was slightly enlarged. There was nothing noteworthy about the appearance of the kidneys. There was congestion and edema of the brain, and there was a whitish exudate following the course of veins between convolutions.

CASE VI—1922.—F. S., corporal, marine. Enlisted December 10, 1920. Died at base hospital, Second Brigade, U. S. M. C., Santo Domingo City, D. R., February 9, 1922. Age, 35 years.

Medical history.—January 12, 1922—Admitted to sick list with initial lesion of syphilis; general glandular enlargement and macular eruption.

January 13, 1922—Neoarsphenamine, 0.9 gram.

January 17, 1922—Neoarsphenamine, 0.45 gram.

Discharged to duty same day with no open lesions.

January 21, 1922—Neoarsphenamine, 0.9 gram.

January 24, 1922—Mercury salicylate, grain 1, by intramuscular injection.

January 28, 1922—Neoarsphenamine, 0.6 gram.

February 3, 1922—Neoarsphenamine, 0.6 gram.

February 6, 1922—Mercury salicylate, grain 1.

After the injection of mercury salicylate on February 6 the patient noticed that his teeth were becoming sensitive. His jaws became sore. He felt dizzy and cold. His teeth became loose and there was ptyalism.

February 8, 1922.—He was again transferred to hospital. He felt all right except for sore gums and glands. In the evening he complained of pain in the left great toe which he said he had bruised. At that time the nail was blackened. An hour later the entire toe was inflamed and the redness extended up on to the dorsum of the foot. Six hours later the patient had a sharp pain in the chest; dyspnea supervened, and he became cyanotic and pulseless. He died with edema of the lungs at 9.05 a. m., February 9, 1922, three days after the last dose of mercury and six days after the last dose of neoarsphenamine.

Post-mortem findings.—Embolus of anterior tibial artery at left ankle. Thrombus filling right ventricle. Pericardial exudate. Dilated gall bladder. Edema of the lungs. Kidneys, liver, spleen, stomach, and intestines not affected so far as could be judged by macroscopical examination.

This case was reported in the United States Naval Medical Bulletin for September, 1922, by Lieut. S. R. Mills, Medical Corps, United States Navy, as a death from embolism following the administration

of salicylate of mercury by intramuscular injection. The effect of the mercury is to be considered, but the most probable cause of death was acute poisoning by arsenic or the arsenical compound administered.

CASE VII—1922.—R. L. S., water tender, 1 cl. Enlisted December 28, 1916, for four years. Died at United States naval hospital, Mare Island, Calif., March 6, 1922. Age, 28 years.

Medical history.—July 19, 1918—Admitted to sick list with gonococcus infection of urethra.

September 5, 1918—Readmitted with gonococcus infection of epididymus.

September 27, 1918—Discharged to duty, cured.

April 28, 1921—Admitted to sick list with broncho-pneumonia.

August 4, 1921—Discharged to duty, well.

February 4, 1922—Admitted to sick list with syphilis, the patient having stated that he had had several blood tests which were weakly positive. No definite signs of the disease reported.

February 9, 1922—Four plus positive Wassermann test.

February 23, 1922—Neoarsphenamine, 0.9 gram without reaction.

March 2, 1922—Neoarsphenamine, 0.9 gram. This dose was follower by marked prostration.

March 4, 1922—Patient had marked nervous symptoms.

March 5, 1922—Patient transferred to naval hospital, Mare Island, Calif., at 5.45 p. m. He was unconscious upon admission to hospital and had clonic contractions of all muscles. His skin was cold, clammy, and cyanotic. Temperature, 103° F. The urine contained albumin and granular casts. Physical signs of pulmonary edema. He died at 12.55 a. m., March 6, 1922, three days and several hours after the second injection of neoarsphenamine. This man's health record indicates that he received no mercury.

Post-mortem findings.—Congestion and hemorrhages in spleen and liver. The pelves of both kidneys contained pus. Lungs edematous. The brain apparently was not examined.

CASE VIII—1922.—E. S., private, marine. Enlisted December 24, 1919. Died at the field hospital, First Brigade, U. S. M. C., Port au Prince, Haiti, September 1, 1922. Age 21 years, 6 months.

Medical history.—April 28, 1922—Admitted to sick list with gonococcus infection of urethra.

August 6, 1922—Readmitted with same diagnosis.

August 18, 1922—Typical secondary eruption of syphilis.

August 29, 1922—Discharged to duty. A note in the health record abstract states that he received from August 15 to August 29, 1922, mixed treatment over period and also neoarsphenamine, 0.45 gram August 21, 1922, without any bad effect, and 0.6 gram August

28, 1922. He was apparently in good condition when discharged to duty.

August 30, 1922—At about 4.30 p. m. he developed convulsions which the medical officer thought were controlled by suggestion. The convulsions returned the following day and were more severe. Dyspnea supervened and he became cyanotic. He died at 4.20 a. m. September 1, 1922, three days and some hours after the second injection of neoarsphenamine. An autopsy was not performed.

Case IX—1922.—R. H. S., corporal, marine. Enlisted December 21, 1920. Died in sick bay, constabulary detachment, First Brigade, U. S. M. C., Port au Prince, Haiti, March 10, 1922. Age, 31 years, 7 months.

Medical history.—October 10, 1921—Admitted with chancroid.

November 9, 1921—Diagnosis changed to syphilis, general macular eruption; joint and bone pains.

November 10, 1921—Neoarsphenamine, 0.6 gram. This was followed by severe febrile reaction, temperature, 105° F. He vomited twice. His temperature remained high for five hours.

November 21, 1921—Neoarsphenamine, 0.6 gram. Febrile reaction with temperature 102° F. Temperature normal the following morning.

November 29, 1921—Neoarsphenamine, 0.6 gram. Without reaction.

December 6, 1921—Neoarsphenamine, 0.8 gram. Without reaction.

December 14, 1921—Neoarsphenamine, 0.9 gram. Without reaction.

December 21, 1921—Neoarsphenamine, 0.8 gram. Without reaction.

December 28, 1921—Mercury salicylate, 1 grain.

February 28, 1922—Neoarsphenamine, 0.9 gram. Without reaction.

March 8, 1922—Neoarsphenamine, 0.6 gram at 12 noon. Violent reaction. Temperature 103° F. Pulse, 110.

March 9, 1922—Apparently recovered from reaction. Temperature and pulse normal.

March 10, 1922—Admitted with delirium and convulsions. Temperature, 99.4. Spinal puncture revealed clear fluid under considerable pressure. Convulsions and violent delirium continued until he died at 5.45 p. m., about two days and six hours after the last dose of neoarsphenamine.

Case X—1923.—E. K. M., first sgt., U. S. M. C. First enlisted September 17, 1912. Died on board U. S. S. *Asheville*, Amoy, China, August 19, 1923. Age, 36 years.

Medical history.—Severe attack of influenza complicated by pneumonia in 1919.

August 9, 1923—Admitted to sick list with syphilis; maculopapular eruption on body, copper colored in places; primary lesion still present. Neoarsphenamine, 0.45 gram.

August 16, 1923—Neoarsphenamine, 0.9 gram. With no apparent ill results and but slight reaction.

With the diagnosis of syphilis the patient began worrying about his health, and his worry increased day by day. Stated he did not think he would get well, and what was the use anyway with almost 20 years' service with a clear record. He became more and more introspective and kept himself away from others.

August 19, 1923—Admitted to sick quarters at 1 p. m. with temperature 100.2° F., complaining of a slight headache. At 5.30 p. m. he became unconscious. There was muttering delirium. At 8.30 p. m. his temperature was 102.4° F. At 9.45 p. m., temperature 104.4; cyanotic. Died at 10.55 p. m., three days and some hours after the last dose of neoarsphenamine.

Post-mortem findings.—The kidneys were slightly congested. Other organs showed nothing noteworthy. The brain apparently was not examined.

ADMISSIONS FOR INJURIES AND POISONINGS, JANUARY TO OCTOBER, INCLUSIVE, 1924

Form F cards received in the bureau between January 1 and October 31, 1924, notified injuries and poisonings as follows:

	Within command		Leave, liberty, or A. W. O. L.	Total
	Connected with actual performance of work or prescribed duty	Not connected with work or prescribed duty		
Injuries	2, 922	1, 518	885	5, 325
Poisonings	17	129	26	172
Total admissions	2, 939	1, 647	911	5, 497

Of these admissions, 83.43 per cent were for injuries and poisonings occurring within the command, and 16.57 per cent for cases incurred while on leave or liberty.

Of the cases incurred within naval commands, 64.08 per cent were connected with the actual performance of prescribed work or duty, and 35.91 per cent were not so connected. Of the total admissions for injuries and poisonings only 53.47 per cent were connected with the actual performance of work or prescribed duties, i. e., the result

of true naval industrial hazards. The remainder were incidental to liberty, athletics ashore or afloat, skylarking, quarreling, falls other than those connected wtih work, etc.

Poisoning by a narcotic drug or by ethyl alcohol is recorded under the title "Drug addiction" or "Alcoholism," as the case may be. Such cases are not included in the above figures.

The following cases selected from reports received during the past month are worthy of notice from the standpoint of accident prevention:

Transport.—While uncovering hatch, man slipped and fell into hold. Death resulted.

Battleship.—Two men were overhauling a motor-boat engine and flooded it with gasoline by undue priming. When the engine finally started, spark ignited the gasoline which exploded and burned the mechanics about the face and hands.

District vessel.—In lighting-off boiler, wood was used which was soaked in gasoline. When ignited, an explosion of the gasoline fumes occurred, the flames of which flared out and burned the hands and face of the mechanic.

Air station.—In passing hands wet with gasoline over a hot stove, the gasoline ignited. Burn of hands resulted which required transfer to hospital.

NOTE.—As will be noted from the three foregoing selected cases, the careless handling of gasoline continues to cause preventable disablement of personnel.

Battleship.—A baker carelessly leaned against a dough mixer which started and injured his arm, occasioning 10 sick days.

Destroyer.—Tip of middle finger lacerated in meat grinder.

Cruiser.—Tip of ring finger avulsed in feeding meat grinder. Disabled 28 days.

Destroyer.—An engineman suffered a burn of hand, arm, and side of chest while working on a steam valve which had not been drained before loosening the bonnet. Steam escaped with explosive force.

Destroyer.—While sharpening tool on emery wheel a piece of steel became imbedded in the operator's eye. No safety device was installed or reported as "available" for the emery wheel on that vessel.

Battleship.—A ship's cook lacerated little finger while slicing bread with bread knife. Incapacitated 30 days.

Battleship.—During battle practice an ascending powder can failed to catch on retaining gear in turret and thus spilled two powder bags which fell on and contused the foot of the primerman. On sick list 10 days.

Battleship.—As a result of the negligence of the compartment cleaner in not properly securing hatch cover, the hatch cover fell,

catching and crushing a finger of a man who was descending a vertical ladder.

Haiti.—When a defective gasoline torch exploded a marine received burns of the legs and hands which necessitated 60 days hospitalization.

Haiti.—Seven days incapacitation followed the stepping on an upturned screw in a loose board carelessly left lying about.

Battleship.—In descending a ladder into fireroom, a man stepped on a broken rung of ladder and in consequence he fell to the deck below suffering a contusion of the hand requiring 9 days on the sick list.

Marines.—Right index finger wounded when pistol which marine was holding in left hand discharged while he was attempting to extract cartridge.

Wound of right foot caused by the accidental discharge of a pistol while man was examining it.

Ship.—A case of drowning occurred because of the following apparently preventable circumstances: According to report a gangplank, evidently of insufficient length to permit the play of the ship, was rigged from the cargo port to the dock. While the deceased was passing from the dock to the ship via the gangplank the ship suddenly swung away from the dock. The gangplank fell from the ship as a result and the man was precipitated into the water and drowned.

Reports are received with surprising regularity which record burns of exposed parts and eyes, due to strong solutions of lye used for various purposes and particularly cleaning. Burns from lye seldom cause prolonged incapacitation, but when combined a considerable number of sick days accrue from this usually preventable cause.

HEALTH OF THE NAVY

This report is for the month of December. The general admission rate, all causes, was 593 per 1,000 per annum. The median December rate from the experience of the preceding five years is 610.

Acute infectious diseases of the respiratory type, of course, accounted for many admissions to the sick list, and, in general, expected rates for the common infections were slightly exceeded. So far as diseases of Class VIII(A), Navy nomenclature, are concerned, it appears that admission rates for all diseases in this group were somewhat lower than expected rates, if acute anterior poliomyelitis, one case of which was reported, be excepted.

For the entire Navy, 177 cases of influenza were reported, as compared with 101 cases in November and 228 in December, 1923. Comparatively few cases were reported by ships. The naval station, Mare Island, Calif., reported 23 cases during the month among 1,135 men. Influenza in real epidemic form was not reported by any station. For the Navy as a whole the December admission rate for influenza was 18.09 per 1,000 per annum. The five-year median December rate is 18.56. Cases reported as influenza serve as a pretty good index of the actual prevalence of the disease, especially when considered in conjunction with admission rates for the common respiratory diseases—catarrhal fever, acute bronchitis, etc.—for while many cases reported as influenza may be nothing more than ordinary colds, it is at the same time probable that many true cases of influenza are reported under other respiratory disease titles.

The admission rate for pneumonia (all forms) was comparatively low—2.15 per 1,000 per annum. The median December rate of the preceding five years is 2.67. This low rate was due in large part to the comparative freedom from measles and influenza.

There were fewer admissions for acute tonsillitis than were expected from the experience of previous years. The December admission rate was 42.3 per 1,000 per annum. The median December rate of the preceding five years is 47.2. As might be expected, the admission rate for acute bronchitis was low. Formerly, admissions for acute tonsillitis and acute bronchitis were about equal. Since the title catarrhal fever was adopted it has naturally been used for many cases which previously would have been notified as cases of acute bronchitis. Figures are, of course, not yet available to indicate expected rates for catarrhal fever.

With regard to communicable disease conditions in the United States at large, the weekly health index for the week ended December 20, 1924, prepared by the Bureau of the United States Public Health Service on the basis of returns from 104 cities having an aggregate population of nearly 29,000,000, indicates that diphtheria and measles are less prevalent this year than last year, but that scarlet fever is slightly more prevalent. Smallpox and typhoid fever appear to be much more prevalent than in recent years.

The following table shows admission rates per 1,000 per annum for the principal communicable diseases, entire Navy, December, 1924. For comparison corresponding median rates are given for the same month, years 1919 to 1923, inclusive.

	December, 1919–1923	December, 1924
Cerebrospinal fever	0.08	0
Diphtheria	.71	0.31
German measles	.51	0
Influenza	18.56	18.09
Malaria	22.81	10.63
Measles	2.28	.41
Mumps	8.62	1.53
Pneumonia	2.67	2.15
Poliomyelitis, acute anterior	.08	.10
Scarlet fever	.81	.51
Smallpox	0	0
Tuberculosis	2.92	2.04
Typhoid fever	0	.20

TABLE No. 1.—*Monthly report of morbidity in the United States Navy and Marine Corps for the month of December, 1924*

	Forces afloat	Forces ashore	Marine Corps	Entire Navy
Average strength	76,934	40,494	20,802	117,428
All causes:				
Number of admissions	3,080	2,393	1,122	5,806
Annual rate per 1,000	480.41	709.15	647.25	593.32
Disease only:				
Number of admissions	2,678	2,140	981	5,112
Annual rate per 1,000	417.71	634.17	565.91	522.40
Communicable diseases, exclusive of venereal disease:				
Number of admissions	698	769	347	1,467
Annual rate per 1,000	98.87	227.89	200.17	149.91
Venereal diseases:				
Number of admissions	1,000	312	206	1,377
Annual rate per 1,000	155.98	92.46	118.83	140.72
Injuries:				
Number of admissions	388	252	141	678
Annual rate per 1,000	60.52	74.68	81.34	69.28
Poisons:				
Number of admissions	14	2	0	16
Annual rate per 1,000	2.18	0.59	0	1.64

TABLE No. 2.—*Admission; diseases of special interest reported during the month of December, 1924*

	Forces afloat, Navy and Marines (strength, 76,934)		Forces ashore, Navy and Marines (strength, 40,494)		Total (strength, 117,428)	
	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000
Class III:						
Appendicitis, acute	48	7.49	33	9.78	81	8.28
Cholangitis, acute	27	4.21	11	3.26	38	3.88
Colitis, acute	5	.78	2	.59	7	.72
Enteritis, acute	15	2.34	10	2.96	25	2.55
Gastritis, acute catarrhal	12	1.87	30	8.89	42	4.29
Gastroenteritis, acute	21	3.28	37	10.96	58	5.93
Ulcer, duodenum	1	.16	3	.89	4	.41
Ulcer, stomach	1	.16	2	.59	3	.31
Total	130	20.28	128	37.93	258	26.37
Class V:						
Laryngitis, acute	4	.62	7	2.07	11	1.12
Pharyngitis, acute	12	1.87	15	4.45	27	2.76
Rhinitis, acute	9	1.40	6	1.78	15	1.53
Total	25	3.99	28	8.30	53	5.42

TABLE No. 2.—*Admission; diseases of special interest reported during the month of December, 1924*—Continued

	Forces afloat, Navy and Marines (strength, 76,934)		Forces ashore, Navy and Marines (strength, 40,494)		Total (strength, 117,428)	
	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000
Class VIII (A):						
Chickenpox	4	0.62	5	1.48	9	0.92
Diphtheria	0	0	3	.89	3	.31
Influenza	84	13.10	93	27.56	177	18.09
Measles	3	.48	1	.30	4	.41
Mumps	6	.94	9	2.67	15	1.53
Pneumonia, broncho	5	.78	3	.89	8	.82
Pneumonia, lobar	8	1.25	5	1.48	13	1.33
Poliomyelitis, acute anterior	0	0	1	.30	1	.10
Scarlet fever	2	.31	3	.89	5	.51
Whooping cough	0	0	1	.30	1	.10
Total	112	17.47	124	36.75	236	24.12
Class VIII (B):						
Angina, Vincent's	33	5.15	24	7.11	57	5.82
Bronchitis, acute	133	20.75	106	31.41	239	24.42
Catarrhal fever	104	16.22	188	55.71	292	29.84
Tonsillitis, acute	223	34.78	191	56.60	414	42.31
Total	493	76.90	509	150.84	1,002	102.39
Class IX:						
Dysentery, bacillary	4	.62	12	3.56	16	1.64
Dysentery, entamebic	4	.62	1	.30	5	.51
Paratyphoid fever	1	.16	1	.30	2	.20
Total	9	1.40	14	4.16	23	2.35
Class X:						
Dengue	21	3.28	59	17.48	80	8.18
Filariasis	0	0	2	.59	2	.20
Malaria	53	8.27	51	15.11	104	10.63
Total	74	11.54	112	33.19	186	19.01
Class XI:						
Tuberculosis (all forms)	10	1.56	10	2.96	20	2.04
Class XII:						
Chancroid	258	40.24	64	18.97	322	32.91
Gonococcus infection	576	89.84	178	52.75	754	77.05
Syphilis	166	25.89	70	20.74	236	24.12
Total	1,000	155.98	312	92.46	1,312	134.08

TABLE No. 3.—*Admission rates per 1,000 per annum for venereal diseases reported from ships for month of November, 1924, and from various shore stations for the five-week period December 1, 1924, to January 3, 1925, inclusive*

	Average strength	Admissions	Rate per 1,000	Maximum rate	Minimum rate
All ships	62,596	849	162.76	1,535.55	0
Battleship divisions—					
Battle fleet	14,758	145	117.90	206.90	70.64
Scouting Fleet	6,742	79	140.61	251.36	87.53
Asiatic Fleet [1]	2,076	95	549.13	1,535.55	0
Light cruiser division—					
Scouting fleet	3,113	21	80.95	195.35	0
Destroyer squadrons—					
Battle Fleet	5,527	47	102.04	475.25	0
Scouting Fleet	4,097	35	102.51	595.04	0
Asiatic Fleet [1]	2,338	104	533.79	1,310.92	0

[1] Month of October, 1924.

TABLE No. 3.—*Admission rates per 1,000 per annum for venereal diseases reported from ships for month of November, 1924, etc.*—Continued

	Average strength	Admissions	Rate per 1,000	Maximum rate	Minimum rate
All ships—Continued.					
Miscellaneous [1]—					
Battle Fleet	5,679	78	164.82	705.88	0
Scouting Fleet	5,030	30	71.57	480.00	0
Asiatic Fleet [2]	1,657	38	275.20	466.02	0
Naval Forces, Europe	1,741	58	399.77	549.62	274.89
Special Service Squadron	1,767	31	210.53	392.52	117.11
Naval Transportation Service	2,718	45	198.68	391.30	0
Special duty	5,353	43	96.39	346.82	0
All naval districts in the United States	28,052	163	60.43	258.16	0
First naval district	3,332	15	48.82	139.60	26.78
Third naval district	2,402	18	77.94	120.80	0
Fourth naval district	1,242	13	108.86	164.21	61.90
Fifth naval district	9,995	47	48.90	92.20	0
Sixth naval district	2,555	9	36.63	80.31	31.71
Seventh naval district	160	3	195.00	195.00	195.00
Eighth naval district	944	5	55.08	85.95	50.55
Ninth naval district	1,343	16	123.90	123.90	123.90
Eleventh naval district	3,935	17	44.93	61.68	24.90
Twelfth naval district	1,135	6	54.98	54.98	54.98
Thirteenth naval district	1,009	14	144.30	258.16	0

[1] Vessels of train, base force, etc. [2] Month of October, 1924.

PERCENTAGE OF TOTAL VENEREAL DISEASE ADMISSIONS REPRESENTED BY CHANCROID, GONORRHEA, AND SYPHILIS, RESPECTIVELY, AND RATIO BETWEEN SYPHILIS AND GONORRHEA

	Chancroid (per cent)	Gonorrhea (per cent)	Syphilis (per cent)	Ratio, syphilis to gonorrhea
All ships	28.03	62.07	9.90	1 to 6.3
Battleship divisions—				
Battle Fleet	5.52	78.62	15.86	1 to 5.0
Scouting Fleet	21.52	77.22	1.26	1 to 61.0
Asiatic Fleet [1]	29.47	40.00	30.53	1 to 1.7
Light cruiser division—				
Scouting Fleet	28.57	71.43	0	0 to 15.0
Destroyer squadrons—				
Battle Fleet	6.38	89.36	4.26	1 to 21.0
Scouting Fleet	37.15	54.28	8.57	1 to 6.3
Asiatic Fleet [1]	48.08	45.19	6.73	1 to 6.7
Miscellaneous [2]—				
Battle Fleet	25.64	65.38	8.98	1 to 7.3
Scouting Fleet	16.67	80.00	3.33	1 to 24.0
Asiatic Fleet	36.84	60.53	2.63	1 to 23.0
Naval Forces, Europe	55.17	36.21	8.62	1 to 4.1
Special Service Squadron	35.48	61.29	3.23	1 to 19.0
Naval Transportation Service	42.22	57.78	0	0 to 26.0
Special duty	27.91	62.79	9.30	1 to 6.8
All naval districts in the United States	10.43	80.37	9.20	1 to 8.7
First naval district	0	86.67	13.33	1 to 6.5
Third naval district	0	94.44	5.56	1 to 17.0
Fourth naval district	0	92.31	7.69	1 to 12.0
Fifth naval district	17.02	74.47	8.51	1 to 8.8
Sixth naval district	44.44	55.56	0	0 to 5.0
Seventh naval district	33.33	66.67	0	0 to 2.0
Eighth naval district	0	100.00	0	0 to 5.0
Ninth naval district	18.75	75.00	6.25	1 to 12.0
Eleventh naval district	0	87.35	12.65	1 to 4.7
Twelfth naval district	16.67	66.66	16.67	1 to 4.0
Thirteenth naval district	0	85.71	14.29	1 to 6.0

[1] Month of October, 1924. [2] Vessels of train, base force, etc.

TABLE No. 4.—*Number of admissions reported by Form F cards and annual rate per 1,000, entire Navy, for the month of December, 1924*

	Navy (strength, 96,626)		Marine Corps (strength, 20,802)		Total (strength, 117,428)	
	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000
Diseases of—						
Blood	2	0.25	1	0.58	3	0.31
Circulatory system	35	4.35	9	5.19	44	4.50
Digestive system	356	44.21	84	48.46	440	44.96
Ductless glands and spleen	5	.62	2	1.15	7	.72
Ear	360	44.71	81	46.73	441	45.07
Eye and adnexa	53	6.58	13	7.50	66	6.74
Genito-urinary system (nonvenereal)	87	10.80	20	11.54	107	10.93
Communicable diseases transmissible by—						
Oral and nasal discharges (A)	270	33.53	47	27.11	317	32.39
Oral and nasal discharges (B)	830	103.08	197	113.64	1,027	104.95
Intestinal discharges	16	1.99	7	4.04	23	2.35
Insects and other arthropods	100	12.42	92	53.07	192	19.62
Tuberculosis (all forms)	17	2.11	4	2.31	21	2.15
Venereal diseases	1,171	145.43	206	118.83	1,377	140.72
Other diseases of infective type	260	32.29	58	33.46	318	32.50
Diseases of—						
Lymphatic system	32	3.97	9	5.19	41	4.19
Mind	42	5.22	9	5.19	51	5.21
Motor system	71	8.82	30	17.30	101	10.32
Nervous system	31	3.85	4	2.31	35	3.58
Respiratory system	44	5.46	7	4.04	51	5.21
Skin, hair, and nails	82	10.18	33	19.04	115	11.75
Hernia	30	3.73	7	4.04	37	3.78
Miscellaneous diseases and conditions	108	13.41	28	16.15	136	13.90
Parasites (fungi and certain animal parasites)	90	11.18	27	15.58	117	11.96
Tumors	18	2.24	1	.58	19	1.94
Injuries	537	66.69	141	81.34	678	69.28
Poisoning	16	1.99	0	0	16	1.64
Dental diseases and conditions	21	2.61	5	2.88	26	2.66
Total	4,684	581.71	1,122	647.25	5,806	593.32

TABLE No. 5.—*Deaths reported, entire Navy, for the month of December, 1924*

	Navy (strength, 96,626)	Marine Corps (strength, 20,802)	Total (strength, 117,428)
Malaria	1	0	1
Pneumonia, lobar	5	0	5
Tuberculosis, chronic pulmonary	1	0	1
Poliomyelitis, acute anterior	1	0	1
Syphilis	2	0	2
Malignant growths	1	0	1
Other diseases	5	0	5
Drowning	6	0	6
Other accidents and injuries	14	1	15
Poisonings	2	0	2
Total	28	1	29
Annual death rate per 1,000, all causes	4.72	0.58	3.99
Annual death rate per 1,000, disease only	1.99	0	1.64

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TRUMAN H. NEWBERRY,
Acting Secretary.

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Volume VIII, No. 3, July, 1914.
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PREFACE

The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April, 1907, as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, reports from various sources, historical essays, notes and comments on topics of medical interest, and reviews, or notices of the latest published medical books.

The bureau extends an invitation to all medical officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit, the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit and will recommend that copies of such letters be made a part of the official records of the officers concerned.

The bureau does not necessarily undertake to indorse all views or opinions which may be expressed in the pages of this publication.

E. R. STITT,
Surgeon General United States Navy.

NOTICE TO SERVICE CONTRIBUTORS

When contributions are typewritten, *double spacing* and wide margins are desirable. Fasteners which can not be removed without tearing the paper are an abomination. A large proportion of the articles submitted have an official form, such as letterheads, numbered paragraphs, and needless spacing between paragraphs, all of which require correction before going to press. The BULLETIN endeavors to follow a uniform style in headings and captions, and the editor can be spared much time and trouble and unnecessary errors can be obviated if authors will follow in the above particulars the practice of recent issues.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received two months prior to the date of the issue for which they are intended.

The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustrations, if not original, should be accompanied by a reference to the source and a statement as to whether or not reproduction has been authorized.

The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc. All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.*

U. S. NAVAL MEDICAL BULLETIN

VOL. XXII MARCH, 1925 No. 3

SPECIAL ARTICLES

A PLEA FOR BASIC MEDICAL EXPERIENCE PRIOR TO SPECIALIZATION[1]

By E. R. STITT, Rear Admiral, Medical Corps, United States Navy

Gentlemen, I look to the American College of Physicians to keep us from drifting into the methods of the ancient Egyptians, of whom it is stated: "Medicine is practiced among them on a plan of separation. Each physician treats a single disorder, and no more; thus the country swarms with medical practitioners, some undertaking to cure diseases of the eye, others of the head, others again of the teeth, others of the intestine, and some those which are not local."

There is no problem in life more difficult of decision than that of choosing one's profession or vocation, and it is a matter of common consent that many have failed because they did not follow the walk in life best suited to their inclinations or aptitudes. Even those who apparently make a good choice often wonder whether some other calling might not have better fitted them. To succeed one must be interested or even enthusiastic in his work, this attitude outweighing energy or patience.

A few years of a well-balanced general practice not only gives an appreciation of the symptoms which may arise from various regional disturbances, but it affords the young physician an opportunity to determine the branch of medicine which appeals to him and in which his colleagues, as well as himself, recognize his talent. In our medical schools the men chosen to teach are as a rule given such positions as acknowledgment by other doctors of their qualifications. The same rule should hold for specialists, who, in a way, teach by affording the general practitioner a solution of his difficult diagnostic problems. That this recognition of superior talent or qualifications exists widely is attested by the designation, frequently given a skillful surgeon or diagnostician, as a "born" surgeon or diagnostician.

It may be that the complexity of the medical problem will lead us to group the men starting out in the profession as either surgeons or physicians, but this would be a practical rather than a desirable solution. The more medicine a surgeon knows the better surgeon he

[1] Delivered before American College of Surgeons and American Congress on Internal Medicine, Washington, D. C., Nov. 26, 1924.

will be, and the more surgery a medical man knows the abler will he be as an internist.

If such a division of general practitioners should obtain, the ophthalmologist, the urologist, and other followers of the surgical specialties would naturally develop from this group of surgeons. For several years I have noted in the naval service that our skillful young surgeons make the best eye, ear, throat, and nose specialists.

On the other hand, our neurologists, laboratory men, and public-health workers, along with other well-recognized specialists, would come from the internist group.

I recognize as fully as any man in the profession that we must have specialists to clear up cases which require a knowledge above that of the general practitioner, but these superspecialists should rise from the foundation of a wide experience in general medicine and an acceptance by other practitioners of their right to perform a service above the general average. The present system of recent graduates in medicine or, I might almost say, medical students, starting in as specialists is all wrong. The general practitioner should do much of the work now fenced off for specialists, and in that way we would need fewer specialists and of these only those who were exceptionally qualified.

We are familiar with the demands of the surgeon and other specialists that the general practitioner call them in the moment a suspicion enters his head that there may be occasion for surgery or other help—the decision to rest with the specialist.

For a number of years we have been sending our young medical officers who show aptitude for surgery to the Mayo Clinic, and the strongest impression these young men get from the Mayo Clinic is that they are being trained in internal medicine rather than in surgery. At that clinic internal medicine, including history taking, physical diagnosis, and laboratory findings, gives the indications for surgery. I believe that in the future we shall follow this practice and that surgery or other special forms of treatment will be prescribed by the internist just as he now prescribes medicines—the necessity for this special form of treatment resting with the internist.

The present trouble with the internist is that he has allowed himself to be forced into a position subordinate to the technician, medical or otherwise, who attempts to make the diagnosis from the chemical, bacteriological, roentgenological, electrocardiographic, basal metabolism, psychological, or other type of laboratory. We have gotten to the point where an internist does not dare to make a diagnosis until he has heard from all these laboratories and from a host of specialists. I have been told that in some of the clinics they even demand a psychometric test in the routine examination

of the patient, and I suppose some would even insist upon psychoanalysis as a regular procedure if it were not so time-consuming.

I was very much interested a few months ago to learn from Professor Stengel, of the University of Pennsylvania, that he had changed the methods of his clinic, demanding that the tentative diagnosis be arrived at by the ordinary methods of physical diagnosis with the help of an old-fashioned urine examination and a simple blood count. Then, and only after the tentative diagnosis is made, are the elaborate reports from various special departments brought in to be used as a check on the diagnosis arrived at by simpler and more practical means. I know it is out of the question for an internist to perfect himself along the various technical lines of scientific medicine, but he should, at any rate, learn to interpret such findings and to evaluate them.

Gentlemen, I believe that it is through such a society as the American College of Physicians that we will come back to the dignified position the general practitioner held in the past, and that with this aim in view we should all support such a society.

GAS POISONING FOLLOWING POWDER EXPLOSIONS

By D. C. WALTON, Lieutenant Commander, Medical Corps, United States Navy

The recent turret accidents on the *Trenton* and *Mississippi* have drawn attention again to the frequency with which such accidents are followed by many deaths due to gas poisoning among the exposed personnel. Accidents on the *Trenton* and *Mississippi* gave rise to many cases which in all respects resembled the cases described as following naval powder accidents in the past. In all the accidents described by various authors the gas poisoning appears to have been due either to carbon monoxide, to nitrous fumes, to lack of oxygen, or to a mixture of all three. The great bulk of gassed cases in the British Navy during the World War were due to nitrous fumes and carbon monoxide. In the British Army very few of such cases occurred and they were found mainly among miners following the explosion of charges in military land mines, with the subsequent formation of gas pockets in the surrounding ground, and a certain number of carbon monoxide cases in machine-gun "pill boxes" and among the personnel operating tanks also occurred. The comparative rarity of such cases following Army powder explosions is usually explained by the fact that in the Army these explosions occur in the open, while in the Navy the gases evolved are confined by the decks or turrets.

A brief review of the various propellants and explosives in most common use will be of value in considering the gas problems that

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may arise from either the "detonation" or the "burning" of these compounds.

Black gunpowder.—The oldest known explosive is the ordinary black gunpowder. The ingredients in various gunpowders differ slightly, but generally they approach the following proportions: Potassium nitrate, 75 per cent; charcoal, 15 per cent; sulphur, 10 per cent. The materials are finely ground, mixed, slightly moistened, and pressed in cakes, which are then granulated and the powder polished and screened.

On explosion of gunpowder the reaction approximates the following:

$$20KNO_3+32C+8S=5K_2CO_3+K_2SO_4+3K_2S+2S+11CO_2+16CO+10N_2$$

About 43 per cent of the products are gaseous, and about 57 per cent form the solid residue (smoke).

Black powder is but little used nowadays as a propellant for military purposes. It is found in saluting charges, in certain fuses, and in some pyrotechnics. When black powder is slowly burned a certain amount of hydrogen sulphide may be formed and give toxic effects in addition to any which may arise from the CO given off. As hydrogen sulphide has a toxicity nearly as great as hydrocyanic-acid gas, the danger becomes a very real one.

Smokeless powder.—This powder is usually made by nitrating a fine grade of cotton. The number of nitrate groups introduced into the cellulose molecule depends on the relative proportions of the nitric and sulphuric acids used in the nitration process and the temperature and duration of the reaction. For explosive purposes a product containing from 12.75 to 13.65 per cent of nitrogen is used, and the formula corresponding to this product would be $C_{24}H_{29}O_9(ONO_2)_{11}$.

After washing and drying the nitrocellulose is gelatinized by working with a mixture of alcohol and ether, and at the same time a little diphenylamine is added as a stabilizer. When thus gelatinized, it is then dried again and formed into grains. In this condition the nitrocellulose is known as "smokeless powder", or "nitropowder." In the American Navy it is usually known as "colloid nitrocellulose."

The oxygen content of nitrocellulose is not sufficient to completely oxidize the carbon to the dioxide when explosion takes place, and hence some carbon monoxide is also formed. If the oxidation of the carbon and hydrogen went as far as possible, the reaction should be as follows:

$$2C_{24}H_{29}(ONO_2)_{11}=7CO_2+41CO+29H_2O+11N_2$$

As a matter of fact, the gases also contain some methane, (CH_4) and even some free hydrogen, which is probably converted to water by combination with oxygen of the air.

Trinitrotoluene.—"T. N. T.," sometimes called "Trotyl," is a true nitro compound, having the formula $CH_3.C_6H_2(NO_2)_3$, and is obtained by the nitration of toluene ($CH_3.C_6H_5$). The decomposition of T. N. T. on explosion probably takes place according to both of the following equations:

$$2C_6H_2(CH_3)(NO_2)_3=12CO+3N_2+2CH_4+H_2$$
$$2C_6H_2(CH_3)(NO_2)_3=12CO+3N_2+5H_2+2C$$

Amatol.—This explosive has been used to a certain extent by various foreign powers as a shell filling. It is a mixture of ammonium nitrate and T. N. T. in various proportions. For the smaller shell equal parts by weight of the two are used, while for larger shell the proportions are four of the ammonium nitrate and one of T. N. T. On explosion, since it has a high content of oxygen, it produces practically no smoke.

Picric acid.—Used by the French under the name "melinite" and by the British under the name "lyddite", picric acid, although a more powerful explosive than T. N. T., has been abandoned by most nations because of its cost. Picric acid is obtained by the nitration of phenol (carbolic acid, C_6H_5OH) and has the formula $C_6H_2(OH)(NO_2)_3$.

Nitroglycerine.—Nitroglycerine ($C_3H_5(ONO_2)_3$) is obtained by nitrating glycerine ($C_3H_5(OH)_3$) with the usual mixture of nitric and sulphuric acids. Nitroglycerine is an oily yellow odorless liquid. It begihs to decompose at 50°–60° C., and at 215°–222° C. it explodes. It is the most sensitive of all commercial explosives to impact, and hence is not used for military purposes and can not be safely transported by railway.

Dynamite.—Nitroglycerine is used in the manufacture of other explosives. It can be absorbed by "kieselguhr" (an infusorial earth consisting principally of the shells of microorganisms called diatoms) in various proportions up to 82 per cent. A mixture of this kind is called dynamite.

Ballistite.—This is a mixture of 60 per cent collodion cotton and 40 per cent nitroglycerine.

Cordite.—This propellant is extensively used by the British under the name "Cordite M. D." It consists of 65 per cent nitrocellulose, 30 per cent nitroglycerine, and 5 per cent vaseline.

Cheddite.—Cheddite is a mixture consisting of about 80 per cent of sodium or potassium chlorate ($NaClO_3$ or $KClO_3$), 15 per cent of nitronaphthalene ($C_{10}H_7NO_2$) or dinitrotoluene ($CH_3.C_6H_3$

$(NO_2)_2$), and 5 per cent of castor oil. It is a favorite blasting powder in France.

Tetryl.—This is derived from trinitroaniline ($(NO_2)_3C_6H_2.NH_2$) by replacing the two hydrogens of the amino group (NH_2) with a methyl and another nitro group. This gives trinitrophenylmethylnitramine ($(NO_2)_3.C_6H_2NCH_3NO_2$) or "tetryl."

As an explosive tetryl is more powerful than any other military high explosive, but owing to its sensitiveness to shock it can not be used as a shell filler. It has been used, however, as a shell booster and also in detonators.

Anilite.—During the war the French often used a liquid explosive in airplane drop bombs, called "anilite," which consisted of a mixture of liquid nitrogen peroxide (N_2O_4) and some combustible liquid such as benzene or nitrobenzene. These materials were contained in separate compartments and were mixed after the drop bomb was released from the airplane. The anilites are powerful explosives, but most of them are rather dangerous to handle unless mixed just previous to use. The principle underlying these explosives is the oxidizing power of the nitrogen peroxide, which oxidizes the combustible matter mixed with it.

Oxyliquit.—An interesting explosive is a mixture of liquid oxygen with various types of combustible matter, such as charcoal, or the liquid oxygen and some combustible material, such as petroleum, may be absorbed in some porous, inert material such as "kieselguhr." These materials must be mixed just previous to use, as the oxygen is quickly lost by evaporation. The Germans used this material extensively during the war for blasting operations in the construction of dugouts and mine tunnels. It produces no CO, is safe to handle, and in the event of a misfire the oxygen evaporates in about 20 minutes, and the charge automatically becomes inert.

An examination of the above list of explosives shows that those explosives most widely used at present are all nitro derivatives. When used properly (completely detonated), they give off enormous volumes of nitrogen, carbon monoxide, and carbon dioxide. The late Prof. Vivian Lewes calculated that a 15-inch gun with its charge of 400 pounds of cordite gives off 2,500 cubic feet of carbon monoxide each time the gun is fired. Under ordinary conditions this CO is rapidly diffused through the atmosphere and no poisoning occurs. If for any reason, however, the gases are permitted to blow back into a gun turret, gun pit, or machine-gun pill box, the CO will rapidly produce symptoms.

While the gas danger resulting from the "normal" detonation of explosives is a very real one, it does not compare in gravity with the dangers resulting from incomplete detonation or from the burning of an explosive charge.

A series of accidents in various mines, especially in the gold mines of the Rand, led to an investigation into the gaseous products of incomplete or partial detonation. It was found that whereas large volumes of CO and CO_2 were produced by normal detonation of the charge, if for any reason the detonation was incomplete, or if the charge burned instead of detonating, large volumes of nitrous fumes were produced which led to many deaths among the Rand miners from pulmonary edema.

In 1914 Professor Esch and Doctor Keller conducted a series of experiments in the torpedo laboratory at Kiel to determine the nature of the gases produced by propellants and explosives under different conditions of detonation or of deflagration. As explosive materials they selected the powders and explosives used by modern States at that time.

The materials to be tested were placed in a chamber of 20 liters capacity and detonated or deflagrated by different methods, such as an electric sprak or a red-hot wire. By various arrangements they attempted to simulate conditions in actual explosions. The chamber was carefully sealed off to prevent any escape of the gases. which were later led off through a valve to be analyzed. An accurate quantitative examination of the gases was not carried out, but sufficient analyses were made to determine what gases would be produced under different conditions of either complete or partial detonation and what would be the main features of the intoxication produced by the inhalation of these gases.

Eighteen experiments were made, and although the authors state that theoretically it is possible under the most favorable conditions (complete detonation and adequate oxygen content of the explosive) to obtain only carbon dioxide, water, and nitrogen, all of which are inert gases, they were unable to obtain these results. In all experiments toxic gases were produced in varying amounts.

"The volumetric relation of these poisonous gases depended upon the conditions of the experiment. The oxygen content of an explosive is of importance in this direction. Another factor in the explosion of grenades, torpedoes, and mines is the so-called charge density (charge density is the relation of weight of explosive in grams to the volume of the shell or container in cubic centimeters). Is this coefficient low, there will be more carbon monoxide produced; is the coefficient high, little carbon monoxide but more carbonic acid and methane. Another factor is the intensity of the initial sparking. According to the strength of the initial impulse, the decomposition of the explosive will proceed with a wavelike motion at very high velocity, so that, practically speaking, all the molecules of the charge will react at one time. On the other hand, if improperly loaded, or as the result of a poor cap or of a low initial impulse, the wave of

propagation of disintegration will lag more or less, and the result will be an incomplete detonation or even nothing more than a mere burning of the explosive. In the first type of explosion, in detonation, the explosive is completely disintegrated. In the second type, deflagration, only a part of the mass of explosive will be exploded almost instantly, as in the case of detonation; the remainder reacts following a wave motion occupying an appreciable time, through less rapid propagation of the flame. In this second type incomplete decomposition of the explosive is always present, and oxide of nitrogen and other gases always accompany the carbon monoxide. Deflagration of explosives can occur through spontaneous combustion, from external flame, or as the result of being struck with a missile. Under certain circumstances detonation may pass into deflagration or vice versa.

"Very favorable results were obtained in the complete detonation of the aromatic nitro products; no noteworthy difference between trinitrophenol and trinitrotoluol was observed. In these experiments notable amounts of carbon monoxide were obtained, but no oxides of nitrogen. Theoretically it can not be denied that oxids of nitrogen could be obtained from such a detonation, since a portion of the explosive always escapes the reaction, as is to be seen in the yellow color after a picrate explosion. Nevertheless, it was only possible once, in an incomplete detonation, to secure traces of nitrogen oxides, and apparently in practice they are to be disregarded.

"On the other hand, however, they always found with incomplete detonation of these explosives nitrogen monoxide. The quantity of the nitrogen oxide depends on the relation of the burning explosive to the exploding material. In these experiments they also determined that large amounts of carbon monoxide are formed. As a matter of fact, where the explosive chamber contains a large amount of air the carbon monoxide will be burned to carbon dioxide by the flame of the explosion. Furthermore, methane, acetylene, and nitrile gases were shown to be present, especially in the cases where nitrogen monoxide was found in plenty, indicating an incomplete decomposition of a portion of the explosive. These gases appear in larger amounts when the explosive undergoes fulmination. Under these circumstances nitrogen oxide appears in appreciable amounts while carbon monoxide is less prominent.

"In the experiments with smokeless powder and with guncotton a similar result was secured. The addition of an appreciable amount of nitroglycerol to an explosive results in an increase of nitrogen monoxide in the resultant gases, it being indeed well known by experience that nitrous gases can be secured in large amounts by extraction of dynamite cartridges. An important observation was made with smokeless powder. As the result of the presence of

a considerable amount of nitroglycerol, this was found in part unchanged in the gases, having been volatilized by the heat. A simple demonstration of this fact can be made by heating a small amount of smokeless powder in a test tube over a flame. The fire damp has a distinctly sweet taste.

"Lewin and Poppenberg had previously shown that in the explosion of nitrated aromatic bodies amounts of carbon monoxid up to 30 per cent were sometimes to be found. They also showed that in the fulmination of a half a gram of picric acid 32 c.c. of nitrogen monoxid were produced, from half a gram of trinitrotoluol 25 c.c. of the same gas were secured, while from half a gram of dynamite as much as 68 c.c. of nitrogen monoxid were formed. The full importance of these figures is only realized when one considers the enormous charges of modern shells, torpedoes, and mines. Nevertheless, a destructive gas intoxication can only occur under unfavorable circumstances."

These unfavorable circumstances, it can be seen from the above, will be more marked when the burning of powder or explosives occur with the production of nitrous fumes in addition to the normal CO and CO_2 to be expected. The danger will, of course, be markedly increased by the locale of the explosion and the degree of proximity of the personnel exposed to the explosion. To those near by, the force of the explosion and the heat evolved will be the primary factors in producing injury, although among these asphyxia or lung injuries will also occur. At a greater distance from the point of explosion the factor of gas poisoning becomes most prominent. In a turret or compartment the gases and heat of explosion will drive all the normal atmosphere out, and the resultant reduction in oxygen will add to the toxic effect of the gases by causing increased respiration with the resultant more rapid absorption of the toxic gases. The toxic action of the gases will also be increased by their high temperature.

Following any explosion the possibility that some of the lung injuries are due to inhalation of flames or overheated inert gases must be considered, also the shock effect of large burns. From the gas-poisoning point of view the cases may be considered as being either in immediate danger from carbon-monoxide poisoning, or in danger after some hours from nitrous-fumes poisoning.

Carbon-monoxide poisoning.—This form of poisoning occurs so often from illuminating gas and automobile exhaust vapors that all physicians are well acquainted with the symptomatology and pathology of the condition. During recent years extensive work on the subject has been done by many investigators, including Henderson and Haggard, Sayres, Haldane, and others. The recently published British Medical History of the War gives the following

excellent symposium on the CO cases following the explosion of military charges in mines:

"When an atmosphere containing CO is breathed, the oxygen in the blood is displaced from its combination with the hemoglobin by CO owing to the fact that the affinity of hemoglobin for CO is more than 250 times greater than for oxygen. With each inspiration more carboxyhemoglobin is formed; as a result all the tissues suffer from oxygen starvation, and all the symptoms are directly referable to this anoxemia. It was formerly taught that his combination was so stable that it could only with the greatest difficulty be disturbed; but this is not so, and although carboxyhemoglobin is much more stable than oxyhemoglobin it is far from being a permanent combination. The rate of absorption of CO depends upon various factors, such as the percentage volume of oxygen present (where this is small, poisoning will be much more rapid) and the susceptibility of those exposed. The rate of dissociation of CO from the blood is also determined by the partial pressure of oxygen and CO in the air breathed. When a man is removed to the fresh air, the CO gradually disappears from the blood and much more quickly in the presence of oxygen; its displacement, however, is much slower than its absorption. The symptoms of CO poisoning depend upon the percentage of red blood corpuscles thrown out of action by combination with CO. If the exposed person is doing hard work, symptoms of slight giddiness and shortness of breath may appear when only 20 per cent of the hemoglobin has been fixed by CO. During rest distinct signs of poisoning appear when 30 per cent of the hemoglobin has combined with CO. With every increase up to 50 per cent the symptoms become more decided, staggering and unsteady gait, confused cerebration, and loss of consciousness ensuing. In some men who are very susceptible to the action of CO a smaller degree of saturation may be sufficient to cause loss of consciousness. Examination of the blood of a number of men taken out of mines who had been killed by CO showed considerable variation in the amount of hemoglobin saturated by CO, the amount varying from 54 to 82 per cent. Most showed 70 to 80 per cent. Men who were killed by the same explosion showed considerable difference in CO saturation. In one man who was sufficiently far from the seat of explosion to have escaped injury by the explosive wave, but who was found dead, there was only 20 per cent CO saturation. The explanation of this is that the man died from breathing deoxygenated air with CO under pressure, the air of that part of the gallery having been replaced by the products of combustion from the exploded mine. In men who have survived sufficiently long to breathe fresh air, or who have had oxygen administered to them, the degree of CO saturation may be found to be much less.

"In mine-gas poisoning there were frequent demonstrations of the cumulative action of CO. Although there is only a small percentage of the gas in the air, it will be gradually and continuously absorbed by the blood until distinct symptoms of poisoning are produced. The amount finally taken up depends upon the relative concentration of oxygen and CO in the air breathed, so that the blood can only be saturated up to a certain point, no matter how long exposure may be. For example, 0.02 per cent CO in the air will never produce loss of consciousness, but tunnelers who worked in such atmosphere frequently complained of headache at the end of their shift, and it was also found that their output of work decreased considerably. According to Prof. J. S. Haldane, 0.04 per cent CO in the air will produce 34 per cent saturation of the blood; 0.05, 46 per cent saturation; 0.06, 52 per cent saturation; and 0.08, 58 per cent saturation. Even after prolonged exposure to such quantities recovery was general. Anything above 0.1 per cent CO is dangerous to life. It is this cumulative action of CO which makes it such a dangerous and insidious poison. For example, it will permit those who are attempting rescue work without apparatus to penetrate a certain distance into a mine without being affected, but a point will be reached when sufficient CO has accumulated in the blood to cause symptoms of poisoning to appear. The affected men now realize their danger when it is too late, as there is too little oxygen available in the blood to carry them to a point of safety before loss of consciousness supervenes. In the same way, when any man was obliged to come out of the mine owing to feeling the effects of the gas, his blood was already dangerously saturated with CO, so that should he descend again only a very short exposure would be necessary to render him unconscious. These points are very important to remember in rescue work. In the early days of mining a considerable percentage of the casualties was among men who rushed in without apparatus to rescue their comrades. Certainly the restricted length of galleries as compared with colliery workings at home was a great temptation to the men to attempt rescue without apparatus. The order 'No man is to descend the shaft without rescue apparatus till the mine is reported clear of gas,' which was early issued, resulted in a noticeable decrease in the number of casualties.

"The consumption of oxygen varies greatly according to the amount of work done by the wearer. At rest a man consumes 250 c. c. of oxygen per minute; when walking at a slow rate, 1,200 c. c.; walking quickly, 2,000 to 2,500 c. c.; and violent exertion, 3,000 c.c. It was difficult to persuade the mine rescue men wearing apparatus that more oxygen was required when walking quickly than when doing hard work with their arms alone.

"In the same way, a man at work absorbs more CO than at rest, and the more strenuous the work the more CO will be absorbed, and the more quickly symptoms will appear. For example, if a miner at rest were exposed to 0.1 per cent CO it would take two hours for symptoms of poisoning to develop, whereas at work the same percentage would cause symptoms to appear in 45 minutes; 0.2 per cent causes loss of consciousness in 20 to 30 minutes in a man at work; and 0.3 per cent in 10 to 15 minutes. Advantage of this fact was taken by one of the officers in charge of mine rescue schools, who taught his rescue men to train white mice to climb actively over the hands and to use this method when testing the air of a suspected place.

"A man feeling himself becoming affected with gas naturally rushes from the danger zone to the bottom of the nearest shaft. Men were taught whenever they were exposed to gas to proceed as quietly as possible out of the galleries, making as little exertion as possible in order to conserve the oxygen supply in the blood. In all rescue operations it is important, then, to see that there is no haste and that men who have been gassed are brought quietly along. It was found that anxiety, excitement, or marked mental effort act in the same way as excessive muscular exertion, all hastening the absorption of CO.

"Analysis of the air in badly ventilated galleries after blows in which men had been poisoned showed that under these conditions the action of CO was intensified and that symptoms of poisoning appeared early. This was probably more the result of the decreased oxygen than the increase of CO_2. Not only so, but percentage of CO, which in ordinary circumstances would cause only discomfort, might under such conditions produce dangerous symptoms. In men who have been found dead near an explosion, but sufficiently far not to have shown effects of violence, death was due in some cases to the combined action of CO under pressure and want of oxygen, the oxygen having been displaced by the products of combustion of the explosive used.

"It is well known that prolonged oxygen starvation has a very serious effect on nervous tissue. Experience of mine-gas poisoning similarly proved beyond question that prolonged exposure to small quantities of CO is much more injurious to the system than short exposure to large percentage. A man who has been exposed to a very high percentage of CO may recover; hence the order given to mine-rescue men to take, whenever possible, oxygen reviving apparatus into the mine after explosions. It was also found that after prolonged exposure to comparatively small percentages of CO relapses after apparent recovery were very common and that serious after-effects developed and sudden death occasionally occurred; whereas, after short exposure to high percentages, when

the patient recovered consciousness a perfect recovery generally followed. The aftereffects of CO poisoning are not due, as is commonly believed, to retention of CO in the blood, but to the organism being deprived for a time of a considerable percentage of oxygen. As soon as an atmosphere free of CO is breathed, the CO in the blood is gradually replaced by oxygen. Even in serious cases it seldom takes longer than three or four hours for the blood to be thoroughly free of CO, and this period can be considerably shortened by the administration of oxygen.

"Individaul susceptibility plays a very important rôle in CO poisoning, some men being much more susceptible than others. Experience showed that some men could work in an atmosphere that would quickly knock out others who were more susceptible. When such men were overcome, they seldom suffered from the distressing aftereffects and made rapid and complete recoveries, whereas in more susceptible men who had been several times gassed heart trouble often ensued. It was also found that young men were more susceptible than men over 40, owing to the deeper inspirations and greater elasticity of the chest permitting more rapid absorption of the gas. Men who were addicted to alcohol or who had recently recovered from a drinking bout, as in the case of some men who had just returned from leave, were usually very susceptible to CO, and the aftereffects were more severe, mental disturbances frequently being marked.

"A number of the specially enlisted miners suffered from bronchitis and asthma. In the early days of mining, when the galleries were small and much less efficiently ventilated, impure air (decrease of oxygen and increase of CO_2 with traces of CO) was a potent factor in precipitating attacks of bronchitis and asthma. It was also found that these men were so susceptible to CO poisoning that an order was issued prohibiting them from working in any place where the presence of gas was suspected. Apart from this, coughing, of course, was a danger in places where silent working was necessary. A considerable percentage of the miners from Australia and South Africa, more especially the older men who had worked in the gold mines, suffered from silicosis. This rendered them more susceptible to CO; they suffered more severely from the effects and took longer to recover.

"It was also found that the functional power of the heart is a decisive factor in a man's ability to stand CO poisoning. Men suffering from heart disease were unusually susceptible. Men who had any inherent weakness of the nervous system were also more susceptible to CO, and if affected were likely to develop certain nervous disorders. In such even a short exposure to CO might result in neuritis and marked mental disorders, such as delirium.

"It is known that obesity predisposes to CO poisoning. Captain Rutherfurd, one of the medical officers of tunneling companies, thinks that this is owing to the fact that human fat dissolves CO and so provides a reservoir of this poisonous substance and keeps up the poisoning.

"It was found that where men were continually working in galleries the air of which contained a small percentage of CO (e. g., 0.02 or 0.03 per cent), a certain amount of toleration to CO was established, and when these men were exposed to larger quantities longer exposure would be necessary before they were overcome than would be the case in others in whom this partial tolerance had not been established. Such men, however, lost this tolerance after they had been working in good air or after they had been back in rest billets. It can not be insisted on too strongly that CO is no respecter of persons and that immunity from CO does not exist.

"SYMPTOMS

"That CO has a very varying effect on those exposed to its action was well demonstrated when, as happened on various occasions, a number of men had been exposed to the same atmosphere for the same time. It was also proved that the symptoms were at times most indefinite.

"If the atmosphere contains a large quantity of CO, or where the percentage of oxygen has fallen and there is increase of CO_2 and CO is present in certain amount, as happens when men are caught in a mine when an explosion occurs, loss of consciousness will develop in a few minutes with practically no warning. It was much more common, however, to find smaller percentages of CO present. On exposure to such an atmosphere the onset of symptoms is gradual and insidious. The first symptom complained of is slight giddiness or lightness of the head accompanied by noises in the ears, indistinct vision, and a feeling of fatigue or weakness. This is followed by dyspnea and palpitation, which are aggravated by the least exertion, and confused cerebration, quickly followed by the characteristic loss of power in the limbs which leads to staggering. All these symptoms are the result of cerebral anoxemia. When this stage has been reached the saturation of the hemoglobin by CO has preceeded so far that it is too late for the man to reach a place of safety, as the least exertion will lead to loss of consciousness. In others most of the above-mentioned symptoms are absent, and the first symptoms drawing attention to the dangerous character of the atmosphere is the utter weariness and powerlessness of the legs, which sometimes feel as if they do not belong to the patient, while in others the arms are affected. In such cases the men may

be fully conscious of the danger, but are unable to escape. In the early days of mining a number of fatal accidents occured owing to men who had been slightly gassed making their way out of the mine by climbing the vertical ladder in the shaft or walking up a steep incline, thus greatly increasing the demand on the already impoverished oxygen content of the blood; this led to powerlessness of the limbs and feebleness of grip, perhaps loss of consciousness, resulting in the men being precipitated to the bottom. Orders were at once circulated that no man, however slightly gassed he might seem should ascend the shaft without being roped and hoisted and that life lines should be kept at each shaft. At that time another danger was not properly appreciated—namely, that exposure to fresh air often rendered unconscious men who had slightly recovered from gas poisoning, so that after gaining the shaft head they fell back unconscious and were killed. Sensory disturbances were occasionally met with, and miners have declared that when ascending the ladder after they have been gassed the rungs and sides of the ladder felt as if they were two or three times the usual size and that their feet were placed on some soft yielding substance. In such cases there was also slow cerebration.

"In a small percentage of cases the first symptom is a feeling of intoxication, exaltation, or exhilaration, the judgment and temper being affected, while others appear as if they were in the early stages of alcoholic intoxication—laughing immoderately, swearing, singing or shouting, and becoming quarrelsome. It was found when these patients regained consciousness there was frequently a return of the above symptoms and, in some, delirium. In other cases the onset is more insidious, the man either dropping without any warning or becoming languid, drowsy with an irresistible desire to rest; the mind also becomes so quickly blurred that unconsciousness develops before the man is able to appreciate the danger. Owing to the above-mentioned mental disturbances men were prohibited from doing any work (e. g., listening, pumping) when alone where there was any suspicion of gas. The insidious effect of breathing a CO-laden atmosphere can not be overemphasized. Warning symptoms can not be relied upon. In some cases, it has been noted, these may not occur; in others, although present, they may not be appreciated owing to judgment, reasoning, and discretion being so quickly impaired; while in many cases collapse follows so rapidly on the appearance of the danger signals that escape is impossible.

"The effect of CO on respiration is quite characteristic. At first there is increased frequency of breathing, which later becomes much slower. In serious cases it may be very superficial, slow, and interrupted by pauses. When the breathing is of this type relapses are frequent, and the patient must be carefully watched. It was wonder-

ful how quickly some of these cases responded to the exhibition of oxygen. After a few minutes the movements of the chest wall, which before were hardly perceptible, became deeper and the pauses disappeared. If the administration of oxygen was combined with artificial respiration, which materially improves the chest movements, the effect was greatly increased and the results obtained were more permanent. Cheyne-Stokes respiration was not infrequently seen. Two of the tunneling medical officers who had seen cases of this were struck by the fact that these patients all showed marked cerebral symptoms, great excitement, delirium, extreme restlessness, etc., when they recovered consciousness. Of cases noticed in which Cheyne-Stone breathing existed two-thirds died, probably as the result of the medullary centers being affected.

"When coma has been deep, rales are frequently found in the chest. These are nearly always to be found where convulsions have occurred, in which case coma is very often profound.

"The pulse rate in the large majority of mild cases was found to be between 80 and 90 per minute. This is also what is found in the preliminary stages of poisoning, but as the case gets worse the tension falls and the pulse becomes rapid and weak. In a considerable percentage of the men found in an unconscious condition the pulse rate was very slow, between 50 and 60. Occasionally it was remarkably slow, e. g., 30, which was the pulse rate of a man who was discovered in a mine after a blow in a deeply unconscious condition, frothing at the mouth, with the arms rigidly crossed over the chest, and who shortly afterwards developed a convulsion. Marked irregularity of the heart has also been noted accompanied by palpitation and a feeling of faintness.

"One of the most characteristic effects of CO is lowering of the body temperature. Even in mild cases the patient complains bitterly of cold, and, if the extremities are examined they will be frequently found to be icy cold, while in serious cases, where the patient has been unconscious for some time, the surface of the body is also very cold. In the trenches this added to the difficulties of treatment, especially if the shafts and galleries of the mine were wet. In many cases where the temperature was taken it was found to be subnormal. The fall of temperature is brought about in two ways: In the first instance, owing to the combination of CO with hemoglobin, the tissues are deprived of a considerable percentage of oxygen, which is intensified by the indirect action of the weakened circulation. This produces decreased oxygenation, and thus decreased metabolism, with decreased production of heat. Secondly, the heat-regulating nerve center in the brain may be seriously affected by the deprivation of oxygen. Later on, when the patient

is recovering, a rise in temperature, with rapid, bounding pulse, is met with.

"Convulsions were frequently seen, and the appearance of a number of the bodies was very suggestive of death having occured in a convulsive seizure. Men were occasionally found frothing at the lips, with the face leaden in hue and the arms and legs quite rigid. In some of these cases the pupils were widely dilated, in others unequal, and in a few contracted to a pin point.

"The color of the face varied very much, in some cases depending upon the rapidity of asphyxiation. Where this had been rapid, the face frequently had a leaden tint; this was also seen in cases where coma had been profound. In such there was froth (thick mucus often tinged with blood) about the mouth. In other cases the face was pale and bedewed with perspiration while in a considerable number of cases the cheeks were pink and the lips of a vivid carmine tint. In those who have died of CO poisoning this sometimes gave the face a wonderfully lifelike appearance.

"On recovering consciousness from CO poisoning men very often appeared quite dazed and stupid and frequently had no recollection of what had happened. Their minds were confused, and they had great difficulty in answering questions. In some cases speech was affected, being blurred, slow, and indistinct, and occasionally there was constant repetition of certain words and sentences. The dull, heavy countenance, the difficuly in getting coordination of thought, the confusion of ideas, and the defect of speech gave some of these cases the appearance of being drunk.

"Some patients on recovering consciousness became very drowsy, great difficulty being experienced in rousing them. Later on in such cases the mental condition changed, and an irritable phase developed, when they were intensely wide awake, insomnia becoming a troublesome feature. Others, again, on regaining consciousness, became apathetic and listless, but it was much more common to find wild delirium and excitement, the patient becoming very aggressive, struggling, fighting, and throwing himself about, swearing and shouting incoherently, or laughing or crying, while a few would behave in the most childish, silly fashion. A number of accidents occurred to mine rescue men owing to the nose clip or mouthpiece of their apparatus having been torn off by a struggling patient. The mine stretcher proved very useful in removing such men from the mine. The quarrelsome, aggressive mood might last for a considerable time; this was recognized by the Germans, who drew attention to the fact that it might lead to defiance and breaches of discipline. Wild delirium was frequently followed by an apathetic state. The following case, described by Captain Stephenson, one of the tunnel-

ing medical officers, shows this change and also some of the prominent mental disturbances mentioned above:

"The patient had been in a mine during an enemy explosion and had been rendered unconscious. On regaining consciousness there was wild delirium. When seen by the medical officer the patient was semiconscious, there was slow muttering delirium, the pulse and color were good. On admission to the field ambulance the patient complained of severe pain in the abdomen, was very cold, temperature being 97.8, pulse 70. Next day he was very quiet, his countenance was vacant and apathetic, there was slow cerebration, practically complete loss of memory, and constant reiteration of the words "It's only my back." After great difficulty the medical officer managed to get coordination of thought, and replying to a question he said, "Mine, sir." Anarthria was marked, the patient making great efforts to talk, but failing. There was slight twitching of the muscles of the arms and movements of the fingers suggestive of rolling paper. The legs were slightly stiff, and he resisted bending of the knees. There was slight hyperesthesia in the lower legs, and the knee jerks were slightly exaggerated.

"Some of the more prominent initial symptoms persisted for varying periods. The most common of all was headache, which was very persistent and intractable, of a very intolerant type, and frequently so intense as to cause vomiting. It was generally of a peculiar throbbing character, with a feeling of constriction as if a band were tied tightly round the head, and it was always made worse by stooping or by any muscular exertion. It was often associated with giddiness and vomiting. These migrainous attacks are most characteristic of CO poisoning. Giddiness generally disappeared early, although in some cases it persisted for a few days or longer, even when the patient was lying in bed. Vomiting, with pain and a feeling of fullness or distension about the epigastrium, was frequently seen, and this might last for several days in spite of treatment. It was probably the relief from the pain gained by vomiting which prompted the exhibition of emetics, an old method of treatment against which the men were warned. Obstinate hiccough was also occasionally met with. In a smaller percentage of cases there was diarrhea with colic, occasionally accompanied by the passing of blood; this generally passed off in a day or two. Such cases were much more common when the men were exposed to CO poisoning in a gallery where the ventilation was bad—that is to say, where there was decrease of oxygen and increase of CO_2.

"Some of the medical officers carried out systematic examination of the urine, and it was shown that if this is done within a few hours of poisoning the presence of sugar might be detected. This generally disappeared in 24 hours, but in certain cases lasted longer. Albu-

minuria was sometimes met with, but it never persisted for any length of time.

"Attention has already been called to the action of CO in lowering temperature. When the patient is recovering, there may be pyrexia, which may be high and last for a few days. The following is an example:

"An Australian tunneler was seriously gassed, being unconscious for a considerable time. He was removed to hospital, and three days later his temperature, from being normal to subnormal, reached 104°, and the pulse rate 88; next day, temperature 102.8°, pulse 78; fifth day, temperature 102°, pulse 76; sixth day, temperature normal, pulse 72. Patient complained of great pain in the left side and over the stomach. There was no area of dullness in the lungs and nothing to explain the temperature. He made a good recovery.

"A number of cases similar to the above could be quoted. The thoracic pain complained of in this case is a not infrequent after-effect of CO poisoning.

"AFTER-EFFECTS

"The cardiovascular system.—It has already been shown that the functioning power of the heart has an important bearing on the susceptibility to CO poisoning; also that men who had any functional or organic disorder of the heart were peculiarly susceptible to this poison. The after-effects which were most commonly met with and which persisted longest were the cardiovascular. It was frequently found that the immediate symptoms of cardiac disturbance did not become prominent till after exposure to the fresh air or after exertion; hence the great value of rest in treatment. There were many cases in which there was tachycardia, breathlessness, palpitation, oppression about the chest, and precordial distress, uncomfortable throbbing of the head and of the large vessels, the more especially in the neck (in some cases the action of the heart was so tumultuous that the patient held his chest with his arms in order to allay the distress); but not the slightest dilatation nor any organic lesion of the heart could be detected. In these cases any slight exertion might bring on giddiness, headache, principally frontal, feeling of faintness, flashes of light in the eyes, or dimness of vision, noises in the ears, all of which are the result of disturbance of the cerebral circulation. Although no cardiac lesion could be detected in these cases, in some the heart sounds pointed to weakness of the heart muscle, probably as the result of the action of CO on the nervous mechanism of the heart. In all these cases the most prominent symptom was tachycardia, which was particularly persistent and was noted many months after gassing. In a considerable number of these heart cases following CO poisoning the patient when at rest

appeared quite normal, making little complaint unless of weakness and depression; the pulse was often normal but on the slightest exertion—e. g., a short walk of 50 yards—the pulse rate rushed up to 120–150 and the patient came in quite exhausted and blown, frequently complaining of frontal headache. In some cases there were paroxysmal attacks of tachycardia for no apparent reason. In one man who had been repeatedly gassed the pulse rate was 145 to 150. These attacks were generally accompanied by breathlessness, a feeling of faintness, and in some by a feeling of impending death; after the attack the patient was very depressed, quite devoid of energy, and often quite lifeless. In some there were acute attacks of dyspnea, which also appeared for no apparent reason. Another man complained of waves of heat, marked dyspnea, great precordial distress, palpitation, and tachycardia (140 per minute).

"After CO poisoning, more especially after repeated exposure, some men developed cardiac mischief, and cases of slight dilatation were frequently met with. In one patient, an officer, repeated exposure to CO lit up old cardiac trouble, causing acute dilatation.

"Attention has already been called to marked slowing of the pulse in men who were found unconscious in mines after explosions. In a number of cases the bradycardia persisted for a considerable time, pulse rates of from 32 to 50 having been noted. This condition was not nearly so frequently met with as tachycardia.

"In all cases of cardiac disturbance following CO poisoning convalescence was very slow, months frequently elapsing before complete recovery.

"The blood: The condition of the blood after serious poisoning by CO has been found to be very varied. In a number of cases anemia with decrease of corpuscles and the hemoglobin value developed. But polycythemia was frequently noted, the number of red corpuscles occasionally being increased to over 7,000,000. With this increase of red corpuscles the hemoglobin percentage might (a) remain unaffected; (b) be increased, in some cases to nearly 140 per cent, which was the more common; or (c) be diminished, in some cases to 80 per cent. Again the hemoglobin value might be considerably increased with no change in the number of corpuscles. Lastly, conditions similar to those found in the blood of men exposed to rarified air have been noted—the presence of many poikolocytes and microcytes, increase of red corpuscles and of the hemoglobin percentage.

"In many of the cases where increased hemoglobin value was found, certain cardiovascular symptoms were generally met with, of which the most prominent were tachycardia and breathlessness. Where the percentage was high tachycardia was almost invariably present. In certain cases exertion was required for its development.

It was found that the hemoglobin percentage as well as the pulse rate varied considerably. In many a peculiar mental condition characterized by depression and apathy was noted and great weakness and loss of energy were general. It was rare to find in cases where the hemoglobin value was high that the pulse rate did not increase on exertion. In all the cases convalescence was very tedious, and the patient remained weak for a long time.

"Pneumonia: CO poisoning must be regarded as a very potent factor in predisposing in pneumonia. A considerable number of cases were reported. In most of these exposure had been prolonged, and the percentage of CO in the air, although not large, was sufficient to cause prolonged oxygen starvation of the lung and nervous tissues. Pneumonia rarely developed in cases of fulminant poisoning where exposure to high percentages of CO had been very short. The action of CO in lowering temperature was frequently intensified by exposure to cold and wet in the galleries and trenches.

"The following are the chief characteristics of CO pneumonia: It develops within four days of exposure to the gas; it is nearly always lobar, unless when caused by nitrous fumes in addition to CO, cases of which have already been described; it is of a very extensive type and runs a rapid course; the pulse rate is out of all proportion to the temperature, which is frequently low; the heart collapses with great rapidity; the right lung is frequently affected. It is a remarkable fact that the lesions following CO poisoning are so frequently located on the right side of the body.

"One case of deglutition pneumonia following CO poisoning was reported; the patient died. He had been seriously gassed and had vomited a good deal while in a semicomatose condition. The anesthetic action of CO makes inhalation pneumonia possible. It was owing to this danger that the order prohibiting the administration of emetics was given.

"The nervous system: From a knowledge of the changes in the brain and spinal cord resulting from CO poisoning, it was not surprising to find a very great variety of nervous disorders. These varied from simple neuritis to the most profound changes, such as hemiplegia and dementia. In most of the cases exposure to the poisonous gas had been prolonged and poisoning consequently severe, the patient having been unconscious for a shorter or longer period. Most of the patients who were affected made good recoveries; only in a small percentage of cases was there permanent damage done to the nervous system.

"Attention has already been drawn to one characteristic result of CO poisoning—viz, powerlessness of the limbs. more particularly the lower. This generally disappeared early, but it was not uncommon to find weakness of the legs and paresis lasting for a few days.

Owing to the implication of certain muscles, curious gaits, for example, the steppage gait, were sometimes produced. In a number of cases there was loss of muscular coordination with certain sensory disturbances, such as prickling sensations, "pins and needles," with a feeling as if the legs were dead. In these the legs felt quite cold. These signs and symptoms were commonly met with and passed off in a few days; sometimes, however, the paresis persisted for weeks, and in certain cases became localized to a certain region, e. g., the peroneal, in which paralysis supervened.

"Neuritis was one of the most common of the nervous disturbances. This might be localized to a single nerve or general, involving a number of nerves, the results being very similar to the multiple neuritis following various toxic conditions, such as alcoholic poisoning. The nerves most frequently attacked were the musculo-spiral, sciatic, peroneal, post-tibial, and facial. One important characteristic of CO neuritis is that the nerve may not be attacked in all its functions—that is to say, the paralysis may be unaccompanied by sensory or vasomotor disturbances, while in other cases serious sensory and vasomotor disorders without paralysis may be seen.

"Paralysis in a few cases came on early, being quite apparent soon after the man regained consciousness, but it was much more common to find it developing a few days after the acute symptoms of poisoning had passed off. Occasionallyit came on slowly, the paresis described above passing into paralysis; but generally there was the free interval which will be referred to again. Paralysis usually affected groups of muscles, more rarely single muscles, as, for example, the deltoid. The right side was more commonly affected than the left, and, as in the case of alcoholic neuritis, the extensor muscles more frequently than the flexor, the places most commonly affected being the extensor muscles of the forearm and the peroneal. The paralysis was usually asymmetrical and very varied in type and sometimes widely spread, several nerves being affected, while the disorder frequently jumped from one place to another.

"More extensive motor disorders may be met with, such as hemiplegia and paraplegia. In a number of these cases the paralysis considerably improved, and in a few days it was limited to a group of muscles. Some heimplegias are complete and are the result of gross lesions in the brain.

"One of the most remarkable cases was that of an artilleryman, under the care of Captain Tyndall, who developed hemiplegia and gangrene of the feet after being poisoned by the fumes from a brazier (CO). This man had been unconscious for 48 hours. When admitted to the casualty clearing station, the breathing was slow, with marked Cheyne-Stokes breathing; the left arm was rigidly crossed over the chest, the right arm being held rigidily to the side;

the left leg was also rigid. There was facial paralysis of the left side. His left pupil was dilated, while mentally he was in a state of hebetude. There was incontinence of urine and feces from the day of arrival.

"Disturbances of sensation such as anesthesia, the most common, hyperesthesia, paresthesia, and formication were all found. Generally sensory disturbances accompanied paralysis, and very often there was some trophic lesion. In many cases paralysis was ushered in by sensory disorders. In serious cases of poisoning there might be complete anesthesia of the skin, but this quickly disappeared. Anesthesia may alternate with hyperaesthesiá and other sensory disturbances.

"All the known vasomotor and trophic disorders were met with. Irregularly shaped patches of a reddish-brown color, insensible to pricking, have been found in various parts of the body surface, also bright cherry-red erythematous patches of various shapes and sizes, more especially over the chest, buttocks, and shoulders, which lasted for a considerable time and were generally followed by anesthesia. The following is a good example of what was very often seen:

"A man was brought out of a mine in a deeply comatose condition. On examination 12 hours later two large areas, one oval shaped over the lower part of the ribs, the other irregularly shaped over the sacrum and buttock, were discovered. Both areas were raised and of a bright red color, acutely painful, and very tender to pressure. There was also paresis of the lower limbs. The patient developed pneumonia, but made a good recovery. Sometimes these patches were found along the course of the sciatic, facial, and other nerves, herpes generally developing when the facial nerve was affected. In other cases areas of a dull red color, considerably raised above the surface, generally very sensitive to touch, although sometimes quite numb, were found over the buttock, sacrum, knees, and inner sides of arms.

"Many of the cases of multiple neuritis following CO poisoning were accompanied by Korsakoff's syndrome. In such cases along with loss of memory, paramnesia, etc., there was usually considerable weakening of the mind.

"Mental disturbances: Attention has already been called to the mental disturbances which are so frequently seen in a patient recovering consciousness. These generally disappeared in a very short time, but in some cases they persisted, and delirium, loss of memory, etc., lasted for many days.

"In all those cases in which pronounced mental symptoms were encountered it was generally found that exposure to the poisonous air had been prolonged and poisoning severe, the patient having been unconscious for some time, and that very often coma was profound.

In some of the cases this comatose condition lasted several days. In most cases it was also found that on regaining consciousness marked cerebal disturbances was seen, such as extreme restlessness, profound apathy, great excitement and delirium. Immediately after this subsided, and before the onset of mental disorder, there was very often a short interval of freedom from symptoms, where the patient seemed to have recovered. This was a peculiar feature of many of the cases of severe mental disturbance and is most characteristic of CO poisoning. The changes in the blood vessels of the brain, which will be described later, will explain this phenomenon.

"In the mildest cases, where mental symptoms followed exposure to CO, there were slowness of perception, confusion of ideas, defective memory, loss of all initiative and self-confidence. The patient appeared confused and thought more slowly. In other words, the mental faculties had become lowered and blunted. At the same time there might be changes in temperament, a stable and nonexcitable man becoming nervous and excitable. In a considerable percentage of the less serious cases there was a certain amount of depression, a feeling of prostration and loss of vitality, which persisted for a few weeks or even longer. Headache was a prominent symptom in many of these cases. Cerebral torpor, with involuntary passage of urine and feces, was also met with, and some of the cases presented perfect pictures of amentia. Indeed, the mental changes showed every gradation up to actual dementia. In some of the cases where mental disturbances were prominent polyneuritis was also seen.

"Delirium was one of the most common of the more serious aftereffects of CO poisoning. As has been pointed out, the change from profound coma to consciousness might be accompained by furious delirium, which called for considerable restraint and which added very much to the difficulties of rescue work in the galleries and ascending shaft and of treatment in the trenches. Occasionally this was accompanied by hallucinations.

"Loss of memory was one of the most prominent of the mental disturbances which followed CO poisoning in mines. It came on rapidly not slowly. The degree of mental confusion which is so characteristic of CO poisoning may have had a good deal to do with certain of the cases of defective memory, more especially those cases in which memory could be easily reawakened.

"All degrees of loss of memory were met with. It existed in a minor degree in many cases which recovered from the acute poisoning, and in which no other symptoms could be detected; in these cases the general memory remained defective for a considerable time. In the hospital when these patients were able to go about they lost their way, forgot the names of their attendants and comrades, when they were last fed, and so on, and after returning to their units noncom-

missioned officers and men forgot their orders and duties, and officers, for the same reason, could not be trusted with certain work. Names, time, and all details were readily forgotten; indeed, loss of memory with disorientation in regard to time and space must be regarded as characteristic of CO poisoning.

"Total loss of memory for some definite period of time was often seen, for example, a brief period of time before the gassing and the events which happened immediately after being completely erased from the mind. Memory for events which happened years ago was generally good; usually it was memory for recent events which was the first to go, although in rare cases the whole previous life of the patient was blotted from memory.

"Paramnesia was occasionally met with in the cases of multiple neuritis.

"Where loss of memory was marked, it was generally accompanied by a certain degree of mental weakness, and where it lasted for a long time permanent mental weakness developed. In most cases memory was slowly regained after a certain stage had been reached; in a few cases recovery took place suddenly.

"PROGNOSIS

"The great majority of the cases of CO poisoning, if rescued from the mines alive and promptly treated, recovered. If a patient did not quickly recover consciousness on the exhibition of oxygen the case was regarded as serious, for even if the man recovered temporarily after-effects were more liable to occur. The deeper the coma the more profound was the effect of CO on the nervous system. A very slow pulse or a very rapid and hardly perceptible pulse were both grave signs. In a number of cases where Cheyne-Stokes breathing occurred death resulted. Cases were reported in which recovery had apparently taken place, when suddenly, without the development of any grave symptom, death occurred. Men frequently died on their way to the dressing station after they were thought to be out of danger. In connection with this, the peculiar action of CO on the vital centers must not be forgotten. Where exposure to CO has been prolonged, serious relapses and sudden death were more liable to occur than where exposure, even to a very high percentage of CO, was of short duration, because the vital centers in the brain can not stand prolonged deprivation of oxygen. Generally speaking, in serious cases of CO poisoning if death did not take place within 24 hours recovery almost invariably followed.

"MORBID ANATOMY

"Attention has already been drawn to the changes in the skin which are sometimes encountered. Where exposure has been pro-

longed and saturation of the blood by CO pronounced, the skin in the region of the chest, face, insides of thighs, and over the forearms and shoulders may exhibit a bright red color, and on section the muscles may show the same bright coloring. The lungs and liver may have a pinkish or rose-red appearance. The blood, more especially if there has been a considerable degree of saturation with CO, is generally of a bright cherry-red color. But these color changes in the blood and parenchymatous organs will not be seen where the patient has lived for some time after being taken out of the mine, as a considerable proportion of CO—the amount depending upon the length of exposure in good air—will have been freed from combination with hemoglobin.

"In those cases where rapid death has occurred, the post-mortem changes are of asphyxia. The venous system and chambers of the right side of the heart are engorged with blood, as are also the parenchymatous organs.

"In typical cases of CO poisoning the pathological findings are very similar to those found in various toxemic conditions. Areas of intense hyperemia may be seen in the pia mater, parts of the brain, lungs, etc. Minute punctiform hemorrhages are frequently found in the brain, which in some places coalesce into larger areas; these hemorrhages are very characteristic of CO poisoning.

"A post-mortem examination was carried out on a man who was found in a deeply comatose condition in a mine. When admitted to a causualty clearing station he was in a semiunconscious condition, unable to speak, but able to swallow. There was incontinence of urine and feces, twitchings of the face, and general spasms, which gradually increased till death occurred three days after the accident. Post-mortem examination showed great engorgement of the vessels of the brain and meninges, capillary hemorrhages in the white matter, but no gross lesions; the other organs were normal except for early signs of parenchymatous nephritis in the kidneys.

"In the cortex the blood vessels may be found congested and dialated and many of the capillaries thrombosed. Examination of these may show rupture frequently limited to the perivascular sheath, which may sometimes pass into the brain substance. Various stages of degeneration of the endothelium of the vessels may be found. The same changes may be found in the vessels of the basal ganglia, or the pons Varolii, and the medulla oblongata. Multiple punctate hemorrhages are especially common in the centrum ovale, internal and external capsules, optic thalamus, and cortex and may be accompanied by chromatolytic and atrophic changes in the ganglion cells in proximity to the hemorrhages and, if the patient has lived long enough and the changes have been progressive, areas of necrosis. Microscopic sections show the deisappearance of nerve

cells in these areas. The anatomical relation of the cerebral vessels favors the development of the hemorrhages which are so frequently seen in CO poisoning.

"Lieut. Col. Gordon Holmes found in a most interesting case of CO poisoning which survived 11 days that few cells in any portion of the cortex stained normally; even at some distance from the areas of softening many were shrunken and stained deeply and homogeneously, while no Nissl bodies could be recognized in most of the others. The cortical softenings did not involve the white matter to any appreciable extent. In sections of the lenticular nuclei similar areas of softening, also limited to the gray matter, were found; these were much more numerous and extensive than appeared probable to the naked eye. The softened areas were filled with tightly packed cells of neuroglial origin. The smaller vessels of these areas were also thrombosed, but no hemorrhages were seen.

"Regarding the nature of the pathological process, Gordon Holmes thought that the primary change was thrombosis of the smaller vessels and capillaries of the gray matter, and the deeper layers of the cortex, which are supplied by a network of very fine vessels and the vitality of which is very dependent on a proper blood supply, are consequently the parts that have suffered most severely. This thrombosis may be to some extent dependent on, or at least favored by, the intimal changes, though he was of opinion that its chief cause was a change in the constitution of the blood. This pathological condition has all the features of a toxic origin, though it might be simply the result of oxygen want. CO intoxication leads to the greater concentration of the blood which favors thrombosis.

"In one post-mortem examination of CO poisoning Sir Frederick Mott found throughout the white matter of the centrum ovale, and especially in the corpus callosum, internal capsule, and cerebral peduncles, multiple punctate hemorrhages, which also occurred in the subcortical white matter and in the basal ganglia. Microscopic examination showed isolated capillary hemorrhages in the gray matter; in the medulla there were only congested vessels but no hemorrhages. In the cells of the medulla a marked chromatolysis with swollen clear eccentric nucleus was shown. In the cortex many of the Betz cells showed a very marked chromatolysis, swelling of the cell and eccentric nucleus, while others in the immediate neighborhood possessed a fairly normal amount of basophile Nissl granules. Besides these changes many of the small vessels exhibited inflammatory changes.

"All the changes described above explain the variety of nervous disorders which follow CO poisoning and why a small percentage of these is permanent.

"TREATMENT

"The most important part of the treatment of CO poisoning was the immediate first-aid treatment in the trenches carried out by the mine rescue men. The only possible way of getting good results from first-aid is to have a rigid, stereotyped line of treatment. In the mine rescue schools it was insisted that all should have a thorough working knowledge of the administration of oxygen and of how to perform artificial respiration. Instructions regarding treatment were printed on cards and placed in every mine rescue station in the line and were also put into all boxes containing oxygen reviving apparatus.

"Schaefer's method of artificial respiration was the one fixed upon as the simplest, and it was the only method taught in the schools. Men practiced this every day till they became expert. No case was ever heard of where damage was done to the patient by too vigorous movements, and artificial respiration must have been carried out many hundreds of times in the front line under the exciting and trying conditions met with at the time of a blow.

"The use of the Novita oxygen reviving apparatus was also carefully taught, and every day the men administered oxygen. It is no use showing the men the apparatus a few times and demonstrating its use. They must be allowed to use it, combined with artificial respiration, every day. This is the only way in which they will become expert in its use. The men were trained to carry Novita sets down the mine; during actual rescue operations reviving sets were taken below whenever possible, so that where a number of men were gassed and it was difficult to move them until further assistance arrived oxygen could be administered. In desperate cases it was always administered before the man was removed in order to drive sufficient CO from the blood to permit of the removal being carried out with safety.

"The administration of oxygen is of the utmost value, as it drives out the CO from the bood five times more quickly than air. The method of administering oxygen through a nozzle held to the mouth or nose, which was done before oxygen reviving sets were obtained, is almost valueless, as most of the oxygen escapes into the atmosphere. In all cases where breathing has stopped, become shallow, or very slow the giving of oxygen should be combined with artificial respiration until the breathing becomes sufficiently deep to enable the blood to be cleared of CO. In all serious cases the men had strict orders to persist in the administration of oxygen. After natural breathing was restored the administration of oxygen was continued for some time. It was demonstrated that this had the effect of lessening the severity of the after-effects.

"The wonderful effect that oxygen combined with artificial respiration has in reviving men who have been seriously—apparently even hopelessly——affected by CO poisoning and the necessity of persevering for a considerable time in efforts to resuscitate them, even though to all appearance life is extinct, was demonstrated in the following rescue work.

"After an intense bombardment the enemy raided our trenches and with a large mobile charge blew the entrance to the shaft leading to a tunnel in which 36 infantry were sheltering. Of these 25 lost their lives from the effect of the explosion and from CO poisoning before they could be rescued. Australian mine rescue men with apparatus from the rescue station were quickly on the scene and succeeded in rescuing and resuscitating 11 men and in recovering the bodies of the others. The rescue work was most smoothly, rapidly, and efficiently carried out. All the men who were rescued were in an unconscious condition and seriously affected by CO poisoning. Two appeared to be lifeless, and a medical officer who was present thought it hopeless to persevere. The rescue men, however, having had instructions to do so in all such cases, persevered, and had the satisfaction, after 10 hours' work, for a good part of which oxygen was administered, of saving both men. All the other men required oxygen and most of them artificial respiration.

"Owing to the action of CO in reducing temperature the application of warmth is essential, and blankets and hot-water bottles were kept in all the rescue stations.

"In the early days of mine warfare the value of rest in the treatment of mine-gas poisoning was not appreciated; indeed a common method of treatment, one which was formerly greatly in vogue in collieries and ironworks, was walking the patient about after he had come to. This was frequently done in those cases where the patient got into a drowsy state. This method of treatment frequently resulted in the patient losing consciousness. A number of men who had been severely gassed, treated at the mine head by oxygen, and had partially recovered, died on their way to, or shortly after arrival at the dressing station. A peculiar feature of CO poisoning is that relapses are frequent, so that a man who has apparently recovered may develop serious symptoms and die. The too-hasty removal, it does not matter how carefully this may be effected, of a man who has been seriously gassed may bring on a serious relapse. The following order was issued: "If possible, no man who has been gassed should be permitted to march back from the trenches to camp. Men who have been unconscious should, if possible, be kept in a dugout near the shaft head for at least two hours before being taken to the dressing station." It was proved

that recovery was greatly hastened and serious after-effects avoided where the order was carried out.

"In mild cases hot strong coffee was administered, supplies of café-au-lait being kept at the rescue stations. Hypodermic injections of strychnine and pituitary extract were found of value in serious cases. In desperate cases transfusion of blood acted in a wonderful way.

"A favorite line of treatment in the early days was the giving of emetics. The rescue men were warned against this on account of the posibility of inhalation pneumonia resulting. The exhibition of phenacetin, aspirin, and such drugs for relief of the intolerable headache was forbidden owing to serious attacks of heart failure having followed their administration."

Professor Henderson, of Yale, and his associate, Dr. H. W. Haggard, have recently advocated the employment of a mixture of carbon dioxide 5 per cent and oxygen 95 per cent in carbon monoxide poisoning in place of the pure oxygen recommended in the past for inhalation. This treatment is based on the fact that in conditions where excessive breathing occurs, as in carbon monoxide poisoning, there is a "washing out" of the carbon dioxide of the blood. This reduction in the CO_2 content of the blood removes the greatest factor leading to active respiration. By giving oxygen mixed with CO_2 the character of the breathing becomes deeper and fuller and the CO is more rapidly removed from the blood. The treatment in addition to leading to a more rapid restoration to consciousness aids in preventing the later complications, such as headache and pulmonary congestion.

The usual method of testing air in mines or compartments for the presence of CO is to introduce a canary bird and watch for toxic symptoms. A more delicate method, and one more applicable to ship conditions, is that described by Hoover.

The detector material is composed of a mixture of 10.6 per cent iodine pentoxide, 33 per cent pumice stone of 8–14 mesh (or some such mesh), and 56 per cent fuming sulphuric acid which contains 60 per cent sulphur trioxide. The material is kept dry. The detector is put in a tube of 5 mm. diameter to a depth of 5 mm. The air is pumped through the detector by squeezing a bulb attached to the tube. The air passes through a layer of activated charcoal before entering the detector. The detector is sufficiently sensitive to detect in a few seconds quantities of carbon monoxide less than that which is harmful to man. A green color is developed in the detector in the presence of carbon monoxide. A permanent color standard made of basic copper acetate and chromium oxide may be prepared for comparison with the color developed. Hoover

claims that by pumping 500 c.c. of air through the tube a concentration of 0.005 per cent can be detected.

Surgeon R. R. Sayers, of the Public Health Service, has devised a method for the quantitative determination of CO in either the blood or air, a modification of which is to be shortly adopted by the Navy.

Nitrous fume poisoning.—Poinsoning from nitrous fumes has occurred for many years in chemical works, especially in nitric acid plants and during nitrating processes. The oxides of nitrogen to be feared are NO and NO_2. Nitrous oxide (N_2O), the ordinary "laughing gas," is nonirritant. Nitric oxide (NO) unites directly with oxygen in the cold to form the reddish brown fumes of nitrogen tetroxide (NO_2). This reaction is reversible:

$$2NO+O_2 \rightleftarrows 2NO_2$$

so the cloud formed by burning explosives contains both NO and NO_2 theoretically. Lunge and Berl found, however, that about 6 or 7 seconds after the action of air on NO and the immediate absorption by agitation with water for 30 seconds that—

1. All nitrous gas was so completely changed that the air no longer had any odor.

2. The water contained a mixture of acids, 54 per cent of which was nitric acid and 46 per cent nitrous acid.

All authors agree that when there is an excess of oxygen in the air the NO immediately changes into NO_2 (brown vapors) and that this upon contact with water vapor changes into nitrous and nitric acids:

$$2NO_2+H_2O=HNO_3+HNO_2$$

Lehmann and Hasegawa conducted an elaborate series of experiments to determine the effects of nitrous fumes. Animals were exposed in a continuous flow chamber to known concentrations of the gas and the effects noted.

They found that cats and rabbits did not give the "delayed-action" picture so common in human cases; with high concentrations they died in the chamber. The animals showed signs of irritation while exposed to the gas, crying, running about, and scratching their noses. At autopsy very little change in the mucosa of the pharynx, nose, or trachea was found, but a massive pulmonary oedema was always present, and always a few hemorrhages in the lung tissue. As the result of a number of experiments they conclude that no nitrite central action is present, all symptoms being due to local action on the lungs.

Hasegawa supplemented these experiments by exposing himself in a large chamber to known concentrations of NO_2. With high concentrations he had a marked burning in the nose and larynx, lachrymation, headache, dizziness, vomiting, and convulsive coughing.

Finally the authors state that the limit of tolerance is difficult to establish but believe that 0.1 milligram per liter can be breathed for several hours with safety, that 0.2 milligram per liter can be breathed for half an hour, while concentrations of 0.6 to 1.0 milligram per liter quickly causes death.

These figures would give nitrous fumes a toxicity by inhalation much greater than chlorine, but less than phosgene.

Esch and Keller found that a 3 per cent atmosphere of NO (probably NO_2) killed guinea pigs in from five to nine minutes.

The above and other experimental gassings confirm the findings in human cases in which the picture is always that of pulmonary oedema.

As example of cases occuring aboard ship may be quoted the result of exposure of men on the S. M. S. *Seidlitz* to the explosion fumes of smokeless powder. Most of the men did not present symptoms for 24 or 36 hours. At this time they developed air hunger, dyspnea, headache, dizziness and nausea, with slow pulse and a high blood pressure. The dyspnea disappeared in a few days, probably due to the absorption of the lung edema.

Symons reports "Early in the morning of April 27, H. M. S. *Russell* was struck by two mines, and the after part of the ship caught fire. Later an explosion occurred in the after turret. It is certain that in the after part of the ship were large quantities of fumes from burning explosives, chiefly cordite, and that many officers and men inhaled these fumes. Seventeen officers and men were subsequently treated in the Royal Naval Hospital, Malta, suffering from poisoning from some of these gases." Symons showed that these 17 cases were due to nitrous fumes. Fourteen of them terminated fatally.

Fairlie gives a very complete description of the gas poisoning following a powder explosion. On November 9, H. M. S. *Britannia* was torpedoed and subsequently sank. Immediately after the torpedo explosion a second explosion occurred, also a fire which involved one of the "9.2" magazines, leading to burning cordite fumes being present. Of a total of 130 casualties over 58 suffered from gas poisoning and over 12 of the latter died from gas poisoning. In addition to these cases Fairlie believes that some of those dying immediately after the accident were killed by carbon monoxide. The period of exposure to the fumes varied. In two of the fatal cases the duration of exposure was probably only one or two minutes.

At the time of exposure the only symptoms noted were a slight feeling of irritation in the nose and chest, coughing, and a sense of constriction in the chest. In some cases vomiting occurred soon after being gassed.

As after phosgene poisoning, a latent period before the development of serious symptoms was common. Some of the men marched to their barracks, feeling quite well for some hours, when serious symptoms began to appear. The cases manifesting themselves immediately were all fatal, but some of the cases not developing symptoms for from 12 to 17 hours after exposure also died. So it does not follow that the longer the latent period the less serious are the results.

With the onset of the pulmonary edema due to nitrous fumes the cases showed the following symptoms: Shortness of breath, constriction of the chest, a feeling of anxiety, and, occasionally, vomiting. The face may be pale, with a slight bluish tinge. Examination of the chest at this stage is usually negative, and if the symptoms do not progress the cases may be quite well in 48 hours.

In the most serious cases the respiratory distress becomes much greater, all the accessory muscles of respiration are called into play, and respiration becomes much more rapid and shallow. Numerous rhonchi may be heard in the lungs and a deep-blue cyanosis appear.

Frothy sputum, which is often blood tinged, appears and may be formed so quickly as to pour from the mouth and nose. Dilatation of the right heart may occur. The pulse is increased in frequency. In serious cases the temperature usually rises to 101°–102° F., occasionally higher.

A consideration of the *Britannia*, *Seidlitz*, *Russell*, and mine accident cases shows that as a sequel of all these accidents a number of men developed an acute pulmonary edema of either immediate or delayed onset. The condition found is very similar to the results of phosgene gassing, and the treatment at present recommended by the medical research division of Edgewood Arsenal for cases gassed by lung irritants such as phosgene, diphosgene, nitrous fumes, etc., is as follows:

Rest: The patient should be put to bed and not permitted to exert himself in the least. All transporting should be restricted to the minimum and done very carefully by litter. The least exertion by one of these cases is often immediately fatal. In a case of pulmonary edema the blood is only carrying from 50 per cent to 60 per cent of the oxygen it would carry normally. Any exertion, with its attendant demand for more oxygen, may cause the oxygen to drop to 40 per cent or less, which sudden drop causes a reflex stoppage of the heart with instant death.

Warmth: The patients should be kept very warmly wrapped. Any chilling or shivering will increase the demands of the body upon an already deficient oxygen supply.

Diet: A light liquid diet should be given till the acute stage of pulmonary edema has passed.

Venesection: An early venesection of 500–750 c. c. of blood will decrease the tendency of the blood to filter through into the lungs. It will also relieve the right heart. It is contraindicated in the ashen-gray cases and should only be practiced either early when the onset of pulmonary edema is suspected or in the deep-blue cyanotic cases where the heart is still strong. In all cases a rise of hemoglobin to as high (in some cases) as 130 per cent is found, and the degree of rise of the hemoglobin percentage is the earliest and most reliable index of the onset and degree of pulmonary edema. Conversely, a fall in the hemoglobin percentage indicates the beginning of recovery and the resorption of the edema fluid.

Oxygen: This should always be given in edema cases. If a mask is not available, it should be given by nasal catheter. Given by a funnel over the face it is valueless. Amounts up to 8 or 10 liters a minute are sometimes indicated and the administration continued for as long as necessary, which may be three or four days. Large quantities of oxygen will be required. The danger of lung irritation from oxygen has always been much exaggerated. The amount of oxygen to be given can be controlled by the appearance of the patient. A bright pink color of the lips and a disappearance of the restlessness present in these cases show that sufficient oxygen is being given. In the event of an acute cardiac failure the oxygen should be given in pure form, and the Haldane apparatus provides for giving this pure oxygen in an emergency by means of a side tube leading from the cylinder to the mask.

Emetics: These were recommended for many years as relieving pain and causing the discharge of a large amount or frothy mucus from the lungs. Their use is now forbidden, as they have often been the cause of an aspiration pneumonia in semiconscious men.

Drugs: The use of drugs is contraindicated. Ammonia inhalations are of no value, as the acid fumes are already neutralized. Morphine and atropine injure the patient by the effect upon an already overburdened circulation and by the depressant effect upon the respiratory center.

So deeply were the French impressed by the great value of early bleeding in pulmonary edema that an official bulletin during the war contained the following dictum: "Bleeding in lung edema is as necessary as the ligature in wounds."

Mixed cases.—As a result of powder explosions a number of casualties are seen in which both NO_2 and CO poisoning are present, in some cases aggravated by a lack of oxygen immediately after the explosion. The presence of CO_2 has in the past been regarded as dangerous, but it is now known that it is the lack of oxygen that causes men to drop immediately upon exposure to air in abandoned caves or wells. During a turret accident it is probable that all the

normal atmosphere is driven out of a turret or compartment by the expanding powder gases, and until this is replaced by the inrush of air from blowers the exposed personnel will be breathing much more rapidly in an effort to make up for the oxygen lack in the inspired air. This deepened respiration leads to a much more rapid absorption of CO and NO_2 and greatly increases the damage done.

In another class of cases seen the men are unconscious from an acute CO poisoning, recover shortly, and appear to be quite well, only to succumb later to a pulmonary edema due to nitrous fumes. Several of the cases occurring on the S. M. S. *Seidlitz* were of this character.

A feature of mixed CO and NO_2 cases is the slow convalescence. The heart remains weak for some time, although no definite lesion can be found. After the slightest exertion palpitation and exhaustion occur, and the "mixed cases" are much longer in recovering than the cases of either pure CO or NO_2 poisoning. They resemble phosgene cases in this respect, and the British have had great success in treating such cases by graduated exercise and by having them live for days in special chambers in which the oxygen content of the air was enriched to 45 per cent by oxygen from cylinders. This treatment reduces the palpitation on exertion and in most cases cures the attacks of nocturnal dyspnea that are such a distressing sequel of irritant-gas poisoning.

Rescue work in powder fumes.—In only too many instances the practice of permitting unprotected rescurers to enter mines or ship compartments after gassing accidents has only served to swell the list of casualties. It is usually recommended that all such rescue parties should be equipped with either the large (two-hour) or small (one-half hour) oxygen apparatus. Unfortunately this apparatus can only be worn by men who have received long training in its use, and the apparatus is not always readily available.

The ordinary Navy mask with either blue (war) or green (training) canister will protect for at least 70 minutes against a concentration of 5.64 milligrams per liter of NO_2, which should give adequate protection against the nitrous fumes, but gives absolutely no protection against CO or lack of oxygen.

The Navy submarine mask will protect one-half hour against a concentration of 3.76 milligrams per liter of NO_2 and is designed to give a high degree of protection against CO, but it does not protect against lack of oxygen.

The simplest solution of the problem appears to lie in the use of the diving helmet (without suit) or of the smoke helmet with air tube and forced air supply. The British and French found extensive use during the war for the so-called "hose mask." This

was used in entering old dugouts and caves where the oxygen content was very low and consists of the ordinary gas-mask facepiece with a long hose attached, the end of which is left in the pure outer air. The wearer breathes through the hose and no air pump is necessary. This device is simple, requires no special training to wear, light, inexpensive, and can be improvised aboard ship.

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PARAVERTEBRAL ANESTHESIA AND ITS SUCCESSFUL ADAPTATION TO KIDNEY OPERATIONS[1]

By W. S. PUGH, Commander, Medical Corps, United States Navy (Retired)

INTRODUCTION

The question of anesthesia is one that is constantly before the surgeon and probably of greater interest to the urological surgeon than others because he is frequently operating upon patients who are poorer risks than those whom the average general surgeon treats.

At the present time it seems that there is great room for advancement in the realm of regional anesthesia.

The author feels that there are some disadvantages in the use of the infiltration form of anesthesia and that it is unwise to use it in every case. At the same time there are large numbers of cases in which it is most unwise to use any other type.

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The main object of this paper is to describe a new method of administering the anesthetic agent for kidney operations as devised by Lowsley and the author. The methods hitherto described have been difficult or impossible to follow in certain cases, especially in fat or very heavily muscled persons.

Before proceeding with this description it seems proper to give a brief historical review of the work already done on this subject.

Paravertebral anesthesia originated with the work of Hugo Sellheim (1) in connection with his extensive studies in experimental abdominal surgery. The reports on the above works were published in 1905. It was Sellheim's idea to perfect a regional technique which would obviate the use of spinal puncture, as in his method the same result would be achieved by a blocking of the spinal nerves.

Sellheim's work was not very successful, but his successors were much more fortunate. Hartel believes the early failures were due to the difficulty in obtaining proper material and a technique not sufficiently well developed.

Following the above attempts little was done until the work of Lawen (2) in 1911. This surgeon early realized the great value of local or regional anesthetic methods in the operative surgery of the kidney, particularly that class known as poor surgical risks. Lawen's opportunity came when a decrepit old man with a renal stone entered the university clinic at Leipzig in 1911. The patient, aside from his kidney lesion, was also suffering with arteriosclerosis, emphysema, and chronic bronchitis.

Lawen performed a nephrotomy by blocking the ninth dorsal to the third lumbar nerves of the side treated. This is the first reported case of the use of paravertebral anesthesia in the surgery of the urinary tract.

Following the lead of Finsterer (3) of Vienna, 1912, paravertebral anesthesia soon found its way into and was adopted by many of the large clinics of Europe, notably those of Kappis (4), Braun (5), and Ziegel (6). The last-named surgeon has alone reported over 2,000 surgical operations under this anesthesia between the years of 1914 and 1919. A considerable number of Ziegel's operations were for renal lesions.

Hartel (7) of Halle has written considerably on this subject, and in Europe one hears frequently the expression "Hartel's paravertebral technique."

Paravertebral anesthesia has undoubtedly received its greatest impetus from a urological standpoint at the large urological clinic of Professor Illyes (8) in Budapest. Snetzer (9) of this clinic alone has used the method in over 1,600 surgical operations. Adler (10), Minder (11), and Aisne (12) have also had a very extensive and successful experience with this anesthesia in urological surgery.

Paravertebral anesthesia having originated in central Europe has naturally been accorded its greatest consideration there. Much important research has been done by the numerous authors quoted in our previous papers as well as by Muroya (13), Franke, Wilhms, Schumacher, Reinhard (14), Denk (15), and others. In the last few years paravertebral technique has spread into France and has been extensively used, particularly by Pauchet (16) and Duvergey (17) in the realm of urological surgery.

The results reported by Duvergey are most successful, and he is now one of its greatest advocates. In America most of the early attempts to introduce this method of anesthesia were in the field of obstetrics and gynecology. Aside from the work of Farr (18), Lowry (19), and Meeker (20), particularly the first named, it is very little discussed in this country as an adjunct of urological surgery.

METHOD OF ADMINISTRATION

Until recently it has been customary with us to employ a method similar to that used by Professor Illyes and his associates and by Hartel, of Halle. As an anesthetic agent it has seemed to us that procain used alone (by that we mean minus suprarenal extract) gives us the best results. It is apparently the least toxic of any of the local anesthetic drugs that may be put to practical use, and until present or future investigations provide us with something less toxic it will continue as our standard.

In regard to procain we have been unable to confirm the observations of Morian (25) to the effect that procain injected subcutaneously frequently produces an albuminaturia even when used in small amounts.

Certain surgeons have felt that the general method of administration and technic of paravertebral anesthesia is elaborate and detailed, requiring too much time. One surgeon, referring to a previous article on this subject (21), laid stress on the fact that paravertebral anesthesia requires an exact knowledge of the skeletal conditions and associated anatomy. In regard to the former it is true that all local or regional anesthetics require more of the surgeons actual time. The art of local anesthesia and successful results can never be attained by hasty methods; in fact, they usually spell failure. From an anatomical standpoint these methods do call for an accurate knowledge of the parts concerned, but what other surgical procedure does not require a working knowledge of its surgical anatomy?

In all regional anesthesia a certain amount of cooperation on the part of the patient is a necessity. In the nervous or highly sensative type every effort should be made to reassure him. It will be

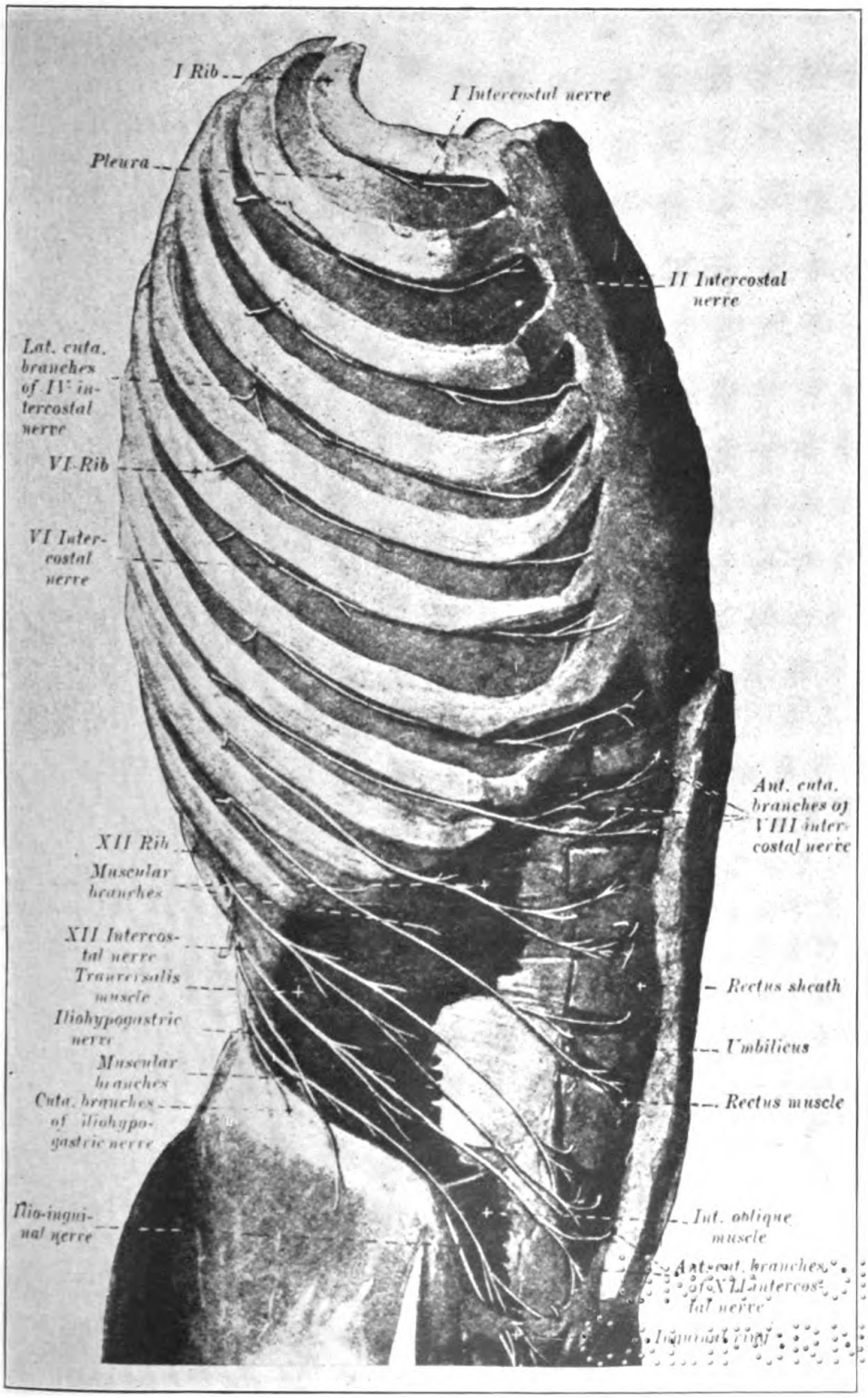

Fig. 1.—Nerve distribution to the posterior and lateral aspects of chest and abdomen. The eighth dorsal to first lumbar trunks are blocked. (From drawing by Landsberg)

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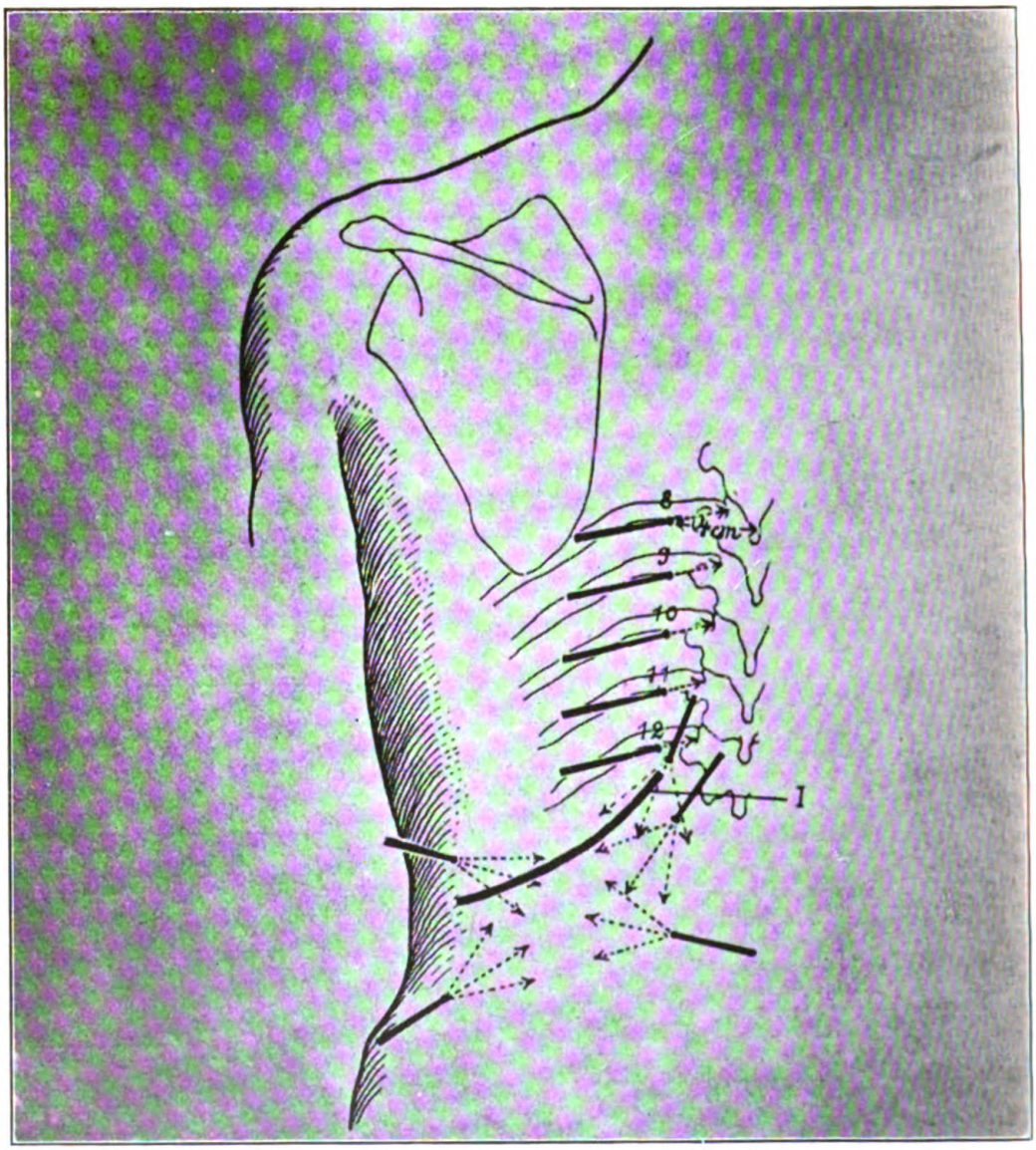

Fig. 2.—Points of injection in dorsal and lumbar areas. The heavy black line is line of incision. Lower arrows represent limits of infiltration anesthesia

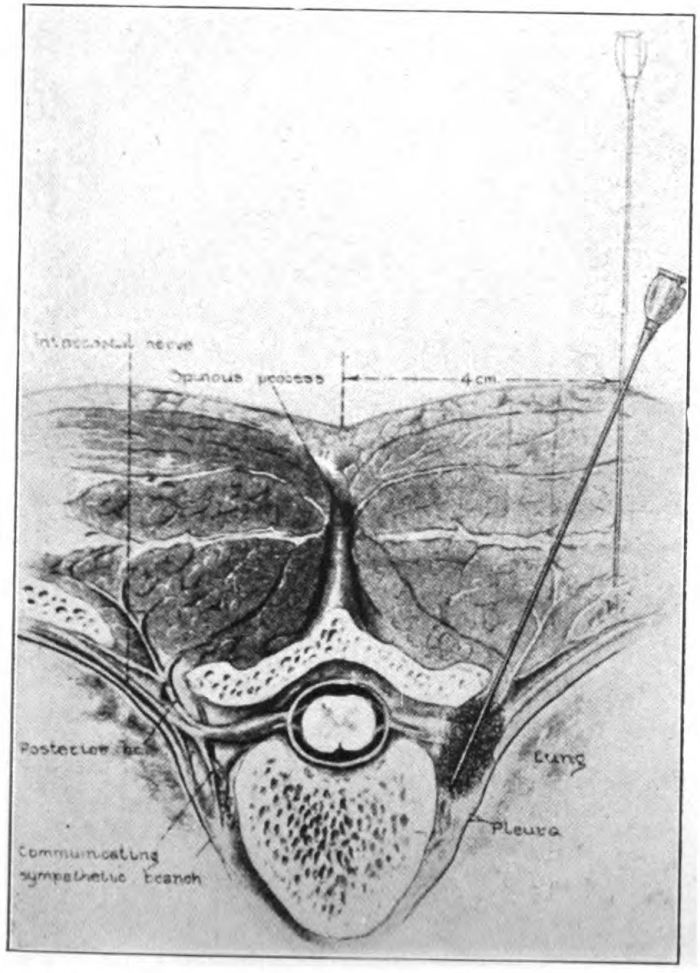

Fig. 3. Nerve blocking. Left side shows final position of needle. Right side, the structures involved. Note particularly the Nervus Rami Communicantes

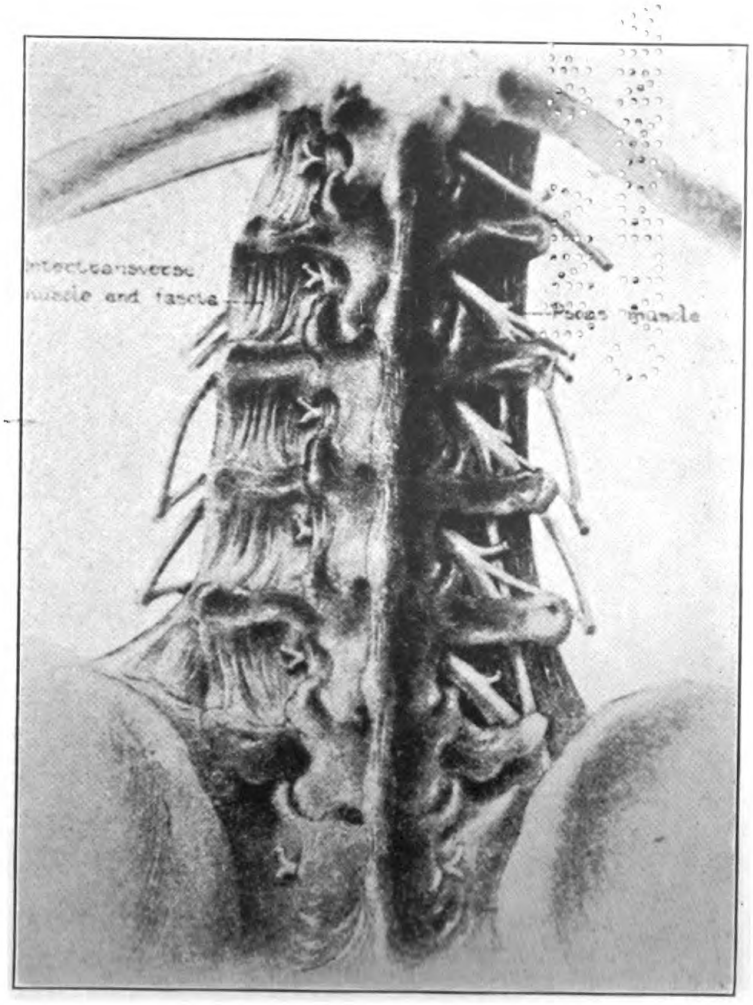

Fig. 4.--Points of emergence of lumbar nerves. Explains the ready response to the lumbar field block

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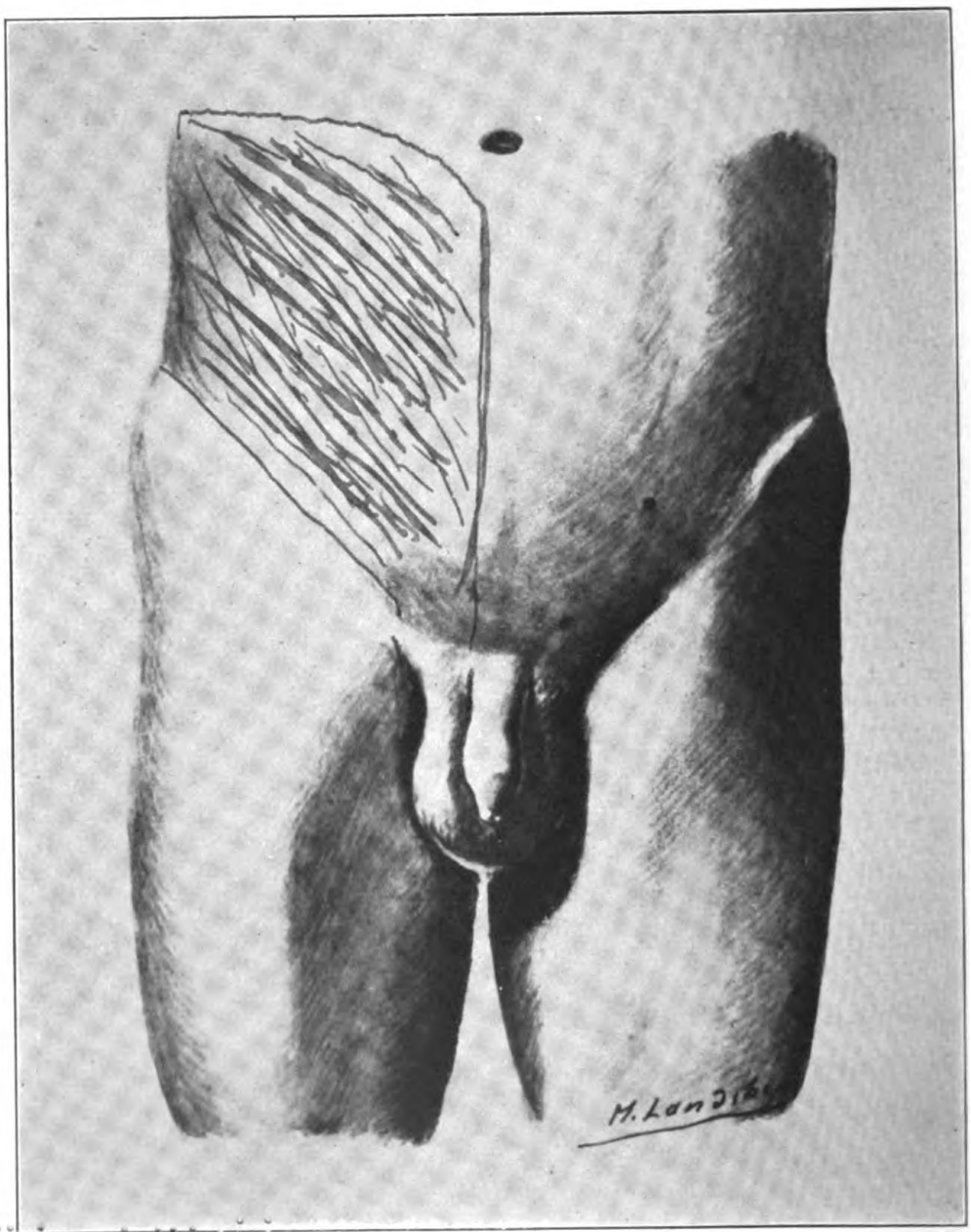

Fig. 5.—Shaded area shows extent of anesthetic area after successful nerve block

well in this connection to emphasize the advantages of the elimination of a general anesthetic. Particularly we should bring out the advantages for those with a damaged renal function, as well as absence of post-operative annoyances.

Aside from gaining the confidence of the patient, it is a wise precaution to avoid all undue haste and flurry about the patient. Nothing is so helpful to a patient of the nervous type as the knowledge that he is in the presence of a smoothly working organization. We find it helpful to use a nerve-quieting drug as a preliminary to the anesthesia. In several of the large European clinics using local and regional anesthesia in urological surgery, it was formerly not their custom to use preliminary sedatives, but they now find it advantageous. Braun (22) advises the use of scopolamine, while many others use morphia and atropine. Recent communications make it evident that this tendency to the use of quieting drugs is gradually becoming more frequent in association with regional and local anesthesia. When the patient is ready for anesthesia, he must be apprised of the fact that he will feel the first prick of the hypodermic needle. By so doing the patient will expect the prick and will not be unduly alarmed when it occurs. Some of these apparently minor points have been spoken of before (23), but their importance is, we believe, sufficient justification for their repetition.

NEW TECHNIQUE EMPLOYED BY LOWSLEY AND PUGH IN THE ADMINISTRATION OF PROCAIN FOR KIDNEY OPERATIONS

As a preliminary the patient is given purgation the day before operation. This allows a comfortable night without disturbance. Sodium bicarbonate is administered by mouth in 30-grain doses or per rectum in a 5 per cent solution. Fluids are given freely up to one hour before operation.

One hour before operation the patient is given one-eighth of a grain of morphine dissolved in 2 c. c. of 50 per cent chemically pure magnesium-sulphate solution after the method of Gwathmey. This is repeated in 30 minutes and a third injection of one three-hundredths grain of hyocine and one-sixth grain of morphine is given just as the patient starts for the operating room.

Upon arrival the patient is taken directly to the anesthetic room and a special nurse assigned to be present until the surgeon is ready to proceed. All evidences of haste, flurry, or active preparations are eliminated.

When all is ready for the administration of the anesthesia, the patient sits on the table with feet on a support. The hands rest on the shoulders of an attendant who stands in front of the patient. The back is bent slightly forward and the head lowered. This posi-

tion throws the bony parts concerned into most prominence and is maintained until the first part of the anesthesia is given. It can be administered with the patient lying on the opposite side, but this is not so suitable.

Starting at a point a little below the twelfth costovertebral angle and about 4 cm. from the midline a long wheal is raised by the injection of 1 per cent procain. This infiltration extends from the original point to the level of the eighth rib. A point opposite the spine of the seventh dorsal vertebra and 4 cm. from the midline is selected. A carefully tested needle is then inserted until it strikes the angle formed by the lamella on that side and the transverse process. It is then slid over the edge of the bone and the point deflected inward, the needle being then inserted for a farther distance of about 1 cm. This brings the point of the needle into the area occupied by the emerging nerve roots. Suction is put upon the syringe to make sure that the point of the needle is not in a blood vessel and then 2 or 3 c. c. of 1 per cent procain is injected into this region. This procedure is repeated at the ninth, tenth, eleventh, and twelfth dorsal vertebra. Raising and lowering the needle point when the area of the foramen is reached aids greatly in the production of anesthesia. The angle formed by the twelfth rib and the vertebral column should be particularly well filled with the anesthetic solution, as in this area there is a wider divergence of the nerve branches.

Beginning at the lower edge of the thoracic wheal we proceed to make another series of intradermal wheals, followed by subcutaneous and intramuscular injections downward and forward in the direction of the line of incision toward the anterior superior spine of the ilium. Fanwise injections may be made radiating from this with ease if thought necessary. We have found that wheals may be readily made either above or below the skin surface. If at the beginning of these loin injections a liberal allowance of fluid, say 10 c. c., is deposited at the proximal pole, the first lumbar branches will be well taken care of. All other nerves are taken care of by the line injection.

We should like at this point to emphasize a few facts. First it is very important to avoid pain in the administration of the anesthesia, as your patient will cooperate much better if he does not have more pain from the technique than he was led to suspect. It is hard to convince a patient that no pain will result from a cutting operation if the administration of the anethesia is uncomfortable.

Second, when we approach the intervertebral foramen care must be taken not to exercise to much pressure at this point, so that toxic symptoms with rapid absorption of the drug will not appear.

Neither is it necessary to have the fluid penetrate the foramen, as pressure at the sill seems sufficient to produce the desired anesthesia.

Third, in regard to the waiting period after injection; this we have usually found unnecessary, and we have always been able to proceed upon the completion of the injections and proper draping of the patient.

Seff (24) in his work on Paravertebral Anesthesia in Pleuritic Conditions states that care should always be used when the needle is close to the ribs, as the periosteum is often hypersensitive.

The successful carrying out of this technique should give us a complete anesthesia of the posterior lateral and enough of the anterior abdominal wall to allow any of the modern kidney incisions to be made. It is rarely possible to obtain a complete middle-line anterior anesthesia unless the nerves of the opposite side are also blocked. In addition to the relaxation of the abdominal wall, we should also obtain a peritoneal and abdominal anesthesia as well if our anesthesia is successful. When we reach the renal pedicle, particularly if tension is placed upon it, we are likely to elicit pain. Pain in this area can always be overcome by mildly infiltrating the connective tissue about it. As in all regional procedures, it is difficult to anesthetize against pulling and we must therefore proceed at all times with great care, handling all structures gently. Speed must at all times give way to gentle and careful manipulation. Where we have to deal with a large mass, the patient may notice some tugging, and if such a procedure is found necessary a mere whiff of ether may aid, but as a rule the presence of the cone with an ether odor is sufficient.

It may be well to repeat that the anesthetized areas should be tested out before we start on an operation. It is also advisable not to ask the patient if he feels pain. If it is present, he will promptly communicate that fact to you. If he is asked regarding sensation many patients are prone to become hypersensitive. An eminently wise precaution that should not be overlooked is the screening off of the field of operation from the patient's view. The well-nurtured patient often expects to experience pain, and this being so, one finds that painful sensations are often absent when the manipulations of the surgeon are invisible to the patient. The presence of a physician or a well-trained nurse to keep the patient's mind diverted from the operative field is a most valuable asset in this technic as in other local or regional procedures.

The method which we have described seems to have several advantages over the older ones. In fat or heavily muscled individuals it is extremely difficult to locate the rib at the point usually recommended on account of the fact that there is a tremendous amount of tissue between it and the skin. By the method described above, how-

ever, it is always possible to locate the angle formed by the transverse process and the lamella of the vertebra, and that allows the injection to be made in the proper place in 100 per cent of the cases.

It is considered particularly important to conduct the entire injection with only one prick of the needle. The patient immediately feels that he will be carried through without pain, and the fact that the injection is practically painless serves as a tremendous psychological boost.

DESCRIPTION OF CASES

Our series of cases is not large, but it is very encouraging.

Two of the cases operated upon are worthy of more complete mention. A brief résumé of the histories follows:

Case 1.—The patient was first admitted February 23, 1924, for cystoscopy and pyelography and discharged February 25. At this time he complained of pain in his right side and a tumor in his right kidney region. He had scarlet fever and measles in childhood and pneumonia at age of 25 without evident complications. Gonorrhea at 17, with one swollen testicle.

Family history is irrelevant. The patient's symptoms began one month before admission with sudden pain in right side, which caused him to go to bed. It was only relieved by morphine. At this time he had an acute tonsillitis and was given diptheria antitoxin. First examination of urine two days later showed it to be full of pus. Repeated urine examinations showed much pus at times with exacerbations of entirely clear urine. He has had intermittent fever for one week. White blood count 30,000, then 26,000, later 12,000. On admission patient showed slightly enlarged tonsils, but no inflammation. There was a large palpable right kidney, which was tender.

Cystoscopy: Instrument passed without difficulty; vesical fundus showed a moderate degree of patchy cystitis. Right ureteral orifice somewhat congested. The trigone was slightly reddened. No. 6 French catheters passed to both kidney pelves without obstruction. Right specimen showed cloudy urine, no urea, no p. s. p. in 15 minutes with many w. b. c. and some epithelial cells. Left specimen clear, 2 mgrs. per 1; p. s. p. appeared 4 minutes with 9 per cent excretion in 10 minutes. There were a few epithelial cells on the left side.

Second admission March 6, 1924. Patient reentered hospital for nephrectomy, as advised at his first admission. His entire family have low blood pressure, usually around 100, systolic. Urine on admission was amber, specific gravity 1020, acid clear, with no albumin or pus. Three days after operation urine showed some pus and bacteria, but has been free from pus since. Patient was prepared for paravertebral anesthesia with the usual purgation, and the ad-

ministration of one-eighth grain of morphine in 2 c. c. of 50 per cent magnesium sulphate solution given at 20 minute intervals one and one-half hours before operation, for three doses, was begun, thus giving the patient three-eighths grains of morphine sulphate.

Nephrectomy (right) was performed with the patient in semi-sitting position; the usual injections made, blocking eighth, ninth, tenth, eleventh, and twelfth thoracic nerve at the point of exit from the spine. Superficial and deep infiltration was made in the quadrangular space over the kidney region. Usual kidney incision exposed the rather large fluctuating kidney, which was separated without much difficulty, the ureter tied off low down, and kidney removed. The anesthesia was successful except while stripping the peritoneum from the kidney. He complained of some pain almost immediately after operation, which required morphine for its relief. There was very slight bleeding during the entire operation. Patient's blood pressure on admission was 98 systolic, dropping to 88 immediately after operation, but again coming to 102 before midnight—i. e., seven hours after operation. For the following three days he complained of some pain in his kidney wound and abdominal distension with gas. After this his recovery was uneventful, his wound healing without any difficulty. Blood chemistry on admission shows urea nitrogen 11.04; p. s. p. 45 per cent first hour, 45 per cent sceond hour, total 90 per cent. Wassermann negative. Specimens showed hydronephrotic atropy of the right kidney with chronic interstitial nephritis and a papillary adenoma of the cortex.

Case 2.—Patient was admitted complaining of pain in region of left kidney of two and one-half months' duration. Four children living and well; five children died before or at birth. Two and one-half months ago complained of burning frequent urination for two days, followed by constant dull pain in left kidney region, occasionally sharp, with an attack of vomiting. Examination showed some tenderness over left kidney region.

Second admission March 17, 1924.

Cystoscopic examination showed subacute cystitis with many stones in the left kidney pelvis and no function from this kidney.

Report of ureteral specimens

	Right	Left
Character	clear.	Clear.
Urea	1 gm. per liter.	0

Phenolsulphonephthalein

Appeared	8 minutes.	No appearance in 18 minutes.
Per cent	12 per cent 10 minutes.	No appearance in 18 minutes.

X ray shows collection of stones in region of the left kidney and a dilated ureter between the ureteral pelvic junction and the point 3 cm. above the posterior inferior spine, with some constriction below this.

Pyelotomy for stones was performed under paravertebral anesthesia in the usual manner. An anterior pyelotomy was done, removing innumerable very small stones and a large amount of pus. Tube was left in kidney pelvis for six days and irrigated. The anesthesia was fairly successful. Her blood pressure on admission was 134 systolic, dropping to 118 immediately after operation and soon rising to the normal 130. Urine showed no pus on admission and is clear on discharge. Urea nitrogen before operation 12.88, blood sugar 105, plasma combining power 53. On the third postoperative day patient suddenly developed a cough, which was relieved by morphine. The following day she developed a similar cough; no physical signs were found to account for this. Convalescense has been uneventful with this exception.

Summary of results.—All of the operations performed as described above were difficult cases with serious destructive lesions of the kidney. The kidneys were the site of marked adhesions in every instance, and two of them had been operated upon before.

All of the cases were prompt to notify us if they suffered pain, and it was necessary to give whiffs of ether to two of them. Whenever the peritoneum was pulled upon in all of the cases except the last, there was more or less complaint. Only one case complained of pain when the pedicle was clamped. This was obviated by injecting some procain solution into the pedicle.

There is much less bleeding noted than is observed with any inhalation anesthesia. There was no case of shock except that of a bilateral polycystic kidney case, which was in desperate straits when operated upon.

On account of the fact that the anesthesia lasts for six to eight hours, there is much less pain after operation and in some cases no pain at all. This is a most important consideration, as a small amount of pain suffered while the patient is in the condition of postoperative slump is very liable to cause shock.

The greatest disadvantage of any injected anesthesia is that no part of it can be removed. Therefore it is important to have it injected slowly and to stop at the first evidence of toxicity. It must be made of pure drugs recently dissolved, and it is our custom to boil it about an hour before it is used to insure absolutely its sterility.

We have had two cases in which the patients felt a little faint after the drug was administered. This was not severe enough to make the use of caffeine or other stimulants necessary.

One death occurred in this series. The case was one of bilateral polycystic kidneys, in one of which there was abscess formation. The woman entered the hospital in a serious condition and was operated upon as an extreme emergency case. The infected kidney was drained, releasing about 3 ounces of foul-smelling pus. Death occurred 7 hours later from shock.

CONCLUSIONS

It is not proper to draw conclusions from an experience as limited as ours has been with kidney operations. We have, however, formed some very definite impressions which may be of interest to the reader.

(1) We feel that the greatest hope for the future development of surgery upon the diseased kidney lies in the perfection of less toxic drugs for the induction of regional anesthesia and methods of introducing them.

(2) The operation itself should be painless. If the anesthesia is insufficient to bring this about, there should be no hesitancy in administering sufficient ether to accomplish this result.

(3) There is apparently about one-tenth the amount of bleeding noted in an operation under regional anesthesia as compared to any inhalation method. This fact and the additional fact that the anesthesia persists for six to eight hours take away the two great factors in the production of shock—namely, hemorrhage and pain.

(4) Our new method of inducing the anesthesia is much more comfortable and certain than any of those previously suggested.

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LYMPHADENOSIS, AN ACUTE BENIGN DISEASE SIMULATING ACUTE LEUKEMIA

By E. C. White, Lieutenant Commander, Medical Corps, United States Navy

Acute leukemia is a rapidly fatal disease associated with profound blood changes and severe hemorrhages. When a benign infection simulates its early symptoms, it leads to an unduly unfavorable prognosis and alarm on the part both of the physician and of the family of the patient. Within the past few years there have appeared in the literature several descriptions of such a disease—that is, of an acute benign disease which resembles leukemia in many ways, but differs from its chiefly in the invariable recovery of the patient. The disease has been variously named by almost every observer. By Downey and McKinlay it was called acute lymphadenosis, by Sprunt and Evans and by Longcope infectious mononucleosis, by Bloedern and Houghton acute benign lymphoblastosis, and by Cross acute benign leukemia. It is evident that

the disease is far from uncommon, and it may be that its prevalence is increasing.

It is the probability of its increasing prevalence that makes it of interest and justifies further description and discussion, for it has happened several times in recent years that diseases that were relatively rare and unimportant have suddenly assumed epidemic proportions. Notably this has occurred with poliomyelitis, encephalitis, and acute infectious jaundice. It may be that in the near future we will have an epidemic of acute lymphadenosis.

Like acute leukemia, this disease is characterized by a very marked increase of the lymphocytes in the blood. These lymphocytes, however, while pathological in type, differ markedly in their morphology from those of acute leukemia; and being pathological in type, they are easily differentiated from the lymphocytes of other conditions in which a relative lymphocytosis is present. In these latter the lymphocytosis is due to an increase of the normal small lymphocytes. This type of lymphocytosis is found at times in normal children, in pertussis, congenital syphilis, rickets, hemophilia, cervical adenitis, chlorosis, hyperthyroidism, furunculosis, streptococcus sore throat, Vincent's angina, and the epidemic glandular fever of childhood. During the recent mild epidemic of Vincent's angina observed in this hospital the lymphocyte count in over half the cases was from 50 to 70 per cent, with 15,000 to 21,000 leucocytes, and the blood picture in many cases did not return to normal during the patient's stay in the hospital. In none of the cases, however, were cells of a pathological type observed. A relative lymphocytosis is also found at times following the ingestion of therapeutic doses of certain drugs, as thyroid extract and pilocarpin.

The clinical features of acute lymphadenosis, the name under which we will discuss the disease, are as follows:

1. An acute febrile course extending over one to three weeks, with temperature usually not exceeding 103°.
2. Enlargement of the lymphatic glands of the neck and of the salivary glands. In some cases there is a generalized glandular involvement, the axillary and inguinal glands also being enlarged.
3. Enlargement of the spleen in about 50 per cent of the cases.
4. The chief complaint in most cases is sore throat or mouth. In many there is an exudate on the tonsils, and in some there is a definite ulcerated area, with edema and hemorrhages into the buccal mucosa.
5. Anemia is never present and a purpuric eruption is very rare.
6. Recovery is invariable.
7. The blood cultures are negative.
8. Vincent's spirilla are present in many instances.

9. The leucocyte counts vary between 3,000 and 26,000. As a rule, the leucocyte count is normal or below during the first few days and then increases to about 20,000.

10. The percentage of lymphocytes varies from 57 to 96. The lymphocytes that make up the increase are atypical mononuclear cells not usually encountered in normal blood. They are larger in size than the small lymphocytes and contain oval or slightly lobulated and deeply staining nuclei. These cells differ morphologically from those found in acute leukemia and differ somewhat in different cases. McKinlay describes three different types of the disease, based on the difference in morphology of the cells, though he admits that the division is artificial and unimportant.

The history of a recently observed case of this infection is as follows: F. J. G., F3c, age 22, single, entered the hospital June 30, 1924, complaining of sore gums, throat, and jaw. The gums began to get sore four days before and he thought at first he was cutting a wisdom tooth. Then he developed fever and chills and was intermittently delirious.

On admission his temperature was 102°, pulse 80, respiration 22, and he looked sick. His gums were swollen, inflamed, and tender, and pus exuded around the teeth on pressure. The throat and tonsils were not inflamed. The submaxillary, sublingual, and cervical glands were swollen, tender, and indurated, particularly on the left side. The family and past history were unimportant except for the fact that he had been infected with syphilis about two months previously and had been treated for it with two injections of mercury and four injections of 0.6 gram each of salvarsan. There was a slight general adenopathy. Syphilis was considered and ruled out as a factor in the present acute illness.

The inflammation of the gums steadily increased. They bled on the slightest trauma, and patches of whitish membrane developed on them. The glands of the neck became greatly swollen and tender. Smears from the gums showed spirilla and fusiform bacilli. The spleen was not palpable.

The urine contained granular and hyaline casts and three plus albumen on admission and continued to show evidence of an acute nephritis for three weeks. On July 3, the fourth day after admission, the blood contained 4,100,000 red cells per cubic millimeter, 85 per cent hemoglobin, and 5,400 white blood cells, of which 35 per cent were polymorphonuclear cells and 58 per cent were lymphocytes. The following day there were 65 per cent lymphocytes.

The patient continued to grow worse. A slough about the size of a silver dollar developed on the oral aspect of the left side of the lower jaw near the ramus and a smaller slough developed on the right side below the second bicuspid and first molar. Blood

cultures were negative. The temperature rose steadily to 104° F. on the fifth day after admission and continued at 103° to 104° for five days, when it fell by crisis to 98° following his first intravenous injection of mercurochrome. This was on the tenth day after admission, or the fourteenth day of the disease. Later on the same day the temperature rose to 101° but reached normal the following day and did not rise above it subsequently.

The blood contained 2,400 leucocytes per cu. mm. with but 2 per cent polymorphonuclears and 96 per cent lymphocytes on the eighth day after admission, the twelfth day of disease. This was the smallest number of leucocytes and the largest percentage of lymphocytes recorded. After that the blood picture gradually improved, the number of leucocytes rising and the percentage of lymphocytes decreasing. The highest leucocyte count recorded was 17,700 on the twentieth day of disease. Anemia did not develop, there being always over 4,000,000 red cells and the hemoglobin being recorded at 65 to 80 per cent.

DISCUSSION OF CASE

The first diagnosis in this case was acute leukemia, based on the glandular enlargement, the severity of the infection, and the high lymphocyte count. This diagnosis was soon proven erroneous, however, by the absence of anemia, by the comparatively low leucocyte count which continued throughout, by the absence of purpura and other hemorrhages, and finally by the morphology of the lymphoid cells. Besides the normal type of small and large lymphocytes, pathological lymphoid cells were found in great numbers. According to Stitt, "In acute lymphatic leukemia the large lymphocytes and Rieder cells are the diagnostic ones. These, however, are pathological and differ from the large lymphocytes in not having typical azur granules and in that the nucleus stains poorly and is often indented." The cells in this case fitted the description of those in the cases of lymphadenosis described by Bloedern and Houghton and by Longcope. Comparing them with the descriptions and excellent colored plates in the paper by Downey and McKinlay, most of them were found to resemble their type I cells, though some more closely resembled the type III cells. Although the blood was examined carefully from day to day, none of the immature cells characteristic of acute leukemia were found. Two months after recovery the blood of the patient still contained a few of these pathological cells.

As compared with other recorded cases, this one displayed several features of particular interest. The temperature was higher, the patient more toxic, and the destructive process on the gums more extensive. The leucocyte count of 2,400, recorded on the eighth day

of illness, is the lowest recorded, the next lowest being 3,000 in one of Downey's cases. Ninety-six per cent lymphocytes, recorded on the same day, is the highest percentage of lymphocytes recorded, Downey's case, with 92 per cent, being the next highest.

Of special interest in this case was the intravenous administration of mercurochrome, following the technique recommended by Young and Hill. They had reported some remarkable results in the treatment of a number of cases of septicemia, particularly staphylococcus septicemia. Subsequently they have recorded almost as remarkable results in the treatment of several cases of scarlet fever complicated by erysipelas and septicemia due to the streptococcus hemolyticus. In this case, although the blood culture was negative, the progress of the disease was that of a very severe infection, and it was felt that it was a suitable case for the experimental administration of mercurochrome. The patient was given 10 c. c. of a 1 per cent solution at 3 p. m., July 8, the thirteenth day of disease. At that time his temperature was 104°, and he was very toxic. Following the administration he had no chill nor other unfavorable reaction. The next morning his temperature was 98°, and he looked and felt better. He was given 10 c. c. more on that day and 10 c. c. the following day, a total dosage of 5 mg. per kilo body weight. Immediately following the administration the sloughing areas in his mouth began to heal and he improved in every way. While recovery would almost certainly have taken place anyway, for there have been no fatal cases reported, yet it was scarcely possible to conclude otherwise than that the mercurochrome had had prompt and very beneficial action.

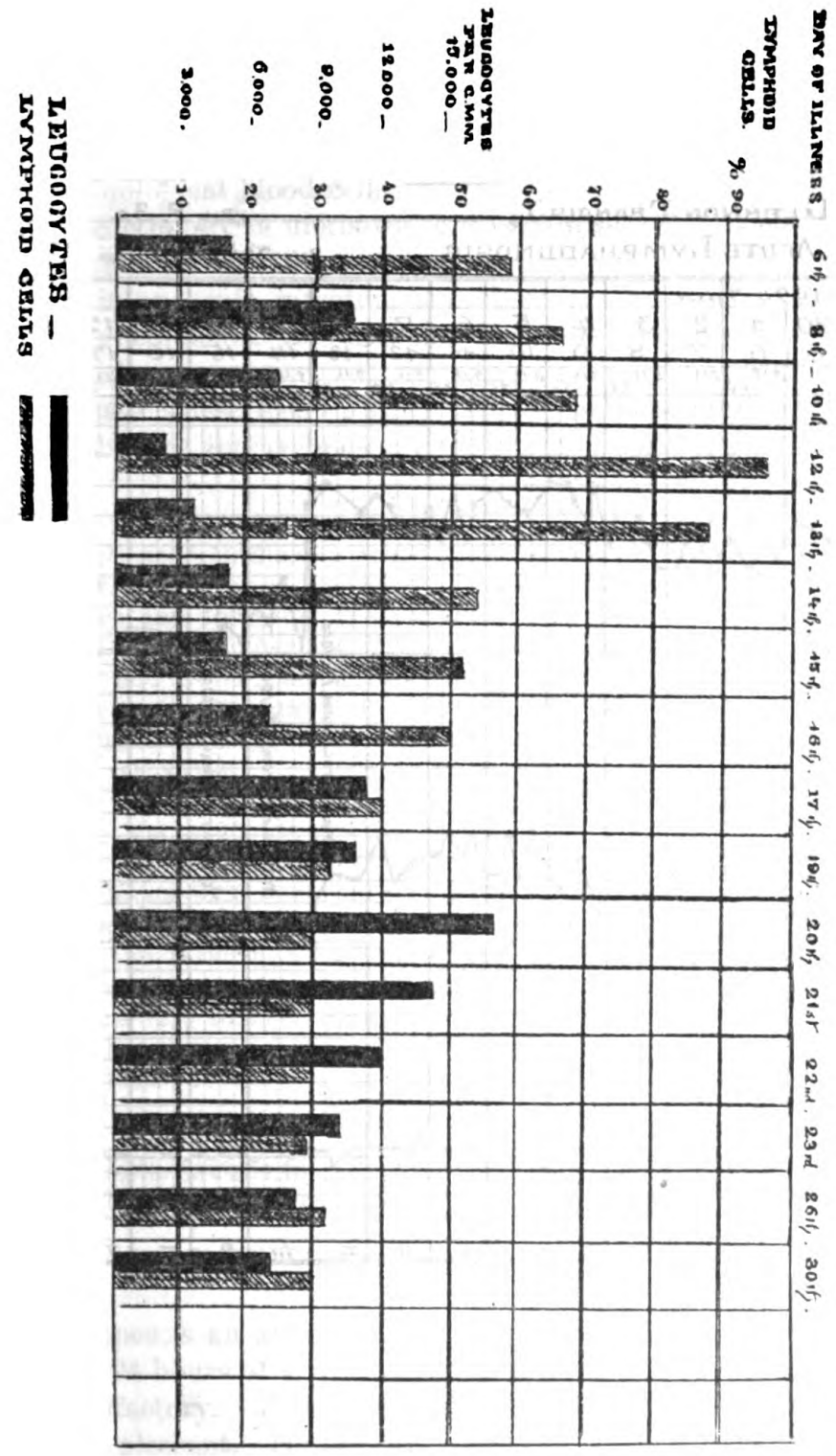
COMMENT ON THE DISEASE

The etiology of this disease, which is apparently a distinct clinical entity, is obscure. The organism of Vincent's angina has been found in a large proportion of reported cases. It was looked upon with favor as a possible etiological factor by Bloedern and Houghton, who found it in three of their four cases. But their position has received no support from subsequent observers, who have found the organism in a smaller percentage of their cases and who definitely rule it out as an etiological factor.

All the cases reported have occurred in young adults and in association with an acute infection of the throat or mouth, which points to that area as the most likely portal of entry. Cervical adenopathy was present in all cases.

SUMMARY

(1) A disease is described which resembles in many ways acute leukemia.



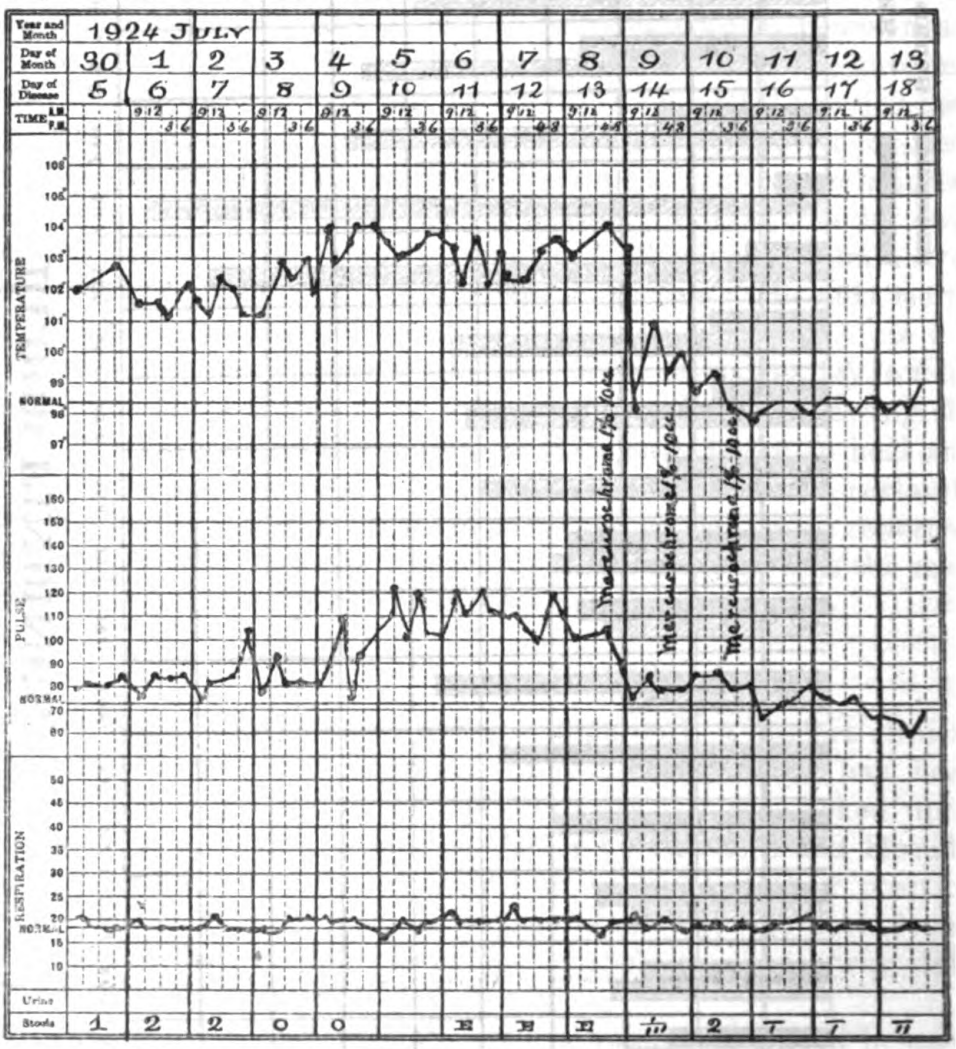
BLOOD FINDINGS.

CLINICAL CHART

Page No. 1

Name GLENNON, FRANCIS J. Rate P. 3c.

Diagnosis ACUTE LYMPHADENOSIS Race WHITE Age 22



(2) It is a definite disease entity and has been variously named by different observers.

(3) Local sypmtoms are usually limited to throat, mouth, and glands of the neck.

(4) Systemic symptoms are fever and a marked lymphocytosis.

(5) It differs from acute leukemia in the absence of anemia, the comparatively rapid recovery of the patient, and in the morphology of the pathological blood cells.

(6) The etiology is unknown, but organisms of Vincent's angina are present in a large proportion of cases.

(7) It is an acute infection and therefore of special interest as potentially epidemic, for this has been the history of other rare infectious diseases.

(8) A case is described in which recovery was apparently markedly hastened by the intravenous use of mercurochrome 220.

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OBSERVATIONS COVERING A PERIOD OF TWO YEARS AT THE RECEIVING BUILDING, UNITED STATES NAVAL TRAINING STATION, NEWPORT, R. I.

By R. A. NOLAN, Medical Corps, United States Navy, and T. R. LEONARD, Chief Pharmacist's Mate, United States Navy

This paper is an attempt to show that medical supervision for a period of 24 hours of a recruit newly arrived at a training station is most satisfactory. These hours, for the recruit, are ordinarily anything but pleasant. He is often placed in the care of a petty officer who knows nothing of the value of observation and whose knowledge of simple psychological and sociological problems and of contagion is *nil* and who often forgets that the recruits are in his care and are

ignorant of Navy ways. The petty officer may seek to impress his importance on the recruit by filthy and obscene language; inflict disciplinary measures, when many of these men do not know the meaning of the word discipline; or bully and attempt to cowe them at times to cover his own inferiority complex. Many recruits lose valuables and clothing if there is no close supervision of their effects. They are often found sleeping on a cement or wooden floor under a poorly slung hammock in their civilian clothes which may be damp or even wet. They are supposed to know how to get into and sleep in a hammock swung about 5 feet from the deck, the only instructions given being "Get into your hammocks." This method of receiving recruits has no benefits, and it takes many days to eradicate these first poor impressions. Men have been known to suffer excruciating pain from a tooth or abdominal condition because they are afraid to ask to whom they might go for relief.

Recruits are received at Newport from the recruiting stations at New York, N. Y., Brooklyn, N. Y., Newark, N. J., Philadelphia, Pa., Buffalo, N. Y., Albany, N. Y., Springfield, Mass., Boston, Mass., Providence, R. I., New Haven, Conn., and Newport, R. I. They are given transportation to the center of Newport, which is about 3 miles from the entrance to the training station. They arrive at the station at any hour of the day or night and on entering are directed to headquarters in detention. Here their names are taken, their valuables deposited—for which they are given a receipt—and they are sent to the receiving building.

From July 1, 1922, to October 1, 1924, we have received and examined about 13,000 recruits. Out of this number there have been recommended for undesirable or medical discharges over 500 men. Ninety per cent of this number manifested their undesirability in a physical, moral, or mental way while in detention. Undesirable discharges were given to over 200 recruits for the following reasons: Inaptitude for service, absence over leave, sending obscene literature through the mails, theft, attempting to effect discharge by self-mutilation, malingering, refusing duty, refusing operative treatment, intoxication, assault with knife, attempt to jump ship, drug addiction, demoralizing recruits, attempted fraud, masturbation, self-confessed sodomy, underage, and fraudulent enlistment. Medical surveys were given at the United States Naval Hospital, Newport, R. I., for epilepsy, 11; frontal sinusitis, 4; cicatrix of skin, 3; union of fracture, faulty, 2; valvular disease, chronic cardiac, 7; neurasthenia, 4; constitutional inferiority, mental, 11; eczema, 2; phimosis, 1; otitis media, chronic, 4; pes planus, 5; malformation, congenital, 1; neurosis of bladder, 1; fracture, simple, patella, 1; asthma, 1; psychosis, unclassified, 3; loose body in joint, 1; hernia, inguinal, 10; tic, convulsive, 3; fracture (old) occiput, 1; insufficiency of ocular

muscle, 2; ichthyosis, 1; varicocele, 3; amputation stump, 1; nephritis, chronic, 7; paralysis of vocal cords, 1; incontinence of urine, 3; atrophy of muscle, 1; hammer toe, 1; gonococcus infection, uethra, 10; tuberculosis, chronic pulmonary, 3; myopia, 1; ankylosis of joint, right shoulder, 1; hypermetropia, 3; leukoma, 1; dermatitis, 1; stammering, 1; keratitis, 1; neuritis, optic, 1; goiter, 1; genu varum, 1; hypertrophy of bone, 1; poison, opium, chronic, 1; genu valgum, 1; hysteria, 1; rheumatic fever, 1; psoriasis, 1; tachycardia, 1; tonsillitis, chronic, 1.

To the best of our knowledge this is the only station where the Medical Department receives and is given full charge of the recruit on his reporting for duty. Much interesting and valuable information is secured by methods introduced here. It is our opinion that mental impressions made on the recruit here during his first hours are lasting and beneficial to the Medical Department and to the Navy in general. As mentioned previously, the recruit may arrive at any hour of the day or night. He may be hungry, wet, or ill. He may be in the infectious stage of any one of the common contagious diseases. He may be a fugitive from justice or an escaped lunatic. He may have committed a crime while *en route* from the recruiting station. He may have drugs, firearms, etc., in his possession. Because of these facts, which can not be rectified, it is our opinion that a specially trained medical unit should be detailed to receive and supervise the recruit for the first 24 hours. It is possible for such a unit to determine various mental, moral, and physical facts concerning the recruit which may have been overlooked or which could not be determined at the recruiting station and in this way to keep out of training the incompetent and undesirable, prevent the issue of clothing, and save the Navy an enormous loss in money and time. The pharmacist's mates detailed for the receiving of recruits at this station are specially selected, and there is one of them on duty at all times. He mingles with the recruits and observes their actions and conversation, reporting anything abnormal to the chief pharmacist's mate, who in turn notifies the medical officer. The duties of this staff are to see that the recruit's first impression of Navy mess is one of cleanliness and neatness; that he does not hear obscene language used by the staff that receives him; that his impression of the value of personal cleanliness is enhanced by a supervised hot bath and the discarding of generally filthy underwear; that in his transit from the center of Newport to the station in inclement weather his shoes or clothing have not become damp or wet, or if they have become so to have them discarded, thereby saving many sick days and possible pneumonias; that he is given a good bed with fresh linen the first night, which is an easy way of introducing him to his hammock; that all personal history that can be extracted from him be obtained, at the

same time noting his personal peculiarities and all information of recent escapades that may have led up to his appearance at a recruiting station. Doing this has resulted in the early detection of the chronic masturbator, bed-wetter, somnambulist, moral pervert, repeater, especaped lunatic, and convict. History of recent marital troubles or other facts that help the examiner are brought out at this time. If a report of suspicions is received from the pharmacist's mate on watch, it is carefully inquired into, and many and varied admissions have been obtained thereby. The opium habit of five years' duration in a recruit 17 years of age who had made his home in a Chinese laundry at Lake Placid, N. Y., prior to enlisting was revealed by this method. He brought his pipe and a supply of the drug with him and had checked them at the Y. M. C. A. before arriving at the training station. Another recruit who held up a mail train in Texas and succeeded in getting away with thirty odd thousands of dollars worth of securities was listed as suspicious and a week later was indentified and apprehended by Texas police officials. Six drug addicts (heroin) were detected and prevented from entering training. One man, with the nickname of " Santa Claus " in his neighborhood and whose people were wealthy, gave away all of his personal allowance of $40 a week to the neighborhood gang (as discovered upon inquiry). The information from the pharmacist's mate divulged the fact that he had distributed $120 among the other recruits. Except for this peculiarity he appeared normal and was allowed to go through. He was issued an outfit of clothing, but before it was stenciled he was found attired in his underwear, the rest having been distributed among his shipmates. He was transferred to the hospital and discharged from the service with a diagnosis of constitutional inferiority, mental. The characteristics of men tending toward sexual perversion have, on many occasions, brought to light information which led to undesirable discharge. The chronic masturbator has been detected in this building and a complete history secured. A tentative diagnosis of " dementia precox and paranoid state" has been made on the information of the trained pharmacist's mate who had observed peculiar appearance, characteristics, or actions on the part of the recruit. One recruit wore a pair of trousers that had been made at an institution. He had escaped from an asylum in Massachusetts one week prior to his enlistment. The pharmacist's mate who detected him had worked two years as an attendant to the insane at the same institution and recognized the trousers. On another occasion, the habit of bathing every hour called for an explanation by the recruit that brought out the unquestioned symptoms of dementia precox. Eighteen cases were detected by this method before entering training.

On arising in the morning the recruits are turned to at cleaning up the building, supervised by a pharmacist's mate. The men receive their hair cuts and are mustered in the examining room at 9 a. m. Here they strip off their clothes *en masse*, and the medical officer whose special duty it is to examine daily is seen sitting in a chair, dressed in a gown and wearing rubber gloves for his own protection, with a pillow in front of him and on a small table at his right the necessary appliances for a complete examination. The description of the position and dress of the medical officer is given because it is not a usual one with medical examiners, and it has been determined by ample experience that a more thorough examination may be made on a large number of men in this way without the fatigue that results from the usual method of examining because of the better prospectus the individual presents as he stands in front of the pillow facing the examiner.

The position and attitude the recruit takes, if studied, will show evidence of previous military training, and because of this fact many repeaters have been discovered.

Careful examination of the hands and feet has distinct value. Abnormal flexion or extension of the digits or arms calls for a complete explanation. Nail-biters number 15 per cent of recruits received and are of five types—the persistent type, which has continued the thumbsucking habit of babyhood; the mild hysteric with neurasthenic tendencies; the occupational type (the mill-hand who works at looms where the thread catches on ragged edges of the nail); individuals who have been in penitentiaries or houses of correction or homes for orphans; the boy who reads much at an early age and does not indulge in the outdoor sports of youth to any great extent. All of these are required to report at 9 a. m. and 4.30 p. m. for protective adhesive dressing. In this way the habit of a lifetime is often corrected. In three recruits from a mill town in Massachusetts the finger nail of the little finger of the right hand was noted to have been given great personal attention. It extended three-quarters of an inch beyond the end of the finger, and all the other nails were cut to a normal length. On questioning the men it was found that they belonged to a gang who identified one another by this peculiarity. Two of them were of Italian descent and had been barbers in civil life. In the September 17 issue of the Liberty Magazine it is stated that in the days of Andrew Jackson the pioneers trained one or two finger nails on each hand for the specific purpose of gouging out the eyes of their opponents in rough and tumble fight. It is a far cry from the days of Jackson and his pioneers to the present time and Italian barbers and from using finger nails to gouge out the eyes of opponents and using them as identification marks, but it

is often on such trivial signs and slender links that the detection of undesirables depends.

After the examination of the hands the recruit is told to turn around, and by his method of proceeding the typical about-face of the military man, who may be a repeater, is detected. He then touches his hands to the floor so that an anal inspection may be made and a view of the back obtained. A rather peculiar marking of the back, due to continual exposure to the rays of the sun passing through cotton clothing, with a definite line of demarcation at the waist line, is always seen on boys who have worked as farmers, track hands on a railroad, laborers in a brickyard, or as roofers for any considerable period of time. Standing erect, spinal deformities, tilted pelves, unilateral abnormalities of the gluteal lines, or folds are looked for.

The recruit then faces the examiner, whose eyes are now on a level with the former's genitalia, so that these may be examined readily and scrutinized thoroughly. It has been found that active gonorrhea and the first appearance of a discharge may come on between the time the recruit leaves the recruiting station and the time he arrives at the training station. Relaxed rings and varicosities have been noted. Two recruits, 17 years of age, were observed to have gaudy butterflies tatooed on their penises. On explaining to them that their parents did not know of this tatooing and that if they should die in the service and this mark be observed after death their parents might think this was a common practice in the service and blame the Navy, they requested a transfer to the naval hospital for excision of the markings. Two men have been noted to have double undescended testicles. In six cases only one testicle was palpable. In 11 there was found extreme atrophy of both testicles. One case of chancre has been found.

The presence of scars of recent herniotomies in recruits has necessitated the issue of an order that no heavy lifting be done by working parties in detention. All of these herniotomies were performed at the suggestion of the medical officers at the recruiting stations. On inquiring into the scars of appendectomies three peculiar histories were obtained. Our reason for citing these cases is to warn, for ordinarily the scar of McBurney's or of a right rectus incision is considered *prima facie* evidence that the individual's appendix has been removed. In the three cases alluded to two operations had been performed at intervals of years. The first operation in each case resulted in the incision being closed without the appendix having been removed. One man stated that the same doctor operated both times. The first time, he was told, the appendix could not be located. Inspection of the skin in the abdominal

region is made and in two cases the roseola of secondary syphilis has been found.

The next step in the examination is to have the recruit kneel on the pillow without touching his hands to the deck. Abnormal functioning of the knee joints (floating cartilages that cause trouble) is noted by his preliminary movements and the expression of pain on his face while bending the knee. His face and chest are now within 24 inches of the examiner. His thorax is scrutinized and palpated without any considerable effort. Stethoscopic examination of the heart follows.

Next the neck is examined for evidence of goiter or abnormal pulsations, and a history of all scars is requested. In one case complete deafness of the right ear, with a right facial paralysis, was discovered because of inquiry into a scar that was noted in the right subclavicular region. This recruit gave a history of having been shot with a .38-caliber pistol and because the wound of exit could not be found an X ray was taken which showed the bullet resting in the antrum. Fourteen recruits showed the scar of unilateral mastoiditis and two showed the scars of bilateral. These recruits were all admitted to training. Attention is also given to any abnormal movements of the head and neck.

The head is next examined, the hair having been cut short. Palpation of the entire caput with the palm of the hand is absolutely essential. Two cerebral hernias and various pathological conditions and abnormalities (old fractures, large sebaceous cysts, etc.) have been found because of this procedure. Inquiry into the history of scars has brought to light the following conditions: Epileptic attacks, jail sentences, blows of the policeman's club, unhappy home conditions, shown by the scars of hot tea-kettles and other household utensils.

With the eyes of the recruit on a level with those of the examiner all questionable personal or physical characteristics are inquired into. It has been observed that a naked individual on his knees, peering into the eyes of a dressed questioner, finds it extremely difficult to give false information, and a history of physical and mental defects, jail sentences, and mental complexes may be secured. The eyes, ears, nose, and throat are now examined. Four cases of pterygii have been found in men who had worked at acetylene welding over a period of one year or more. At least 10 men suffered from complete obstruction of one nasal aperture by deflected septum, the aftermath of fracture, and in one case by polypi. A chronic purulent condition of the ear existed in six cases. Only two cases of color blindness have been detected.

On completing the physical examination the recruits put on their underwear. They now proceed with an experimental intelligence

test, which was instituted by Commander George L. Wickes, the senior medical officer. One of its present uses is the aid it gives in the selection of recruits suitable to become hospital apprentices. After this test the recruit's teeth are charted by a pharmacist's mate specially trained for this work at the naval dental school, Washington, D. C.

The recruit is now given a lecture on topics such as vaccination, typhoid prophylaxis, gonorrhea, syphilis, venereal infection, the prophylactic tube, the use of obscene language in the barracks and its relation to perverted mentalities. A short description of the effects of the habitual use of cocaine, heroin, opium, and morphine, together with the methods of introduction and distribution of these drugs to the innocent used by taxicab drivers, drug peddlers, and inmates of disorderly houses is also given. Stress is laid upon personal appearance; why teeth should be cleaned twice daily; the results of constipation; the care of the finger nails; behavior ashore; and the location of the station of the medical department, the dental department, and the canteen.

Following the lecture, which is given daily, the chief petty officer (instructor) who is detailed for this work verifies the stencil that is to be used in marking the recruit's first outfit. He supervises the proper fitting of shoes and leggings and the drawing of clothes after the recruits leave us at about 11.30 a. m. Next the men are taken to their quarters, where their clothes are stenciled and they are instructed in the proper lashing and swinging of a hammock, so that on their second night on the station, because of the care, instruction, and supervision which they have had, they are able to enjoy a proper night's rest in their new environment.

All instructors detailed to detention for the training of recruits, spend their first two days with the Medical Department, so that they learn the reasons for handling newly arrived recruits in the manner noted above and also learn something of the psychology of the individual. This assists the medical unit, for the instructor will then send any man in his company to us at any time of the day for various imaginary or real ailments that develop when the recruit starts training. Nostalgia, corns, bunions, laceration of feet, constipation, evidence of mental complexes, and other physical or mental troubles are conditions that may come to his notice.

The duties of the medical unit in detention are as follows: To act as a strainer, eliminating undesirable recruit material; to supervise vaccination and read the results on three occasions, one week apart, when the recruits receive their typhoid inoculations; to treat the sick at any hour they may come to the sick bay (the medical officer sees every case during the day, and a pharmacist's mate is on duty through the night); to supervise, directly, the sterilization in boiling

water of all mess gear used, after it has been washed by hand in each unit of 26; to investigate all reports of immorality in the barracks; and to supervise the hygiene and sanitation of detention.

Malingering in simulated epilepsy, hysteria, bed-wetting, and psychoses, in each case, is thrashed out with the man's instructor. We have had four cases of self-mutilation. One recruit deliberately cut off his trigger finger at the base with a bread knife. The other three were faint attempts with safety razors to sever vessels of the right wrist, flexor surface. These individuals all received undesirable discharges. Four cases of masturbation in public have been seen. Cases of drug addiction have been picked up because of their inability to procure the drug. We have had a few cases of minor theft to handle. In case of suspicion the sign of an accelerated pulse rate as compared with other men has proved useful in obtaining a confession. It has been observed that recruits whose parents were from southern Europe are inferior in many ways to the sons of those from the northern countries. This fact was first brought to notice by the youths of Italian descent. The majority of recruits suffering from nostalgia and of those who are temporarily displeased with Navy discipline, with a large percentage of the malingerers, are of this class. Also these are slowest in adapting themselves to their new environment. We attribute this to the fact that while an Italian mother may have six sons all living in miserable circumstances, yet she seems never to recover when one of her sons leaves home. Every letter that the recruit receives is filled with lamentations. We have read many such letters and attribute to them the poor showing that is made by this type of recruit.

Mental treatment in vaccinating and in giving typhoid prophylaxis is very valuable. Recruits when vaccinated are compelled to sit down on the floor immediately. This prevents the sight, so often seen, of men fainting. The explanation of why typhoid prophylaxis is given, the amount of the dose, and the information that reactions are rare have resulted in there being very few reactions. In cases of chills, lying in the sun wrapped in a blanket for 30 minutes and a 20-grain dose of aspirin for headache has been found efficacious. In men suffering from minor reactions we always notice that constipation seems to be a factor.

We have been experimenting with various methods over a period of two years, and we find that our present method is the best one for exactness in the reading of vaccinations of men in the shortest possible time. The room in which the inoculations are given is 25 feet square with an overhead of 20 feet, having two doors and three large windows, giving adequate ventilation, and with a cement floor, which is a convenience when men enter the building with mud or

snow on their shoes. Good ventilation is absolutely essential, for we have found that the staff, working over a period of two hours in an inadequately ventilated room, developed symptoms of headache and asthenia. When this was noticed it was investigated, and as some of us believed that the handling of the serum might have produced these symptoms because of inhalation or absorption we tried to reproduce the symptoms by massaging the arm with the serum and by inhaling the air in proximity to the serum, but were not successful. We then moved our activities to the room mentioned previously. We now know that our symptoms were due to crowd poisoning.

On various occasions we have transferred to the United States Naval Hospital, Newport, R. I., cases of scarlet fever, septic throat, tonsilitis, mumps, German measles (two cases in which there appeared painful and slightly enlarged, postcervical glands, five days prior to the rash), and meningitis (in one of these, in which the patient died, the symptom of stiff neck was brought to the attention of the medical officer by a pharmacist's mate 40 minutes after the man arrived at the station). We attribute the absence of epidemics to the medical officer being available and seeing every case that comes to the sick bay, no matter how minor the ailment nor at what time of day; the sterilization under medical supervision of all mess gear after each meal; the units of 13 men sleeping head to foot; the weekly reading of vaccinations by the medical officer, who is also on the lookout for dermatological conditions, prior to typhoid inoculation; the getting of the confidence of the men so that if they do not feel well or up to the standard they will come to the sick bay; the recruit meeting the medical unit first and having inculcated in him by their attitude that they are interested in him personally; and the cooperation of all the officers and instructors attached to the detention barracks.

In conclusion, the medical staff of a detention unit has vast responsibilities, and to be successful they must observe, listen, and be interested in their duties.

DISCUSSION OF HEART BLOCK WITH A CASE REPORT

By H. E. Hill, Lieutenant (Junior Grade), Medical Corps, United States Navy

Heart block is a term that defines the blocking of the impulse for contraction at some point in its course from the pacemaker to the final distribution of the fibers of Purkinje. The condition of persistent extreme bradycardia with syncopal or convulsive seizures has been known as the Adams-Stokes syndrome.

In the normal heart the impulse of contraction starts at the sinoauricular node, a mass of specialized muscular tissue at the superior

cavo-auricular junction, spreads through the bundle of His in the membranous interventricular septum, and is distributed thence through the Purkinje fibers to the ventricles and their papillary muscles. Any condition occurring in the bundle of His which interferes with the transmission of this impulse to the ventricles will cause heart block. This disturbance of conduction will produce the following abnormalities, each more serious than the last, according to the degree of interference:

1. A prolongation of the interval between the auricular systole and the ventricular systole (normally from 0.1 to 0.2 of a second) to twice or thrice its normal length.

2. "Dropped beats"—i. e., an occasional "silence" of the ventricle in answer to the auricular contraction preceding it.

3. Regularly recurring dropped beats every tenth of a second or oftener.

4. The establishment of a 3:1 or 2:1 rhythm—i. e., three or two beats of the auricle for every beat of the ventricle.

5. Complete dissociation of the auricle and ventricle. No impulses pass down. The ventricle may stand still for good and all or it may gradually initiate a slow rhythm of its own (approximately 36 per minute). This state of affairs constitutes complete heart block, of which the case cited is an admirable example. If the ventricular silence lasts 3 to 5 seconds, the patient usually loses consciousness for a minute. Silence of 10 to 20 seconds usually results in epileptiform convulsions. When these cerebral phenomena are associated with more or less heart block, there occurs the Stokes-Adams syndrome previously referred to. Silence over 90 seconds means death.

Heart block is more common in males than in females. Most of the cases fall within two groups: (1) Patients, usually young adults, who have previously suffered from a rheumatic infection of the heart; and (2) patients usually elderly people, who are suffering from myocardial degeneration. It is not infrequent in the milder forms during the course of infectious diseases, especially in rheumatic fever, diphtheria, pneumonia, and typhoid fever. It also occurs less frequently during an ulcerative endocarditis and in gonorrheal infection. Syphilis is an important and serious cause owing to the auriculo-ventricular bundle being affected in the myocardial involvement or by a gumma. Any form of myocarditis, acute or chronic, may be responsible. In these cases, investigation at the Mount Vernon Hospital demonstrated that the higher degrees of heart block were sometimes induced by full doses of one of the digitalis series of drugs. Occasionally it arises in the course of acute gastro-intestinal upsets.

The pathology involved in heart block is quite variable. Among the more frequent conditions found are:

1. Gumma.
2. Ulcerative anemic necrosis of the bundle of His.
3. Calcified patches involving the bundle.
4. Fibrosis of the bundle.
5. Tumors in the septum: fibroma and round-cell sarcoma.
6. Simple round-cell infiltration of the auriculo-ventricular bundle.
7. Mural ulceration involving the auriculo-ventricular bundle.
8. Fatty degeneration.
9. Arteriosclerosis of the artery supplying the auriculo-ventricular bundle.

The subjective symptoms are variable and depend to a considerable extent on the associated cardiac lesions, whether valvular or myocardial, which are almost invariably present. When, however, the valves and myocardium are normal, there may be a complete absence of subjective symptoms. But in the severe grades of partial heart block and in complete heart block there may be marked weakness and fatigue; and, owing to temporary anemia of the brain, brief attacks of faintness, giddiness, or even temporary loss of consciousness. Less frequently the Stokes-Adams syndrome manifests itself.

Suspicion of a heart block should be aroused when there is a pulse rate of 50 or less. In those cases of mere delayed conduction the diagnosis can be made only by the use of the electrocardiograph or polygraph. If the block is sufficient to produce dropped beats, the condition may be discovered by auscultation of the heart and palpation of the radial arteries. Care must be taken not to confuse a dropped beat with an extra systole. When extra systole is responsible for this unusually long pause, a premature beat can be detected at the cardiac apex, and on auscultation one or two heart sounds will, in the great majority of cases, be audible during the early part of the pause, because the ventricle has contracted, whereas, in the case of partial heart block, there will be absence of the apex thrust and of heart sounds during the pause, because the ventricle has failed to contract. When the ventricular rate suddenly falls to half its former rate, in all probability the case is one of 2:1 heart block. Most cases with a pulse rate of less than 36 have complete dissociation. Also in those cases the rapid pulsations in the jugular vein, more rapid than those in the radial artery, are of aid in making a diagnosis. But very frequently it is necessary to use the electrocardiograph and polygraph to make a differential diagnosis between partial and complete heart block. In complete dissociation of the auricle and ventricle the systolic blood pressure is generally high and during the long pause there is a considerable drop in pressure; the mean blood

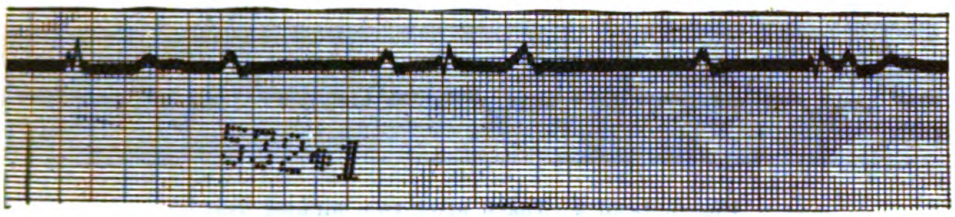

FIG. 1. Lead 1—Strong basal and weak apical lead. Before exercise

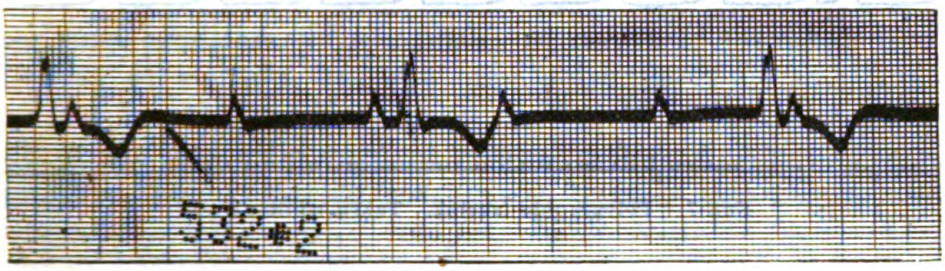

FIG. 2. Lead 2—Strong basal and apical leads. Before exercise

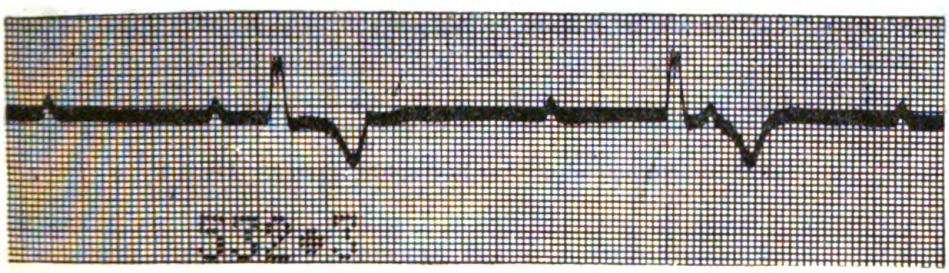

FIG. 3. Lead 3—Weak basal and strong apical lead, Before exercise

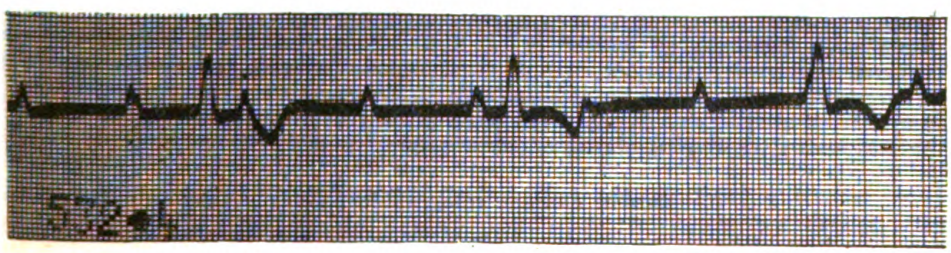

FIG. 4. Lead 2—Taken immediately after exercise

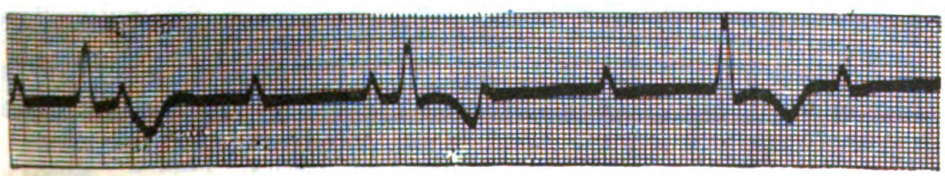

FIG. 5. Lead 2—Taken after two minutes' rest

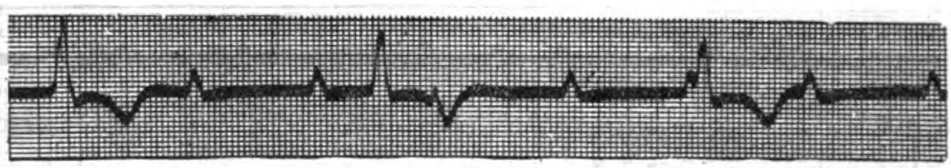

FIG. 6. Lead 2—Taken after two minutes' rest

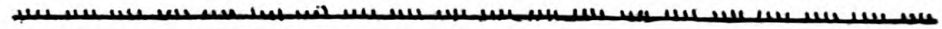

FIG. 7.—Polygraphic tracing. Taken while at rest

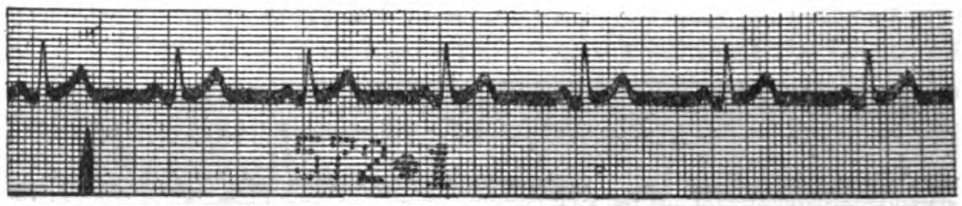

FIG. 8.—Normal electrocardiographic tracing. Lead 1

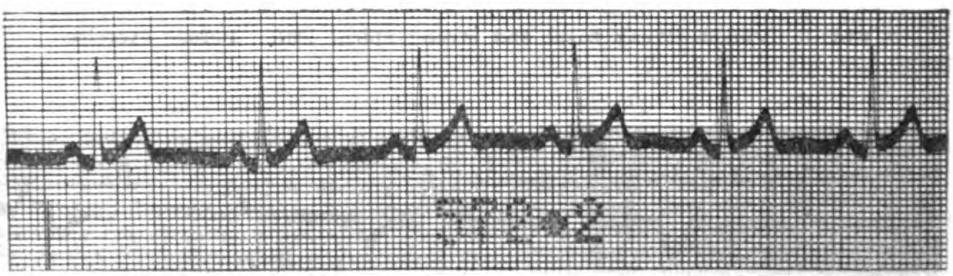

FIG. 9.—Normal electrocardiographic tracing. Lead 2

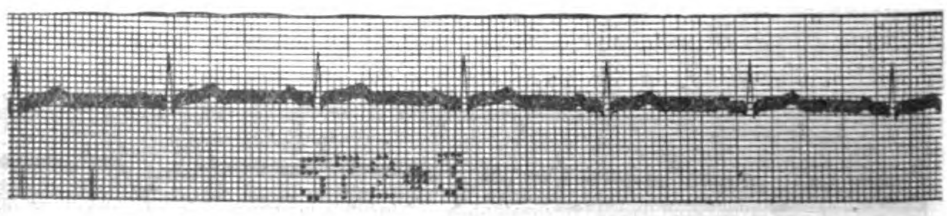

FIG. 10.—Normal electrocardiographic tracing. Lead 3

pressure is low. In our case, however, the blood pressure was quite within normal limits.

The prognosis is good in cases with acute infections as a rule, with the possible exception of diphtheria and rheumatic fever. In the chronic form the outlook is always grave. In some cases due to syphilis gratifying results have been obtained by proper treatment.

Patients with the lower grades of heart block need not be confined to bed, but may be up and around. Patients with the higher grades may attend to some of the accustomed affairs, unless signs of cardiac failure supervene. The treatment of heart block is directed to the underlying condition. Epenephrin, in solution equivalent to one sixty-fifth of a grain, has been used subcutaneously with prompt effect in toxic block. Atropine in one-hundredth grain doses may result in the reestablishment of normal rythm in blocks of milder degree. In cases of partial heart block diagtalis is contraindicated, but in established cases of complete block, without Stokes-Adams syndrome present, it surely is of value if there is a failing cardiac muscle.

The following case illustrates the abnormalities found in heart block:

R. E.—Admitted to the ward walking and in no apparent distress or discomfort on September 19, 1924.

Chief complaint.—Slight aching and numbness in the left side of the neck.

Present illness.—This condition was first noticed by the patient about two years ago. He describes the sensation as one of numbness and likens it to the feeling occurring in the finger which has had its blood supply occluded by a string drawn tightly around it. This comes on only in damp and inclement weather and has never been sufficiently distressing to incapacitate him.

Past history.—He has had excellent health generally. Measles in childhood, malaria in 1914, and influenza in 1918 are the only diseases admitted, except very frequent and severe attacks of tonsillitis from 1910 to 1918. In January, 1918, while playing football, he received a severe kick in the left side of the neck which rendered him unconscious for a few hours. There was an apparent complete recovery in about three weeks.

Cardiorespiratory system: No cough, expectoration, night sweats, swelling of ankles, palpitation, or retrosternal pain. Has noticed that when he smokes excessively there develops an aching pain over the precordia, which disappears when he stops. There is a shortness of breath only when he undergoes some exertion which is more strenuous than that to which he is accustomed. He notices that at times he has greater difficulty in climbing the hill which leads to his home than at other times.

Gastrointestinal system: Is essentially negative. There is some constipation, for which the patient has taken a tablespoonful of MgSO twice weekly for the past 9 or 10 months. There is no nausea, vomiting, or jaundice.

Genitourinary system: Denies any veneral infection by name and symptoms. Voids three to four times daily. No nycturia, dysuria, pyuria, or hematuria; no edema.

Neuro-muscular system: About every two weeks he will develop a frontal headache accompanied by more or less dizziness. During these attacks he will experience transitory fainting spells and will have a tendency to fall unless he can support or steady himself on something. He has learned he can avoid this to a considerable degree by continuous free catharsis.

Bones and joints: Has rheumatism in the left knee in damp weather; no swellings, fractures, deformities, or limitation of movement.

Best weight: Weight 184 pounds in 1914. Dropped down to 174 pounds shortly, and has maintained that weight since.

Mental condition: Patient is alert and answers all questions readily. He is fairly intelligent, and his responses are apparently reliable.

Eyes: Have always been good; no pain, blurring of vision, or inflammation.

Ears: Hearing is good; no pain, discharge, or tinnitis.

Nose: Does not have frequent colds; no epistaxis.

Marital: Married seven years; wife in good health; no pregnancies.

Habits.—Smokes three to four cigarettes daily. Drinks one cup of coffee daily. Denies use of drugs and of alcohol since 1919. States that he never used it to excess. Before entering the service in 1914 he was a leather finisher by occupation. He served in the United States Army until 1919, spending 10 months in Mexico and 9 months in the Philippines. During this time he played for two seasons on his company football squad. Since his discharge he has worked steadily, except January and February of this year. He was compelled to stop working then because of weakness and marked fatigability which, his physician told him, was due to heart beating too slowly. After two months' rest, however, he regained his strength and has felt well ever since. At the present time he is employed cleaning locomotive boilers which, he states, is not hard labor but which necessitates considerable climbing.

Family history.—Is irrelevant.

Physical examination.—The patient is a well-developed, well-nourished male, 67¾ inches in height and weighing 156 pounds. He carries himself well and is alert and responsive. T. P. R. 98–26–18. The skin shows many small areas of pigmentation, especially on the back, and many scars. The mucous membrane is of a normal color and texture. The hair is of normal texture and distribution.

Eyes: Conjunctiva normal; sclera clear; no apparent anaemia. Pupils are even and regular and react normally to light and accomodation. Eye movements are normal. No convergence, nystagmus, ptosis, or edema.

Ears: Hearing is normal; no tophi, discharge, or cyanosis.

Nose: Slight obstruction to breathing on the left side.

Mouth: Lips have normal color; no lesions present. Teeth are good; gums are normal; no blue line or pyorrhea noted. Tongue is slightly coated and protrudes in the midline without tremor. Tonsils are hypertrophied and cryptic. Breath has slightly fetid odor.

Neck: Venuos pulsations show a duplication of the A wave, most marked on the left side. Thyroid is not palpable; no rigidity, retractions, or swellings noted.

Lymphatic glands: The epitrochlears are enlarged to the size of a pea. The inguinals enlarged to the size of a small marble. They are not tender.

Chest: Is well developed and symmetrical. Expansion is equal and good; no retractions or bulgings in the interspaces; fremitus normal on palpation; no masses noted; normal resonance elicited on percussion; no flatness or tympany. Liver dullness noted at seventh rib. Diaphragm expansion equal and good. Breath sounds are normal throughout; no rales elicited.

Heart.—Inspection: The apex beat is rather sharply localized in the sixth interspace, 11 cm. to the left of the midline. P. M. I. is located about 11 cm. medial to it. The apex impulse is regular and forceful. An area of the precordia from the fourth to sixth ribs and from a distance of from 2 to 7 cm. from the midline is seen to heave with each ventricular beat; no precordial fulness noted.

Palpation: No thrill, friction rub, or tenderness noted; an occasional reduplication felt. The ventricular contraction is forceful against the palm of the hand.

Percussion: Left cardiac border mapped out in the third I. S. 6 cm., in the fourth I. S. 8 cm., in the fifth I. S. 10 cm., and in the sixth I. S. 11 cm. to the left of the midline. Right cardiac border mapped out at 2 cm. to the right of the midline.

Auscultation: The sounds are very slow, occurring at the rate of from 24 to 28 per minute. The first sound is accompanied by a reasonably pronounced murmur, which is best heard at the apex and which is transmitted toward the axilla. The second sound has a peculiar loud clicking character, but no adventitious sounds are elicited. An occasional extra systole is heard.

Pulses: Are synchronous and of good volume and tension. Frequency is 28 per minute; 20 hops on each foot increased the rate to 32; after a two minutes rest it slowed to 24 per minute. The radial arteries are not palpable. The blood pressure in the erect posture is 112/62, and in the recumbent position is 110/60. An occasional extra systole is noted.

Abdomen: Is grossly normal; is level, no abnormal masses, tenderness, or spasm noted. Liver, spleen, and kidneys are not palpable.

Rectal: No hemorrhoids or fissures noted.

Genitalia: No discharge or swelling; no hernia. A scar is observed on the dorsum of the penis about 1 cm. proximal to the glans.

Extremities: No edema, bony deformities, or tremor present. Several scars or cuts and burns are seen. Knee jerks are normal; Rhomberg is negative.

Joints: No swellings, redness, tenderness, or deformity noted; patient states that left knee is often painful.

Muscles: No atrophy, hypertrophy, spasm, or paralysis observed.

Laboratory findings.—Blood: R. B. C., 5,090,000; polys., 43 per cent; W. B. C., 7,600; lymps., 43 per cent; Hgb., 95 per cent; L. M. & T., 9 per cent; eosin., 3 per cent; mast cells, 2 per cent; Noguchi and Kolmer, negative; blood chemistry, nonprotein nitrogen (mg. per 100 c. c.), 38; uric acid (mg. per 100 c. c.), 2.9; sugar (mg. per 100 c. c.), 100.

Stool: Negative for ova and parasites.

Sputum: Negative for tubercle bacillus.

Fluoroscopic examination of the heart: The heart is somewhat increased in its transverse diameter. Fluoroscopy shows two independent pulsations. The left ventricle apparently contracts once to every two or three contractions of the auricles. The ventricular beat is more powerful and slower than the usual ventricular beat.

Electrocardiograph: Rate, auricular 60; auricular rhythm, slightly irregular. This irregularity is the type usually seen in complete dissociation. Resistances, lead 1, 2,800 ohms; lead 2, 1,900 ohms; lead 3, 1,800 ohms; string, 1,800 ohms. Ventricular rate, 26 or 27; ventricular rhythm, regular; P. 2 is 3 mm. high, spiked, and 0.12 seconds broad; P. 1 and 3 are upright and normal. There is no relation between P. and the Q. R. S. complex; Q. R. S. 2 and 3 are notched at the top and at the base are 0.16 seconds broad; Q. R. S. 1 is of low amplitude and is the same in duration as the other two leads; T. 1

is upright and small; T. 2 and 3 are large and inverted complexes. In watching the string premature beats were seen. Only one was filmed and it proves to be ventricular in origin. This complex is recorded in lead 3. Its conduction time is 0.14 seconds, and but for the fact that it is inverted it resembles ventricular complexes of leads 2 and 3. After exercise the auricular rate is 78 and the ventricular rate is 28 or 29. After two minutes rest the auricular rate is 65 and the ventricular rate is 27.

Conclusion: Complete heart block.

NOTE.—The increase in ventricular conduction time and the notching of the ventricular complex suggests that the normal paths of conduction are not properly functioning.

Polygraphic tracing: The radial tracing is generally normal. There is a prolongation of the interval; an occasional extrasystole is recorded. The jugular tracing shows an increase in the A waves.

Conclusion: Complete heart block.

In a normal electrocardiographic tracing the complexes follow each other in definite order and are of identical form in the same person. Different individuals, of course, have individual differences in the form of the complex, all being normal for that particular case. These complexes are a graphic representation of the spread excitation wave from its origin in the sino-auricular node to its final distribution by the fibers of Purkinje. It is, therefore, apparent that any abnormality in the place of origin of this stimulus or any variation in its path of conduction and distribution will produce an abnormally appearing complex. In the case of delayed A–V conduction, which is the lowest grade of heart block met with, this variation is manifested simply by a greater P. R. interval than 0.2 second. As the blocking process increases the auricular contraction (P. wave) is not always followed by a ventricular contraction (Q. R. S. complex). And so we have 2:1 or 3:1 block and finally the complete block, of which this case is a splendid example and in which the auricles and ventricles have established an independent rhythm.

ABERRANT PANCREAS OF THE PYLORUS, WITH THE REPORT OF A CASE RESEMBLING A NEOPLASM

By R. M. CHOISSER, Lieutenant, Medical Corps, United States Navy

The occurrence of an accessory pancreas is rather uncommon, but by no means rare. A careful review of the relative literature reveals 81 cases reported occurring in man, 3 in the dog and an occasional one for cats. These latter reports, however, are believed by Mann (1) to be anomalies of another sort and not true aberrant forms.

By a careful study of the embryological development of the pancreas it will be seen that small fragments of the developing viscus

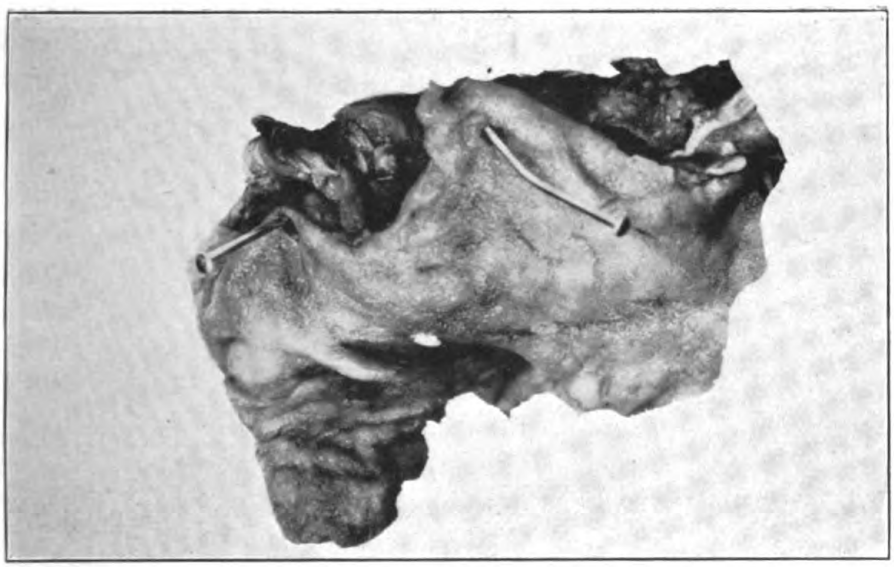

Fig. 1.—Accessory pancreas of the posterior wall of the pylorus projecting into the lumen

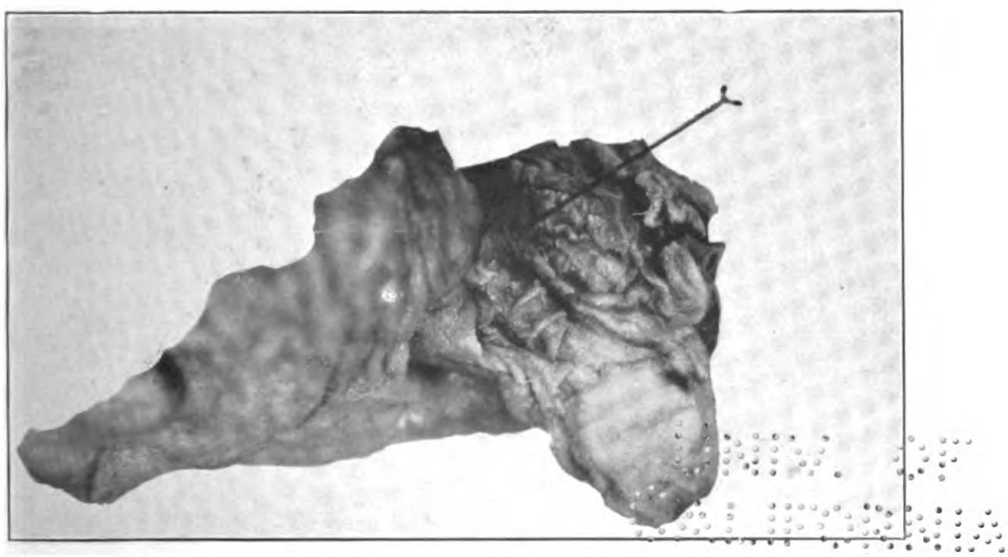

Fig. 2.—Cut surface of accessory pancreas in situ showing small efferent duct leading into the hepatic duct

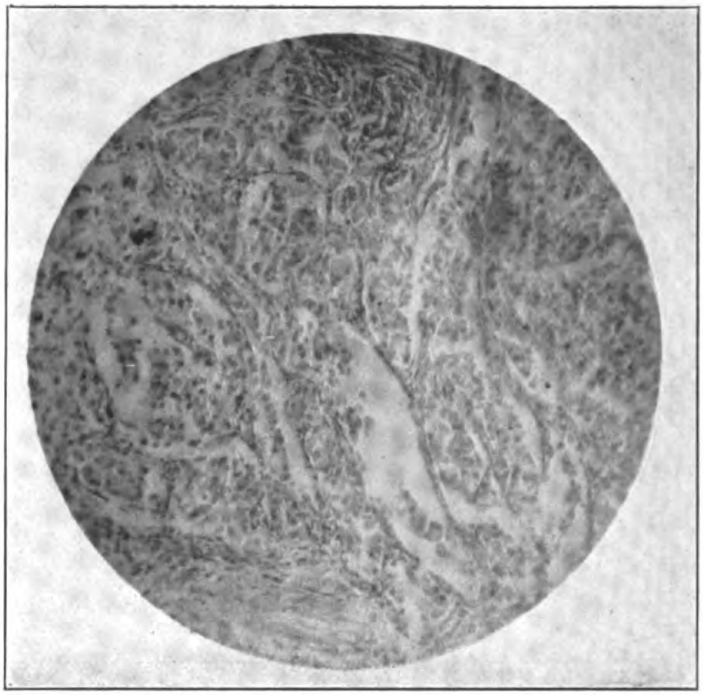

Fig. 3.—Photomicrograph showing pancreatic acini and islet cells.

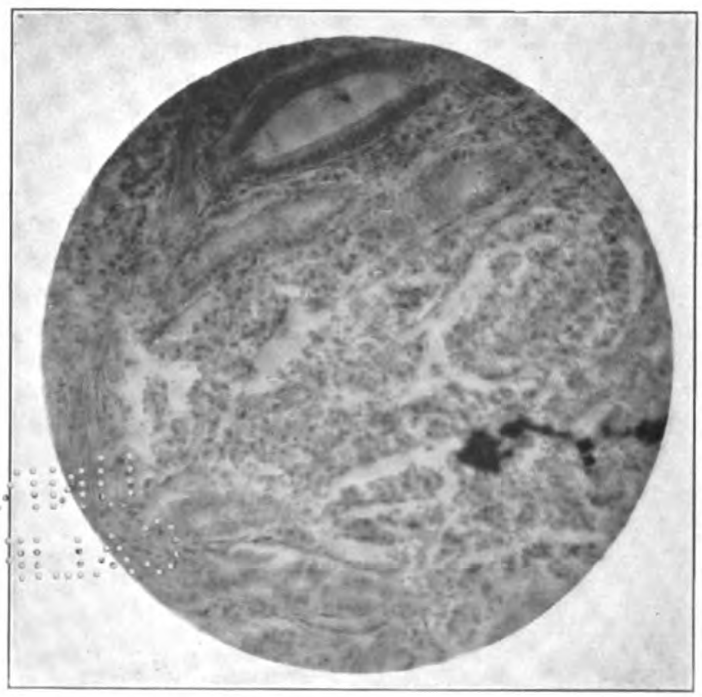

Fig. 4.—Photomicrograph showing acini and section of a duct

may easily be split off from the original anlage and become implanted in a neighboring organ, where they attain independent development. I believe for the above reason that accessory pancreases are not so uncommon as the literature would lead one to believe. The fault lies not so much in the rarity of their occurrence as in the failure of recognition, because the great majority of them are symptomatically unimportant.

Embryology.—The pancreas develops from two anlages, one, posterior, arising from an outpouching of the duodenum and the other, anterior, arising from the common bile duct at its duodenal juncture. These embryonic buds grow rapidly, surround the duodenum, and fuse posteriorly, where they continue to develop in one mass in the dorsal mesentery. After this union the main duct of the anterior bud anastomoses with that of the posterior, and in this way the duct of the anterior anlage with the distal half of the duct of the posterior forms the duct of Wirsung, and the proximal half of the duct of the dorsal anlage forms the duct of Santorini. During this circumrotation and posterior coalescence of the two primitive anlages small masses of cells are believed to break off and either lie dormant or develop slowly in some viscus where they produce independent ducts. These empty into either the gastrointestinal tract directly or into some ramus of the pancreatic or common bile duct.

Etiology.—The above hypothesis regarding their etiology is, however, not generally accepted, for if this were true the masses would be large and always found in the gastrointestinal tract, which, of course, is not the case. The Cohnheim theory of embryonic rests also does not apply, as sections of the masses show in a majority of cases mature differentiated acinic cells and well-developed independent ducts. By special staining methods zymogen granules have been demonstrated in the cytoplasm of these cells, which indicate their activity. Zenker believes these structures originate in early embryonic life by the formation of additional duodenal diverticula which continue to develop singly and are carried along the gastrointestinal tract as it grows longer. This theory may at first seem very reasonable and does account for aberrant masses which occur in the stomach and intestine, but it can not explain their existence in such locations as the spleen, mesentery, and omentum. Warthin believes they arise from a budding of rudimentary pancreatic ducts as they penetrate the intestinal wall and that portions of pancreatic tissue thus formed are snared off and carried by the longitudinal growth of the intestine either upward or downward as the case may be. Weidman accepts Warthin's theory, finding that it applies very well in his own case, in which numerous pancreatic fragments were found in the intestine surrounded by connective tissue.

It is obvious that any theory attempting to explain the etiology of these masses must be entirely speculative, as none of them seems to account for all cases. I am in accord with the theory propounded by Horgan (2), which to me seems most plausible and especially applicable to the various cases reported. He believes that during the primitive development of the pancreas in man the dorsal and ventral anlages are large and out of proportion to the size of the original gut, which is at this time a straight tube. During the rapid growth of these outpouchings, together with their circumrotation and posterior union, the branching buds are thrown in contact with some developing viscus and become engrafted thereon. Later, as the gland pulls away in its growth, the small portions which have become attached are pinched off and remain incorporated in that organ as a graft. As growth continues these masses become fixed by connective tissue and probably begin functioning along with the main pancreas, although anatomically distinct.

Of the 81 cases now on record of aberrant pancreases, 72 were in the stomach and intestine, 9 being found in other locations. Records show 19 in the wall of the stomach, 39 in the duodenum and jejunum, 4 in the wall of the ileum, 6 in diverticula, and 4 in Meckel's diverticulum. One was reported as occurring in the mesenteric fat, one in the great omentum, and one in an umbilical fistula. The most interesting were the remaining six, which occurred in the capsule and hilum of the spleen.

Supernumerary pancreatic glands seldom reach a very large size, the largest one recorded measured 9 cm. in diameter while the smallest was only 0.4 mm. The majority of them seldom exceed 2 cm. They are usually flattened or disk-shaped bodies, but may assume a pyramidal or olive form. Various shapes and sizes may occur, and in some cases numerous small fragments were found beneath the alimentary mucosa.

Histology.—These masses of disconnected pancreases always lie superficial in the musculature or just beneath the mucosa when related to the stomach or intestine. They are firmly fixed by fibrous tissue and may even present a capsule. The histology of the structures themselves varies, depending upon their size and location. The majority of them, however, show some pathological change. They resemble very closely, at first glance, adenomata (3), but upon closer observation definite pancreatic parenchyma can be clearly made out. The smaller bits that occur as multiple fragments usully present only acini, but in most all of the larger single masses definite islets are found. In practically all of the cases one or more ducts lined with normal epithelium were present. This is especially true of the larger forms, which possess both the acinic and islet cells.

The question regarding the secretory powers of these cells is still open for discussion, although the presumptive evidence is highly in favor of their functional activity. They at least possess all of the anatomical characteristics of a normal pancreas, but due to their size alone they could never supplant it.

Surgical considerations.—The surgical significance of aberrant masses of pancreatic tissue is a matter of relative importance. It stands to reason, since they resemble, in the majority of cases, the pancreas histologically, that they are subject to the same pathological conditions such as fat necrosis, inflammatory reactions, degeneration, fibrosis, and neoplastic changes. When they exist beneath the gastrointestinal mucosa, they naturally weaken the walls and predispose to diverticula. Several cases of such are on record which are believed by the observers to be caused by accessory pancreatic glands. They may grow to such a size as to establish a complete obstruction of the bowel or by their weight produce intussusception, as in Benjamin's case (4). Cohen (5) reports the finding of an aberrant pancreas of the pylorus with an associated gastric ulcer which he believes was caused by the irritation of the mass. In only one case have these structures shown a malignant transformation; however, many believe that carcinomata of the stomach and duodenum often originate from these misplaced glands. Ellis (6) refers to his case as an adenoma and thought that he recognized "beginning malignancy." Branhan, however, reports a case of pyloric obstruction with partial pylorectomy, which was diagnosed by Welch "malignant adenoma which originated in misplaced pancreatic tissue (7)." The above instance is the only case in which a definite malignancy has been miscroscopically established.

Regardless of whether or not these masses undergo malignant changes, the fact remains that they not uncommonly produce definite symptoms, which, together with the formation of a tumor mass in the stomach or intestine, may readily be mistaken for a malignant neoplasm. The case reported below is an illustration of such a misinterpretation.

The patient, M. Q., ex-service man, age 57, entered the hospital July 23, 1924, complaining of pain in the epigastrium and loss of weight. He was born in Ireland, but had lived in Washington, D. C., most of his life except when on foreign service with the Army and Marine Corps. He has served in China, Philippine Islands, and in Panama during the Spanish-American War.

Family history.—His father died at age of 65 from unknown cause. Mother died during confinement at age of 30. He has two brothers and two sisters, all of whom are living and well. No evidence of tuberculosis, malignancy, kidney or heart disease in any of his immediate family or relatives.

Past history.—Patient has no knowledge of having had the usual diseases of childhood. He had some fever in 1901 while in the Philippines, but did

not know the cause. In 1914 he had acute arthritis involving all joints and was sick for three months. Since 1901 he has been subject to epileptic attacks about twice a month. He has never had tonsilitis, pneumonia, pleurisy, influenza, typhoid, or dystentery. He has never had a venereal infection and has been in good health most of his life, except for chronic constipation. His average weight is 135 pounds; best, 140 pounds; present, 116 pounds.

Present illness.—About one and one-half years ago he developed a pain in the epigastrium which has gradually become more severe. At the beginning the pain was intermittent, but now is continuous and at times acute. The pain has no relation to the taking of food or alkalies. He feels, however, that it is exaggerated by meat and has not eaten any for the past 10 months. He is not nauseated, does not vomit, and has never noticed blood in his stools. His main complaints are continuous pain in the upper abdomen, loss of strength, and emaciation.

Physical examination.—Patient is poorly developed and nourished. He appears quite ill and complains of severe pain of a gnawing character in the abdomen.

Bony framework.—No gross abnormalities.

Glands.—No general glandular enlargement.

Skin.—Color fair, very lax, indicating considerable loss of weight.

Eyes, nose, ears, and mouth.—Show nothing unusual.

Neck and chest.—That of an emaciated individual.

Lungs.—Normal on percussion and ascultation.

Heart.—Apex impulse felt in fifth interspace 7.5 cm. to left of midline, sounds clear except for slight prolongation of systolic at apex.

Pulse.—Regular in rate and rhythm, equal, well sustained.

Arteries.—Thickened, brachial tortuous and palpable. B. P. 155/80.

Abdomen.—Retracted, tense; tenderness throughout; more marked above and to the right of umbilicus. Liver edge just felt. Spleen and kidneys not palpable.

Genitalia and extremities.—Negative.

Reflexes.—Hypersensitive.

Laboratory findings.—Blood Wassermann, negative. W. B. C., 7,600; R. B. C. 4,800,000; hg., 90 per cent; polys, 68 per cent; blood chemistry normal; urine and spinal fluid, negative; feces, negative for ova and parasites. Slight trace of blood, benzidine.

Fluoroscopic examination.—Duodenal cap filled and smooth. Pylorus not freely movable. No peristalsis at lower end of stomach. Stomach shows no six-hour residue. Conclusion, lesion at pylorus.

Patient transferred to the medical ward and placed on Sippy diet for six weeks. The pain was never completely relieved except by morphia. Transferred to surgical service September 1, 1924. An exploratory operation was performed September 3, 1924, which revealed the pylorus dilated and thickened. A tumor mass the size of an olive protruded into the lumen from the posterior wall. Mesenteric glands enlarged and hard. Diagnosis of carcinoma was made and gastroenterostomy performed. Condition of patient not considered satisfactory for pylorectomy. Wound closed with silkworm gut. Patient reacted poorly to the operation and died three days later. Permission for a partial autopsy only was obtainable; the stomach and a portion of the duodenum were removed through the operative wound and forwarded to the laboratory for study.

Pathologists Report.—Gross description: The specimen consisted of a stomach and 5 cm. of the duodenum attached. An incision 3–5 cm. long was present on the posterior surface of the stomach, the site of a recent gastroenteros-

tomy. The area surrounding the pylorus showed some thickening. Upon opening the stomach a tumor mass 1½ by 2 cm. projected into the pylorus from beneath the mucosa. No areas of ulceration noted in the immediate vicinity. Cut section of the mass showed it to be rather firm in consistency, whitish in appearance, and surrounded by a thin fibrous capsule. Two small bile-stained ducts were noted coming from the base of the mass. These anastomosed and formed one duct, which emptied into one of the hepatic ducts.

Microscopic Diagnosis.—Sections stained with H. and E. show the tumor to consist of pancreatic acini, fibrous tissue, and numerous ducts of various sizes. The individual cells show no pathological changes. In one area a small mass of islet cells was noted. The stroma shows extensive proliferation, and there is an associated hyperplasia of the ducts. The specimen is apparently an accessory pancreas of the pylorus. No evidence of malignancy.

CONCLUSION

1. Aberrant pancreatic glands are occasionaly encountered in the gastrointestinal tract, although rarely in other places.

2. They are usually small, seldom exceeding 4 cm. in diameter, and resemble normal pancreas histologically.

3. They possess independent ducts, but the functional activity of these accessory glands is unsettled.

4. They are subject to the same pathological changes as the pancreas, although they are not prone to malignancy.

5. When encountered in the course of a surgical operation, they are not infrequently mistaken for a neoplasm.

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CLINICAL NOTES

THE PRESENT ATTITUDE REGARDING PERITONEAL DRAINAGE

By C. C. YANQUELL, Lieutenant (Junior Grade), Medical Corps, United States Navy

The question of surgical drainage of the abdominal cavity has been discussed at considerable length during the past decade. For a time the opinions expressed by leading surgeons were quite divergent. Now the literature on the subject reflects a more nearly unanimous agreement along the line of a few general principles as the different series of cases are reported. An interesting feature of the early part of the controversy is the apparently uniform success which was claimed by the advocates of diametrically opposed theories of drainage.

The biological basis of peritoneal drainage was well stated by Horsley in 1920. Going on the premise that simple gravity drainage of septic material from the abdominal cavity is difficult to obtain, he states that the true basis of surgical drainage in any case is the result of the reversal of circulation in the local lymphatics, whereby serum is poured out in the neighborhood of foreign substances. The peritoneum is an enormous lymph space and is able to mobilize the lymph and phagocytes to the point of injury, diluting the toxins and destroying the bacteria. The resistance of the peritoneum to infection is greater than that of most other tissues. Peritoneal drains do very little more than stimulate such an outpouring of lymph and prevent positive pressure in the abdominal cavity.

The peritoneum does not drain in the general acceptance of the term, for drainage materials, when left in the peritoneal cavity for four hours, are completely enmeshed in a dense covering of fibrin and are impervious to the passage of fluids. If, then, the general peritoneal cavity can not be drained, it is useless to drain in diffuse peritonitis with no definite focus. If the focus is known, however, a drain will be of service by isolating the infected area with the adhesions it produces. There is a high mortality through the introduction of drains by means of multiple incisions in diffuse peritonitis as well as by much handling of the viscera.

Wilensky and Berg (1923) propose to determine the need for drainage by a hasty examination of the types of organisms found in the contaminated area. This is at once open to severe criticism,

for the outcome of a peritoneal infection is dependent upon the balance between the power of the individual's resistance and the virulence of the bacteria, something which can not be estimated offhand. The tissue changes in the peritoneum do not cause death, but the toxins do.

Most recent writers agree that the presence of pus in the abdominal cavity is not necessarily an indication for drainage. Churchill (1922) reports a number of such cases which were closed with free turbid fluid in the abdominal cavity and which healed by first intention, with no residual abscess. A raw and bleeding peritoneal surface and the presence of necrotic material calls for drainage. The peritoneum abhors abrasions, and consequently a dry, diffuse peritonitis with a gangrenous appendix requires a drain. Here the toxins have not been diluted sufficiently. With a similar condition and a moderate amount of homogeneous fluid—not blood—it is safe to close without drainage.

Once drainage has been decided upon there is much difference of opinion regarding the manner of carrying it out. Soresi (1920) advocates draining all cases of gangrenous appendices through a stab wound in the flank, using paraffined gauze. Rulison (1919) used soft, fenestrated rubber tubes and removed them daily so as to prevent the formation of fecal fistulas through pressure necrosis. Farr (1921) employs the Gibson-Urikulicz tampon in appendicitis with much pus, tape being used to hold the edges of the incision together and secondary sutures introduced. Payne (1924) says that the cigarette drain is the best type, for it stimulates isolating adhesions most rapidly.

A summary of the literature shows general agreement on the following points:

1. A diffuse peritonitis with no definite focus fares better with no drainage.
2. A bloody exudate, necrotic material or intestines, and the presence of raw or bleeding surfaces demand drainage.
3. When retroperitoneal spaces are opened, drain.
4. Do not irrigate or swab out the peritoneal cavity.
5. A thick, purulent exudate with a foul odor and a dull peritoneal surface, together, call for a drain.
6. The old adage, "When in doubt, don't drain," is again in favor.

With the above rules, the peritoneal cavity will seldom be drained. The emphasis is laid more upon dealing thoroughly with the primary source of infection and carefully removing the secondary deleterious matter with the smallest possible amount of handling of the viscera. The peritoneum can then be closed in the great majority of cases with no drainage, except, possibly, some for the abdominal muscles.

The tendency at present, it will be seen, is for great conservatism in the matter of peritoneal drainage. With statistics showing that the mortality in the drained and the undrained is about the same, the advocates of limited drainage can further claim the following advantages:

1. Shock is diminished.
2. After-treatment is less painful.
3. Fewer fecal fistulas result from ulceration of the bowel with tubes.
4. Adhesions are less likely to form to such an extent as to cause intestinal obstruction.

DERMATITIS EXFOLIATIVA

By E. T. CURE, Lieutenant (Junior Grade), Medical Corps, United States Navy

DEFINITION

A more or less generalized, exceptionally limited, exfoliating, inflammatory disease of acute or subacute type and of various duration, arising primarily as such or supervening upon other chronic scaly affections.

ETIOLOGY

This condition, as it is ordinarily met, is not contagious; but the infantile and epidemic varieties, which are probably separate entities, are doubtless of an infectious nature. The predisposing and etiological factors are as yet somewhat of a mystery. Although clinically similar in their chief external symptoms, there are doubtless several etiological factors to consider, some of which may be accepted as septic and parasitic in origin. The condition often occurs in gouty and rheumatic subjects, and it is also occasionally associated with tuberculosis. In rare cases it has been observed to follow excessive alcoholism. Central and peripheral nerve changes are suggested as being, in rare instances, causative factors. In some cases, however, both preceding and at the time of attack, the patient has been in fair health. The condition is sometimes seen to develop from a preexisting psoriasis or a squamous eczema. Local irritation from drugs such as chrysarobin, arnica, mercury, and iodoform have been known to provoke an outbreak in some instances. The ingestion of drugs such as quinine may be responsible for some of the obscure attacks. The disease is rare and is observed most often in males between the ages of 25 and 60.

PATHOLOGY

The findings are dependent upon the character, severity, and persistence of the disease, varying from a pure hyperemic condition very similar to erythema scarlatinoides to one in which considerable inflammatory and atrophic change occurs. There seems to be a very close relationship between a mild dermatitis exfoliativa and erythema scarlatinoides. In the extreme varieties there is a complete obliteration of the papillæ, with variable atrophy of the interpapillary rete prolongations. The glandular structures partially disappear, and pigment granule deposit is noted in the lower epiderm. There is also sometimes a thickening of the blood-vessel walls in the subpapillary plexus. Myelitis and central inflammatory nerve changes have been recorded in some instances.

SYMPTOMS

As a primary affection the disease may begin insidiously in several scattered areas, most commonly about the axillæ, groins, and other flexures; it spreads rapidly, and with the appearance of new areas soon covers the greater part of the entire body surface. There may, on the other hand, be general involvement at once. The outbreak in many cases is preceded by chills, malaise, and sometimes vomiting and febrile action; these symptoms may or may not continue. The skin is seen to be hyperemic and red, with a slight inflammatory infiltration. This, as a rule, becomes more pronounced later. After several days to a week the true exfoliating feature presents itself, the exfoliation taking place as thin variously sized flakes or scales. The scales are usually of a dirty brownish tinge. The skin underlying them is smooth, red, and shiny. Later it becomes of a yellow cast. The process thus instituted continues, the formation of new scales going hand in hand with the exfoliation of the old. Hyperesthesia of the skin and a feeling of coldness often appear. Itching and burning may be present in all degrees or may be entirely absent. One of the most striking features of the disease is the dryness of the skin. No moisture whatever is excreted by it. If the dermatitis be acute, there is accompanying febrile action with evening exacerbations. In sluggish cases slight temperature depression is noted. After a variable time—several weeks to several months—the process abates, the redness disappears, and exfoliation is less marked. Finally all symptoms disappear and recovery takes place. Such remissions and recurrences may continue indefinitely. Recovery when once established is rarely lasting. In persistent cases the patient's health begins to suffer, and arthritic symptoms and internal complications may arise. The mucous membranes of the conjunctiva, mouth, and bronchi may be involved.

The hair in long continued cases may be lost and the nails become opaque, brittle, striated, and often are shed. Cases arising from psoriasis or eczema, after long repeated attacks, lose their special characteristics and present the typical picture of dermatitis exfoliativa. The primary cases are of variable grades of severity. In the very acute type grave symptoms of a septic character are present, and death may ensue in the course of a few weeks. On the other hand, the disease may persist for a long time or recur often and never present any very alarming symptoms.

There has been one case of exfoliating dermatitis in this hospital:

J. R., Veterans' Bureau patient; age, 31 years; admitted June 25, 1924.

Family history.—Irrelevant.

Past personal history.—Denied any illness of any type up to the present time. He has lost 31 pounds in the past few months and is in poor physical condition.

Present illness.—Patient had no skin disease of any type until about one year before admission. At that time he developed a rash localized in the groins and axilla. The type of this rash is not definitely known. It persisted, however, and spread slowly until it covered the entire body. At the time he was admitted he presented a typical picture. The skin over the entire body was of a bright red color and was very tough, so tough that a needle would hardly puncture it. It was also greatly thickened. Over the entire skin were many thin, dirty-brown scales in various degrees of separation. The palms of the hands and soles of the feet were cracked in places. The penis was greatly swollen. The rash was especially prominent on the flexures. The patient's chief complaint was terrible burning and itching of the skin. He was also extremely irritable and nervous. There was a general glandular enlargement present. His first treatment was a hot sodium bicarbonate bath daily, followed by local applications of ammoniated mercury, 5 per cent. This was continued for a short time, and then Whitfield's ointment was used. Other things used were calamine lotion, 5 per cent, salicylic acid, zinc oxide, etc. All treatment was symptomatic and seemed to have no effect whatever upon his general condition.

Laboratory.—Urine negative except for a faint trace of albumen. Red blood cells, 4,115,000; leucocytes, 16,500; neutrophiles, 51 per cent; lymphocytes, 30 per cent; transitionals, 2 per cent; and eosinophiles, 17 per cent. It is seen here that the eosinophiles are very high. This is very typical of a parasitic infection. The Wasserman was negative. Examination of teeth and tonsils was negative. Blood chemistry examination showed little variance from normal. Probably the most important laboratory finding came from examination of the scales. A mycelium was found that was pronounced epidermophyton. The condition of the patient varied but little. One day he appeared better and the next worse. Each day, however, there was some weakening in his general condition. On July 28, 1924, after being extremely irritable for several days, he became delirious. From then on he sank rapidly, and on July 31, 1924, he died, apparently from toxemia. No autopsy was done. The etiology in this case was doubtful, but the most probable theory is that the man had a primary infection by the epidermiphyton. This condition was not cared for, and dermatitis exfoliativa developed as a secondary condition.

The patient's symptoms while in the hospital were typical of dermatitis exfoliativa. The diagnosis were confirmed by two specialists in this city. There is no treatment that is of much value in this condition. The disease seems to run its course. Most of the things mentioned in the literature were used, but no effect was seen. The death of the patient was due apparently to a toxemia. This toxemia was due no doubt to the destruction of skin tissue, causing an inability to excrete the substance that it ordinarily does.

NONSPECIFIC PROTEIN THERAPY

By J. R. SMITH, Lieutenant (Junior Grade), Medical Corps, United States Navy

Medical men of the early half of the last century previous to the advent of Pasteur and Koch regarded disease and infection with a philosophic attitude. After the work of these illustrious men and with the development of instruments of precision, accurate biological observation took the place of generalization.

Specificity in therapeusis was ushered in by the work of Von Behring, Ehrlich, and G. Bordet. Specificity then became the ruling word of medical men, and any clinical observation that did not fit in with this prevailing thought immediately passed into oblivion.

In 1893 Eugene Frankel reported the treatment of 57 cases of typhoid fever treated with subcutaneous injections of typhoid bacilli. The results were promising. Rumpf, who concluded from his experiments that while soluble toxins might be specific and call forth a specific response on the part of the patient, all bacteria probably contained a common component, nonspecific, against which immunization might conceivably be carried out. His work was followed by numerous men working on the same principle, who used various proteins and serums. These investigations recognized the fever-producing element in the proteins and their leucocytic reaction and appreciated their therapeutic value.

In this short discussion I shall limit myself to the use of milk as a nonspecific therapeutic agent.

The intramuscular injection of milk was introduced by Schmidt and Saxl in 1916 to induce a protein reaction—that is, the typical rise in temperature observed following other agents. Milk offered the advantage that it would be easily available to the profession. The method is very simple.

Ordinary pasteurized or fresh milk is boiled from 5 to 10 minutes and when cooled from 5 to 10 c. c. are injected intragluteally or into other muscles of arm and back. Milk being composed of many and varying elements, efforts have been made to identify those compo-

nents that might be most efficaceous. The bacteria content in particular has been held responsible for the reaction produced by the milk injection. Milk boiled for 10 minutes is always found to be sterile. There seems to be relatively little danger of sensitization or of anaphylactic shock following repeated milk injections. Many thousand injections have been reported and but few cases of shock following repeated injections. Where shock symptons have occurred, it is by no means excluded that part of the injection may not have accidentally reached a vein. Great care should always be exercised that the injections are intramuscular.

The writer's experience with intramuscular milk injections is limited to 15 cases, all of whom had acute epididymitis caused by the gonococcus. Invariably the pain would subside after the first injection. Usually not more than two injections were necessary, and in most instances one proved sufficient to effect a cure. The swelling began to subside within 24 hours after the first injection. The average length of time until the patient was up and about his business was one week.

It is practically impossible to ascertain beforehand, because of varying individual factors, the degree of the reaction that will be produced. It is well to start with a small dose.

Usually the first symptom that comes to the attention of the patient following the injection is a chill or rigor. This usually sets in from three to four hours after an intramuscular injection. The degree of the reaction varies. There may be merely twitching of the leg or arm muscles, or the chill or rigor may be quite general and severe and last from 20 minutes to an hour. Commonly this phase of the reaction begins to wear off in from one-half to three-quarters of an hour after its inception. During this time the patient may complain of actual sensation of chilling and demand extra covering and hot-water bottles; in other cases there is merely the muscular twitching and trembling without sensory disturbances.

The temperature of the patient usually begins to rise with the subsidence of the chill or during its later stages. The rise in temperature varies with the individual patient and may range from 97° to 106° F. The reaction is independent of the dosage to a considerable degree, yet it is noticed that after several doses the reaction became less marked.

Coincident with the temperature reaction, the pulse is invariably increased to some extent, usually from 15 to 30 beats a minute. With the onset of sweating, the peripheral dilatation brings this down to almost preinjection level. As a rule the quality of the pulse is not altered. Cyanosis is uncommon.

After milk injections, there is a slight primary decrease in blood pressure, followed by an increase. Shortly after the subsidence of the

chill, the patient generally sweats profusely. This is of therapeutic value, particularly with arthritis patients.

Headache of short duration, lasting usually not more than two to three hours after the chill, is a common symptom. A polymorphonuclear leucocytosis ranging from 10,000 to 20,000 was observed in every case.

It has been observed that following milk injections Wassermann negative luetic patients have frequently become Wassermann positive.

Protein therapy in proper dosage results in transient but well-marked stimulation without clinically apparent fatigue. If continued for a period of time, the alteration of metabolic processes is manifest in increased general well-being.

It must be realized that this therapy is a stimulation treatment and is of no value, but quite detrimental if the body cells are profoundly fatigued. There are, then, definite contraindications to its use. The patient must be a good clinical risk. It is contraindicated in patients with diabetes and cardiac lesions. It should not be used on alcoholic patients or pregnant women. Great care must be exercised in its administration to asthma patients, and serum sickness must be watched for.

Nonspecific protein therapy should never be a routine measure, but should be strictly an individualized therapy. It is not the purpose of this paper to put forth the merits of nonspecific therapy as a rival of specific measures. Specificity is well grounded in the minds and practice of medical men, and rightly so. However, there is a wide field for the use of this very valuable adjunct to our therapeutic measures, and it is believed that its value in a very wide range of possibilities is not sufficiently appreciated.

ALBUMINURIA IN APPLICANTS FOR ENLISTMENT

By L. B. MARSHALL, Lieutenant, Medical Corps, United States Navy

The new issue of the physical descriptive sheet of the Navy Health Record requires an examination of the urine for albumin and sugar. Heretofore it is probable that such an examination has been done only in suspicious cases. The number of recruits applying daily, the time element, and the lack of proper apparatus are responsible for this.

The routine examination of urine in this office consists of the heat and acetic-acid test after the urine has been filtered if cloudy and made acid if alkaline. This has been used as the final part of the physical examination.

Serum albumin and serum globulin are the two protein substances of most importance that appear in the urine (1). These appear together, usually respond to all ordinary tests for albumin, and have about the same significance.

The causes of albuminuria are many, such as—

(*a*) Accidental albuminuria,
(*b*) Physiologic albuminuria,
(*c*) Changes in the circulation of the kidney,
(*d*) Organic changes in the kidney,

and so on. We are, however, concerned with albuminuria which can not be traced to any organic condition and occurs in young men between the ages of 17 and 21 years who are "well men" so far as we can determine. Yet the speculation is made that nephritis is as common in youth as after 45 years of age, but that it is either a process of extreme chronicity or that it frequently results in spontaneous recovery (2).

In the recruiting office the decision between a pathological and transient albuminuria must be made with the heat and acid test, in the absence of any other signs or symptoms and with a negative history. Simon (3) confidently asserts that a detailed study leads to the conclusion that the presence of albumin in every case is a pathologic phenomenon; but it is manifestly impossible for us to make a detailed study. However, most authorities discuss a physiologic albuminuria and give the following causes:

(*a*) Excessive muscular exercise in those unaccustomed to it.
(*b*) Excessive ingestion of proteins.
(*c*) Prolonged cold baths.
(*d*) Pregnancy and childbirth.

In addition they discuss a cylic albuminuria and an orthostatic albuminuria. Since the above are apparently recognized, I believe there should be another added which may be called, for lack of a better name, "Excitement albuminuria." It has been noted in the examination of the urine of about 3 per cent of the applicants that a distinct cloud, which will not clear up and yet is not heavy enough to be called a heavy cloud or precipitate, appears.

These specimens of urine are taken after the physical examinations are completed and are immediately examined. The men are apparently normal in every other way. All of these applicants have been rejected, temporarily, at least, and are asked to report to the office the following morning, when another specimen is taken and upon examination found negative. Simon (3) also states "That it may be safely asserted that a transitory, intermittent, and cylic albuminuria is not infrequently observed in apparently healthy individuals, but that the facts so far brought

forward do not warrant the assumption that such forms of albuminuria are physioligical.

All recruiting medical officers know that there is a certain element of nervousness associated with the physical examination, and especially so in men who have never been examined before. This is manifested by an accelerated heart beat, which may go up 10 to 15 beats above normal, and an elevation in blood pressure of 10 or more points. These things, of course, should be discounted in the final sizing up of the applicant.

Since the above is true, is it not reasonable to suppose that, with the general nervousness exhibited by these applicants, there might be some slight transient kidney disturbance which would account for the small amount of albumin as shown by tests and which disappears and can not be found upon subsequent examinations?

There is probably little doubt that nearly every one will show albumin at some time or other during life, as in periods of stress, long night watches, all-night rides on train (sitting up), and prolonged physical strain.

The physical health of the Navy is primarily in the hands of the recruiting medical officer, and he should exercise all due care and precaution to weed out the unfit.

In asking these applicants to return the following day or several days later the question of economy must be considered. A great many of our recruits come in from the substations, and it is impracticable to subsist these men in the hope they may clear up. Also we will lose many of them, because they get "cold feet" in the interval and fail to return. Recruits are reasonably hard to get with the present requirements, and we should make every effort to enlist these men.

There is no reason why our physical examinations should not be as stringent as possible, for the Navy should be essentially an organization of well and healthy men, and by weeding out the physically unfit we save the loss of many days of valuable time, as well as accomplish a great monetary saving. I do not believe that the requirements should be lowered, but I do believe some latitude should be given in these cases of an apparently transient albuminuria in men otherwise negative.

Are we to consider these men as undesirable for the service and class them as pathological cases, or shall we, in the absence of all history and symptoms, "take a chance" and enlist them provided the urine is free on subsequent examinations? The albuminuria is found in men who are young and healthy, who have worked hard, who have been athletes, and who have always felt well and fit. They are very desirable material and in the majority of cases will probably never have any trouble.

Still we must look not only to the immediate present but also to the future, for some time later these men may come down with a frank kidney condition, and then, of course, the recruiting medical officer is to blame, for he had noticed a transient albuminuria when the man enlisted.

The question of waivers has been considered but there are several objections:

(*a*) The distance to Washington.
(*b*) The applicant in many cases loses interest and fails to return in spite of the follow-up system.
(*c*) The department does not know the conditions and circumstances and would probably reject in 100 per cent of cases.
(*d*) Economy.

This paper is not intended as a report. In order to obtain a report of value, complete laboratory equipment must be available; the urine must be examined before and after the physical examination as well as before and after exercise; a 24-hour specimen should be taken and examined, and a microscopial examination made. This is impossible for the recruiting medical officer to do.

CONCLUSIONS

(*a*) That there is an albuminuria in a certain percentage of applicants, probably due to the excitement of the physical examination.
(*b*) That desirable young men will be rejected when there is really nothing abnormal present.
(*c*) That such cases as described may be safely enlisted.
(*d*) That the distinction between physiological and pathological albuminuria is not definitely settled.

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THE WEAK FOOT

By W. A. Hornaday, Lieutenant (Junior Grade), Medical Corps, United States Navy

The weak foot, flat foot, or pronated foot to-day, as in past centuries, plays an important rôle in both industrial and military life. In industrial life the importance of this deformity is being recognized to such an extent that many of the large manufacturing plants are making rigid physical examination for this condition and refuse to employ men thus afflicted for positions which require any great

strain on the feet. The military officials have recognized the importance of efficient feet for centuries.

Weak feet are produced not by a flat arch, as is often thought, but by an abnormal position and movement of the tarsal bones. Normally in passive weight bearing the talus rotates downward and inward upon the calcaneus, depressing its anterior and internal border until the movement is checked by the strong ligaments connecting the bones (the deltoid, the calcaneonavicular, and the interosseus). In other words, in the passive attitude the leg has a tendency to slip downward and inward from off the foot. In the weak foot this condition has become a deformity, for the ligaments and muscles have become stretched to such an extent that an actual subluxation really exists. The talus rotates and slips to the inner side of its normal position to an attitude of exaggerated rotation and plantar flexion, making the medial maleolus very prominent. The calcaneus has become depressed, the joint space between it and the os calcis has been increased, resulting in a lowering of the middle border of the foot.

Care must be taken to differentiate between the true flat foot and that of pes planus. The latter is a condition characterized by a painless, flat arch which clinically has no great importance. It is characteristic of certain races. It is due to an inherited laxity of ligaments or to a rachitic condition in which the bones, at a pliable stage in life were able to mold themselves into an efficient position. Here there never was an arch.

To the industrial world, the malingerer; to the Veterans' Bureau, the ex-service man seeking compensation; to the military world, the dissatisfied recruit seeking a medical discharge, make the proper diagnosis of painful feet very important. The following points should be observed:

(1) The patient should be placed under observation to see if he has difficulty in walking when he does not realize that he is being watched.

(2) Shoes should be examined to see if the medial border of the sole and heel are worn more than the lateral border, or if there is a bulging of the shoe over the medial malleolus.

(3) The attitude of the patient in standing and walking. Observe whether there is a turning out of toes with the characteristic heel walk and slouchy gait.

(4) Contour: Place heels and toes together. Normally there is a slight concavity remaining between them. If the feet are weak, this is obliterated or may be replaced by a convexity.

(5) Bearing surface: This may be recorded by taking an impression of the soles of the feet upon carbon paper. Bearing in mind that weak feet are due to strain upon the ligaments and

muscles and not the obliteration of the arch, one realizes that although this is the most popular test used, it is also the most unreliable.

(6) Range of motion: This is one of the first signs of weak feet. Normally the patient should be able to flex the foot from 10° to 20° less than a right angle and to extend it from 40° to 50° beyond the right angle, adduction being about 30°. This is probably one of the most reliable tests and also the earliest positive test. Movement of less than these angles should make one suspicious of painful feet if there is not an evident cause.

Treatment.—Successful treatment for weak feet require a great amount of time and perseverance. If the treatment is not thorough, little hope of improvement can be expected. The course of treatment may be divided into three periods:

(*a*) Establishment of the normal relationship of the tarsal bones and rest.

(*b*) Physical exercises for the development of ligaments and muscles.

(*c*) Selection of proper shoes and strict attention to the proper method of walking.

Establishment of proper relationship of the tarsal bones and rest are best secured by means of plaster casts. Here the position of the foot before applying the cast is very important. The foot should be adducted from 10° to 15° and be at an angle of 90° to the leg. This position is most easily secured by making a strap from a roller bandage about 5 feet long. It is used double, the loop being placed over the ball of the foot and each end held in the hand of the patient. The patient applies traction to the strap with his foot held rigid in an angle of 90° to the leg. The greater tension is applied by the hand opposite to the foot being placed in the cast. Thus the desired adduction of the foot is obtained. Two casts are made from plaster-of-Paris bandages. The first extends from three inches below the the knee posteriorly over the calcaneus and extends over the sole of the foot to the base of the toes. It is reinforced about the ankle and foot. It should be about 4 inches wide. The second bandage is made in a similar way, but is placed on the medial side of the foot, passes over the medial malleolus, thence laterally over the arch over the dorsum of the foot anterior to the ankle to meet the other splint medially. Muslin should be placed next to the skin. A roller bandage is now applied tightly to mold the splint and hold it in place. Sand bags are placed about the foot to hold it rigid while the cast is hardening. The second foot is treated in the same manner. The toes should be watched for the first 24 hours to see that the circulation of the foot is not impaired. After the splints have hardened the patient may be

allowed to arise from the bed to care for himself, but it is better that he be kept in bed the greater part of the time. These casts should be removed after three weeks.

After the casts have been removed, a definite routine of physical exercises should be followed. These include picking up marbles with the toes and placing them in a bucket. This strengthens the muscles of the arches. Walking on the lateral side of the foot—better on adduction—the toes pointing straight ahead, and, most important of all, tiptoe exercises. In this exercise the patient places the feet in the attitude of moderate inward rotation, raises the body on the toes to the extreme limit, the limbs being fully extended at the knees, then sinks slowly, resting the weight on the outer border of the feet in the attitude of marked varus, 20 to 100 times. This stage should be carried on under supervision three times a day for from one to three months, depending upon how the case responds to treatment, and it should be insisted that it be continued after patient is discharged.

The selection of a proper shoe is very important. It should contain sufficient space for the independent movement of the toes. The shape of the sole should correspond to the foot, and it should be twisted inward at the front to prevent adduction of the foot. The medial border of the sole should be thicker than the outer border. The heel should be low, broad, and the medial side extend 1 inch farther anteriorly than the lateral side. These appliances will tend to throw the weight of the body on the lateral border of the foot. In general the use of patent arch supports is to be discouraged, as their tendency to produce pressure atrophy defeats the very purpose for which they are applied.

In discharging the patient it is well to impress upon him—

(1) That unless he continues to favor his feet, the condition will certainly return.

(2) That he should not endeavor to follow a vocation which will throw great strain upon his feet.

(3) That he should not stand in one position for a long time.

(4) The importance of keeping up the physical exercises as outlined.

(5) When walking always to keep his feet parallel, not rotated laterally.

(6) Always to wear a sensible shoe.

NOTES AND COMMENTS

THE DIAGNOSIS OF A HEALTHY HEART

In an address delivered before the Canadian Medical Association June 19, 1924, and published in The Lancet of September 6, 1924, John Parkinson, M. D., F. R. C. P., London, makes a plea for the "Diagnosis of a Healthy Heart." He considers it extremely important that this diagnosis be established whenever possible, both from the standpoint of rational treatment and for the effect it has upon the patient in allaying his fears and restoring his confidence. We should not be afraid to give the diagnosis of a healthy heart because we might be in error as shown by subsequent events. During the war many really healthy men were rejected for service or were invalided out of the service on very slight evidence of cardiac disease, largely because examining physicians were afraid to take a chance and pronounce the heart sound. To-day many of these men are pensioners and will never again consider themselves fit for work. The term "heart disease" should be used only when the condition is such as to threaten the life or restrict the activities of the patient. *Acute rheumatism* remains the chief cause of heart disease in children. It is the real "heart fever." Other infectious diseases should not be looked upon as likely to cause permanent heart damage. Chorea is really rheumatism so far as the heart is concerned. A history of either should make us hesitate to give a diagnosis of a healthy heart. *Syphilis* is the other cause of infection and permanent damage of the heart. When heart diseases develops in middle life, it should always be looked for. If we could be sure that a person in middle age had never had rheumatism or syphilis, we might reasonably presume that he would have a healthy heart. Later *age changes* play an important part.

Nervous strain and *physical strain* have never been proved to damage the heart. The "athletic heart," like the "strained heart," is a myth. Undue exertion has, of course, revealed the presence of an unsuspected cardiac disease. *Toxic influences* have been overstressed. Tonsils, teeth, and intestinal toxemia have all been blamed. They act only by their general debilitating effect. Tobacco, when used in excess, causes an increased pulse rate and raises the blood pressure. It may produce indigestion and induce pain in the

left thoracic region or even in the left arm. This is not true angina and disappears when the patient reduces his smoking. The most constant and pathognomonic symptom of heart disease is *shortness of breath.* Without this, true organic heart disease rarely exists. A symptom often complained of, but not necessarily denoting heart disease, is thoracic *pain.* An aching pain below the left breast is a common complaint of neurasthenics. Angina pectoris is relatively uncommon, while other chest pains are common enough. A headache does not necessarily signify disease of the brain; therefore a chestache need not imply disease of the heart. *Palpitation* usually means nervous instability; *giddiness* is most often aural in origin; *syncope*, or its milder sister, *faintness*, have to do with a temporary change in circulation probably vagal in origin; and *weakness* is characteristic of an exhausted nervous system. The signs of cardiac disease are more reliable than the symptoms. An *enlarged heart* means heart disease, but we must be very careful before we say it is enlarged. No assumption of enlargement can be based upon the visible pulsation being more diffuse than usual and covering a larger area. This is often due to simple tachycardia. An unduly forcible beat is a reliable sign of enlargement. All aids must be made use of in diagnosing enlargement; radioscopy, teleroentgenology, etc., must be added to percussion and palpation. Even unusual *heart sounds* do not necessarily mean heart disease. A duplicated first sound is commonly met with in healthy persons and is sometimes difficult to distinguish from a short presystolic murmur. *Systolic murmurs* are a source of trouble and can not be easily explained. However, a systolic murmur at apex or base, if soft and blowing in character and unaccompanied by signs of enlargement or symptoms of heart disease, can, in the majority of nonrheumatic cases, be ignored.

Bradycardia and *tachycardia* are not necessarily signs of heart trouble. They are "among the mysteries of ordinary clinical practice." Paroxysmal tachyardia is an example of functional heart disease, probably really functional nervous disease. *Extrasystoles* are not in themselves an indication of heart disease, but may occur with it. *Enlargement of the liver, passive congestion of the lungs, edema about the ankles*, are all signs of heart failure. In their absence one would hesitate to diagnose heart disease in a patient who claimed to have suffered from this condition for several years. There are difficulties in the way of making a diagnosis of a healthy heart. Several conditions arising from the heart give slight evidence of their origin. *Angina pectoris* is the most troublesome. Often we must diagnose angina pectoris solely from the patient's statement, and we should hesitate to say that a person who com-

plains of a severe pain in the sternum on exertion—and on exertion only—has a healthy heart. When the syphilitic origin of angina pectoris in middle age is remembered, the importance of diagnosis is evident, as antisyphilitic treatment—mercury and iodides—holds out the only hope for relief. It is not always easy to determine whether or not *valvular disease* exists. A murmur may be present at one examination and absent at the next. Always listen at the apex with the patient standing, then immediately after exercise, with the patient lying on the left side. A definite presystolic murmur means stenosis. Systolic murmurs are often functional, but where there is a rheumatic history usually imply incompetence. Aortic incompetence is revealed by an aortic diastolic murmur even in a person seemingly well and able to indulge in athletic sports. *High blood pressure* must always be borne in mind. The sphygmomanometer may reveal the cause of otherwise obscure symptoms. It is sometimes difficult to determine whether a case is one of a true cardiac disease or a *nervous disease*. Because patients are often ashamed of functional nervous disease, they often attribute symptoms of this to other organs and not infrequently to the heart. The neurasthenic should not be allowed to consider himself a victim of heart disease when, in reality, his condition is a purely nervous one. Having considered the above conditions and excluded them, having found no adequate cause for heart disease, and there being no enlargement, we are in a position to give a diagnosis of a healthy heart "as valuable and beneficent a diagnosis as a doctor could hope to reach. The diagnosis gives the line to treatment. If the heart is healthy, it requires no treatment directed to itself, but if we recognise that some other condition is operating then we shall be well on our way toward treating it."

THE PREVENTION OF CARDIOVASCULAR SYPHILIS

Writing in the American Journal of Syphilis for October, 1924, on the prevention of cardiovascular syphilis, William D. Reid, M. D., of Boston, Mass., calls attention to the frequency and severity of this often-ignored syphilitic condition. Syphilis is just as common in the Navy as it is in civil life, and the probabilities are that, on the whole, it is more thoroughly treated there than elsewhere. However, in the large number of syphilitic patients coming under our care there must be some whose heart and aorta become affected by the disease. It is to assist in preventing this that a brief *résumé* of Doctor Reid's article is considered advisable.

In stating the problem with which the physician is confronted, Doctor Reid says:

"Cardiovaseular syphilis maims and kills those in the prime of life. Syphilis is a common cause of heart disease, and the latter for several years has been first in the list of diseases causing death. In the medical autopsies at the Boston City Hospital during 1921 cardiovascular syphilis was present in 7 per cent. A. R. Lamb, of the Presbyterian Hospital, New York, estimated that 15 to 25 per cent of organic heart disease in a general hospital are syphilitic, and it is present in 50 to 75 per cent of the patients affected by syphilis. Figures obtained in previous studies are in agreement with those of Lamb and of other observers, who find luetic changes in the circulatory organs in 4 to 7 per cent of all autopsies.

"There is evidence that the spirochetes invade the heart muscle and the wall of the aorta during the early secondary period of syphilis. A small number of cases then give sufficient symptoms to cause recognition of the disease. The majority, however, remain latent for years. Sixteen years was the average period between infection and symptoms in the cases treated at the Massachusetts General Hospital.

"As a cause of aortic regurgitation in patients over 20 years of age syphilitic infection far exceeds that of rheumatic origin. Aortic regurgitation and aneurysm are late effects of syphilitic infection and the majority of cases of angina pectoris in patients under 50 years of age are due to syphilis.

"* * * Experience shows that the most skillful treatment of these advanced stages is of but little avail. On the other hand, evidence is rapidly accumulating as to the value of antiluetic therapy if administered before the heart is irreparably damaged. * * *"

In the Navy practically all of the enlisted personnel may be considered as "in the prime of life," and therefore of the class who should be most affected by cardiovascular syphilis. In the Surgeon General's report for 1924 it is shown that heart disease in all its forms caused 17 deaths in the year 1923, while syphilis is credited with but 5, in only 2 of which was a heart condition recorded as a secondary cause of death. It would be interesting to know in how many of the 17 who died as a result of heart disease syphilis was a contributing factor.

Reid states further that, "Of course, the prevention of cardiovascular syphilis is primarily that of syphilis itself." He recognizes, however, that men are only human and consequently syphilis will always be present among us. Granting this, we should strive to diagnose the condition early and institute adequate treatment before the integrity of the circulation is irreparably damaged. By so doing there is evidence that much can be done in the prevention of serious damage to the heart and aorta and untimely death of the patient.

To advance earlier diagnosis, more frequent examination of the circulatory system should be made in all patients known or suspected to be infected by syphilis. Roentgen examination and especially a repetition of this after the lapse of a suitable interval, perhaps several months, is helpful. A Wassermann test should be done on the blood of all doubtful cases. A negative reaction should not be interpreted as ruling out cardiovascular syphilis, provided the diagnosis is otherwise justifiable. There were 7, or 25 per cent, full negative results at the Massachusetts General Hospital in 27 Wassermann tests performed on cases proved shortly after at autopsy to have definite cardiovascular syphilis.

The use of the therapeutic test is advocated by Reid when other evidence of syphilitic involvement is lacking. He also urges very strongly the use of a terminology which will indicate clearly the *cause* of the circulatory disease—e. g., syphilitic aortic regurgitation, syphilitic angina pectoris, etc. "It is only by coming out in the open and using the words 'syphilitic,' 'luetic,' etc., that the facts of the case will sink home. The term 'cardiovascular syphilis' for the primary diagnosis has much in its favor."

In conclusion, Reid offers seven suggestions pertaining to the prevention of cardiovascular syphilis:

"1. The use of a terminology which clearly indicates the syphilitic origin of the disease.

"2. The examination of the circulatory system of all patients in attendance at the various clinics treating syphilis.

"3. Emphasis to the patients of the need of the continuance of treatment and the return for reexamination in the future.

"4. Arrangement with social service department of all hospitals so that no patient on whose record the diagnosis of known or suspected cardiovascular syphilis appears shall be allowed to cease attendance at the clinic without being followed up * * * .

"5. The consideration of all suspects as having the disease until the contrary is proved.

"6. Free advertisement of cardiovascular syphilis—stressing its frequency, its tendency to progression, and the value of treatment if instituted early.

"7. The avoidance of reference to the late stages of the disease without pointing out that these serious conditions could probably have been prevented by diagnosis and treatment at an earlier stage.

"It is believed that the early recognition and efficient treatment of cardiovascular syphilis offer one of the best opportunities that there is in cardiology for the practice of preventive medicine."

POSTOPERATIVE TREATMENT

One of the chief reasons why naval medical officers are prone to do as little major surgery as possible on board ships (other than hospital ships) is the great difficulty in giving the patient the proper preoperative and postoperative treatment. This often leads to the adoption of merely palliative measures rather than radical operation. Occasionally this happens even when the indications are strongly in favor of prompt operative procedure with consequent damage to the patient.

In the Canadian Medical Association Journal of September, 1924, there appears an article by Dr. F. McKelvey Bell, of New York City, upon the subject of postoperative treatment, in which he recalls to mind in a very clear and concise manner some points which might be of assistance to the naval surgeon and methods which can be carried out on board any capital ship of our navy.

Doctor Bell begins his article by stating that "one of the most important elements in postoperative treatment is preoperative treatment." He warns against an overestimation of imaginary complications, as well as an underestimation of real dangers, and urges the surgeon to remain interested in his patient until he has completely recovered. "The path of abdominal and pelvic surgery bristles with potentialities for mischief; shock, acidosis, internal hemorrhage, sepsis, acute dilation of the stomach, pneumonia, etc., are some examples of the earlier complications. Paralytic ileus, mechanical obstruction, thrombophlebitis, pulmonary embolism, etc., are later demons which hover expectantly over our patients and keep the surgeon always on the *qui vive*—Eternal vigilance is the price of safety!"

As stated above, Doctor Bell considers the preoperative preparation of the patient as being of the greatest importance. This may, in certain cases where no emergency exists, be greatly prolonged. In the Navy, of course, patients suffering from anemia, hemophilia, jaundice, diabetes, nephritis, or bronchitis would not be operated upon on board a fighting ship in the absence of grave urgency, but would be transferred to a hospital or hospital ship where their case could be more scientifically studied and where they could receive more thorough preparation for operation. Even on board ship, however, patients suffering from these conditions who are in urgent need of radical surgical treatment may be operated upon with a minimum of risk if certain simples measures are adopted. Diabetes can be readily controlled by insulin, now obtainable almost everywhere; anemia can be improved by blood transfusion, preferably by the direct method, although this method is not always feasible on board ship; hemophilia and jaundice, with their consequent de-

crease in the clotting power of the blood, can be combated by blood transfusion or, where this can not be done, by the injection of horse serum or by calcium feeding. Bell states that "Acute bronchitis can now be readily eliminated in 48 to 72 hours by the intravenous administration of one of the aniline dyes, such as gentian violet or neutral acriflavine." If operation while the patient has acute bronchitis or nasopharyngitis is imperative, general anesthesia is strictly contraindicated.

Linzenmeier's citrated method of blood sedimentation is stated to be valuable in determining whether or not operation is likely to change a latent into an active infection. If not urgent, the operation may be postponed until this danger no longer exists; if operation be urgent, Bell considers that infection may be prevented by adhering rigidly to the following postoperative routine: "Modified Fowler's position, head of bed elevated 18 inches, enteroclysis with 1 per cent sodium bicarbonate solution for the first 24 hours, morphine for pain and as a cardiac stimulant, and the intravenous use of 50 c. c. of 1 per cent solution of neutral acriflavine, *pro injectione* (National). If there has been a probability of soiling of the tissues, neutral acriflavine is given as soon as the operation is finished. If this is impossible for any cause, it is given at least within six hours of the operation. Whenever symptoms of infection without discernible cause occur * * * it is given at once. Almost invariably, no matter what the infection may be, the temperature will drop to normal within 24 hours."

Linzenmeier's method of blood sedimentation is described briefly as follows: "Two-tenths of a cubic centimeter of 5 per cent sodium citrate solution is drawn into a dry hypodermic syringe. Into the same syringe 0.8 c. c. of blood is also quickly drawn and the two are slowly mixed. Coagulation must be prevented and the mixture injected into a 1 c. c. dry sedimentation tube which has markings from above downward, I, II, III, and IV, upon it, indicating 6, 12, 18 and 24 mm. At ordinary room temperature, the speed of sedimentation is noted by observing mark IV. In healthy individuals the time of sedimentation is 12 to 20 hours. In latent infections it is less than 1 hour; in active infections less than 30 minutes. A sedimentation time of over two hours excludes all possibility of active infection, and the patient may safely undergo operation." Bell states that this test is not absolute, but is an added aid in diagnosis and another step toward safer surgery.

As to catharsis before and after operation the author believes that "most of the postoperative distress attributed to so-called 'gas pains' is the result of well-meaning but mischievous catharsis a few hours prior to operation. * * * The patient will be much more comfortable after the operation if the laxative is given 48 hours

before—only one enema being used not less than six hours prior to operation." The point that purging and preoperative starvation are two important causes of acidosis is also brought out. Too early use of cathartics after operations is decried.

Crile is quoted as giving five essentials for minimizing the risk our patients must run. They are as follows:

(*a*) An abundant supply of water by every route, even hypodermoclysis.

(*b*) An abundant supply of oxygen; transfusion if necessary.

(*c*) Maintenance of the semipermeability of the lipoid cell membrane by employment of nitrous-oxid-oxygen analgesia, not anesthesia, plus local anesthesia.

(*d*) Maintenance of an optimum temperature especially by hot packs over exposed viscera and by other necessary means.

(*e*) Preserving the integrity of the brain and liver by minimum trauma, long periods of rest and sleep, and morphine when required.

Other points emphasized in this paper are—

1. Never to operate upon a patient who has been vomiting without first washing out the stomach.

2. To have your patient in a quiet and peaceful frame of mind before operation. If necessary, give bromides.

3. Pillows under the head, knees, and small of the back will help prevent pain in the back muscles following operation.

4. It is more important to have a clear field and free access to the operative area than it is to have a small scar.

5. Trauma is harmful.

6. A painless and efficient form of intraabdominal drainage may be secured by passing a catheter through the drainage tube before it is withdrawn and injecting through this a modification of Beck's bismuth paste containing 5 per cent iodoform. The sinus will drain itself and close quickly.

7. Apparently, operative wounds left exposed to the air heal just as rapidly as and with no more danger of infection than those dressed in the usual manner with gauze.

The author concludes his paper with a statement as to what should be our aim in surgery and a prophecy as to the future which apply as well to naval surgery as to that of civil life:

"No matter what therapeutic or surgical ideals fall by the wayside in our forward march, painless, bloodless, and 'infectionless' surgery must be our aim.

"If during the next two decades we continue to pay the same attention to improvement in preoperative preparation and postoperative care as we have during the last two, the mortality from ordinary abdominal and pelvic surgery will sink into oblivion."

DERMATITIS CAUSED BY PEDICULOIDES VENTRICOSUS

In the British Medical Journal of November 22, 1924, attention is called to a parasitic skin disease sometimes encountered in merchant ships.

"The general manager of the docks recently reported to the medical officer of health of Bristol the occurrence of a highly irritating rash among dock laborers engaged in unloading barley from Morocco, which was attributed to spicules penetrating the skin.

"On visiting the S. S. *River Lagan*, one of the ships concerned, a number of laborers were found to have a closely set but discrete papular rash on the arms, neck, and face. The back, chest, and abdomen were also affected, but to a lesser degree, and here the rash was more widely distributed. In no case were the legs affected. No constitutional effects had ensued among the patients examined.

"The barley was of excellent quality, and to the naked eye very clean. Some of it was screened, and the dust was found on microscopic examination to contain the mite *Pediculoides ventricosus*, which appears to be a parasite of the caterpillar of the cotton moth. In some samples only one or two were discovered after a long search, while in others mites were present in practically every field. For an unknown reason only females were found, no males or gravid females being present in these specimens. A long and careful search is necessary, as many negative samples may be followed by one containing large numbers of mites.

"The disease shows little tendency to spread from one person to another, although the laborer's family may become infected apparently if much dust is carried home on the clothes. The mite does not burrow under the skin and does not persist for long on the human body. Soothing ointments and bathing with warm water containing soda were recommended, and as a prophylactic measure smearing the exposed parts with grease was advised, followed by a bath after work, a procedure which is reported to have produced good results in America.

"Dust blown from the barley will apparently carry the mite and so cause the disease. We are informed that in another port the inhabitants of some cottages quite close to the dock where Moroccan barley was being unloaded developed the disease, although not in contact with the grain. The captain and the mate of the *River Lagan* were affected, although they had not actually handled the barley. This is readily intelligible when one sees the great numbers of mites present in small quantities of the dust.

"Although of little harm beyond the annoyance caused by the itching and the consequent loss of sleep, the disease is of considerable economic importance. Dock laborers require up to 10s. a day extra

pay when handling this grain, and certain port authorities are even considering whether they shall refuse to allow it into their docks at all. The majority of laborers who handle the grain develop the disease, but a few exceptional individuals seem to be immune. The problem is also of some interest owing to the fact that recently there has been a large increase in the amount of barley imported from Morocco."

TESTING MALINGERING OF DEAFNESS

In the Atlantic Medical Journal of November, 1924, Dr. Douglas Macfarlane, of Philadelphia, Pa., outlines various useful tests for disclosing malingering of deafness. "The general attitude of the examiner," says the writer, "should be sympathetic and friendly, rather than domineering and overbearing. The object is not to make the patient report against his will but to lead him to betray himself unwittingly. Making a row with the patient is a decided mistake and gets one nowhere. The examiner has no occasion to dispute with the patient as to what he reports; it is sufficient simply to record the findings. Frequent repetitions of the tests will usually show up a variation in the findings that can be accounted for upon no other grounds than upon an effort to deceive."

The following tests are recommended for use when malingering is suspected.

"*Tuning-fork tests; timing the forks.*—Take a C–256 or C–512 fork and by striking it with a rubber-covered stiff-rod pendulum time the duration of air and bone conduction with the normal ear. A stop watch is essential. Test both ears of the patient and record; repeat the same test, using identical technique; still another time repeat, and compare the three sets of findings.

"*Teal's test.*—Blindfold the patient. Test the air conduction in the ear reported as affected; the hearing will probably be reported as gone. The Weber test is taken by placing the resonating fork on the vertex and asking the patient where it is heard. It is usually, though reluctantly, reported in the 'deaf' ear. Bone conduction is tested over the mastoid, and again the patient will usually report that he can hear the tone in the 'deaf' ear. The final and crucial test is to put a nonvibrating fork or pencil against the mastoid and hold a vibrating fork at the external auditory meatus.

"*The Weber test* can be used to determine malingering. Carry out the usual Weber technique. The patient will say he hears best in his good ear, or he will say that he hears only in his good ear. Stop up his good ear. He should now hear better in his good ear, but he may not report so.

"If there is some degree of true nerve deafness on one side, this test is not perfect, but in this event Kerrison tries the caloric test on the bad ear to see if the labyrinth is normal. The point is that in nerve deafness both the acoustic and vestibular functions are sub-normal or lost.

"*Keiper's voice test.*—The patient is blindfolded and the test is made as the usual voice test is practiced. The examiner approaches from a distance of 20 feet repeating words or numbers. 'He may hear perfectly up to 10 feet and refuse to hear beyond that; then it is best to step back the full 20 feet and ask him in a low voice, 'Do you hear me now?' Very many will respond, 'No, Doctor, I do not.' Put him down as a malingerer. Or, we may begin at 20 feet away and say, 'Raise your hand when you hear a spoken word;' the examiner approaches repeating the same word over and over. The simulator will in due time raise his hand when the examiner gets close to him. This demonstrates him to be a liar, for he heard the command at the full 20 feet.'

"*Barany's noise apparatus.*—This alarm clock makes a rattle that drowns out hearing. The patient is asked to read aloud, and during his reading the noise apparatus is placed in his good ear. If he is deaf he will shout in order to hear himself; if the voice is not raised he is not deaf in the alleged ear.

"*The confusion test.*—Two speaking tubes, one to each ear, two persons reading dissimilarly into the tubes—this is the 'set' of this test. If good hearing exists in both ears, the patient will be unable to repeat what is being read to him.

"*Stethoscope test.*—The examiner stands behind the patient. The ear tips are placed in the patient's ears, the examiner speaks into the diaphragm or bell end and can pinch the rubber tubes at will. The patient's answers will often be erroneous.

"*Plugged stethoscope-tip test.*—The tips of a stethoscope can be removed and one plugged with wax. They can be alternately used in the good and 'bad' ears to trap the patient.

"*Galton whistle test.*—If a low calibration of the Galton whistle be taken, the patient should hear the sound 'around the head' and in the good ear when the whistle is put to the 'deaf' ear. He will usually report no hearing.

"*Erhard's test.*—The normal ear, though stopped, will hear the spoken voice within a few feet. 'If the patient says he can not hear in his good ear after it is stopped, he is again malingering.' Erhard uses a loud watch instead of the spoken voice.

"*Distraction of attention.*—The patient may often be caught by questioning him when he is off his guard or by dropping a coin.

"*Stenger's test.*—Two identical forks are used, say C–256; the patient is blindfolded. Each ear is first tested independently for the hearing by air conduction. The alleged deaf ear is usually reported as not hearing. One fork is now struck and placed at the good ear, and after it has 'died down' somewhat, the second fork is struck a strong blow and put to the 'deaf' ear. If the second fork is heard in the 'deaf' ear, it should drown out the hearing in the good ear. This test is very consistent and reliable.

"*Total deafness.*—Simulated bilateral deafness is rarely seen unless the patient has had some degree of real bilateral deafness, in which case the simulation is as to the amount of deafness. Total deafness is practically never simulated, as the rôle is too difficult to carry out. If there is a true unilateral deafness, the caloric and galvanic tests will show negative findings. In bilateral total deafness the tuning tests will be without signs. (This may also be the case in unilateral nerve deafness, eighth nerve degeneration, both acoustic and vestibular branches being involved. A compensation for the vestibular loss on one side is set up, and in a few weeks' time no vestibular reactions can be obtained by the tuning tests.)

NURSE CORPS

PUBLIC HEALTH AND WELFARE WORK OF THE NAVY

Until recently public health departments have been entirely separate from the hospitals of the community, each one carrying on the work with no interest in what the other was doing. To-day the two are being more closely brought together, and one often supplements the work of the other.

The National Organization of Public Health Nursing has been making recently a census of the public health nurses in the United States and its possessions as of January 1, 1924, to determine to what proportion of the population the services of public health nurses are available. Although the Navy has no public health nurses, termed as such, yet the Navy nurses in the island possessions of Guam, Samoa, and the Virgin Islands train the native women to go out among their own people to do public health work, the work being carried on under the supervision of the medical officers and Navy nurses attached to the hospitals. The success of the work has been dependent on the ability of the nurses to educate the public and to make these primitive people realize that the nurses are working for the welfare of their race and not from any selfish motive.

In Samoa clinics are held at the hospital three times a week and the natives are treated free of charge. All those who need hospital treatment are advised to remain, and the others are sent back to their homes with whatever instructions are needed. The native graduate nurses go out among their people, advise and treat those who have simple ailments, and send the others to the hospital. The nurse has quite a good deal of authority and the people have learned that she must be obeyed to a certain extent or they will be reported to the medical officer, who can take whatever steps are needed for the welfare of the community.

The work at Guam and the Virgin Islands is carried on in about the same manner. In the Virgin Islands a Navy nurse goes out among the people and holds clinic in the villages. One of the most important phases of the work in these island possessions is infant welfare. Statistics show that infant mortality has very much decreased since the medical officers and nurses have been educating the mothers in the care of their babies.

It has been uphill work, for the people are so imbued with old traditions about what to do and what not to do that the first step has been to get their confidence and assure them that one means no harm to their children.

THE WELFARE WORK

By L. A. BENNETT, Chief Nurse, United States Navy

During the World War and the epidemics of influenza following the irregularities of the service brought much additional work to the naval hospitals throughout the country. At Mare Island the hospital personnel was taxed to the utmost with work relating to patients outside the general routine. This condition was met by a nurse being detailed by the commanding officer to handle the daily problems, sift out and settle minor requests, and present those that might be of an official nature to the proper authorities.

From this has grown the need of a regular social service corps of workers which is maintained by the Red Cross with whom the welfare nurse forms the connecting link in matters pertaining to the welfare of the patients. The offices are located in the former Red Cross House, which since war days has been turned over to and maintained by the naval hospital. These buildings are called the "convalescent houses". in many of the stations and provide an attractive and homelike atmosphere for patients and hospital corpsmen when off duty. A splendid library is maintained by the morale division and is in charge of a hospital librarian. Books are distributed to the wards daily. The reading room contains all reading matter of interest and help to the hospital personnel. Leading magazines and newspapers are furnished. Pool tables, games of many kinds, as well as the inevitable Victrola, are provided, and moving pictures given daily at the hospital theater.

The Red Cross provides the services of an occupational therapist, and a workshop is maintained where convalescent patients are taught many kinds of light work as a pastime. Sweaters, scarfs, hand bags, belts, wickerwork, and rug making seem to be the popular diversion. Rooms are set aside for the relatives of patients seriously ill coming from a distance in response to telegrams sent by the hospital authorities, where they are comfortably housed and anxiety relieved by being close at hand in case of need.

Mare Island being the clearing station for the Orient, every transport brings additional work, particularly with the psychopathic and tuberculous patients, the former being cared for in the psychopathic ward under the care of the ward surgeon who is a psychiatrist. The serious cases are usually sent to the State hospital for treatment,

confirmation of diagnosis, and recommendation of disposition. Later they are returned to this hospital for medical discharge or transfer for further treatment to Veterans' Bureau hospitals near their homes.

The tuberculous patients are given temporary care in wards or in tents awaiting transfer to the proper sanitariums for treatment of tuberculosis.

A ward is also set aside for treatment of patients from the naval prison situated here. The work of the welfare nurse is largely with the above class of patients, whose needs are looked after in the daily visits to the wards, and the problems of the bed patients are taken care of, including communication with the families in the form of telegrams or letter writing as the case may be; locating stray baggage; looking up pay accounts; collecting valuables and money to deposit until such time as the patient is able to attend to these details for himself. Through the Red Cross their difficulties pertaining to investigations of Government insurance, allotments, State and national bonus claims, arranging to alleviate home needs through the various Red Cross chapters, etc., are taken care of.

The duties are varied and numerous. Many are home service matters which are taken care of by the field director of the Red Cross; others are of less importance, but aid in the mental comfort of the man.

The work is of interest and help both to the men and to the Navy as a whole. The Navy Department is interested in providing for the morale and well-being of the men who are devoting their lives to the Nation's service. To the men who are disabled and receiving care in the hospitals, all consideration and help possible is provided by the service through the welfare department of the naval hospitals.

A CRUISE TO SOUTH AMERICA

By R. M. Anderson, Chief Nurse, United States Navy

Although many of the incidents which occurred during our cruise to South America are quite vague, I shall try to recall some of the pleasantest days I have spent since being with the Navy Nurse Corps.

On January 4, 1921, we sailed from San Diego, Calif., aboard the U. S. S. *Mercy*. It was a typical California day, clear and cool, and everyone aboard was very enthusiastic, anticipating an ideal trip which it proved to be in every respect. Our ship was second in formation with the Pacific Fleet Train. We had aboard, 14 line officers, 12 medical officers, four nurses, a crew of 250, and about

200 patients. Unfortunately, just a few weeks previous to sailing, there was an epidemic of mumps on the various ships which necessitated isolation of patients; therefore our patients' quota was above the average.

Our commanding officer was so thoughtful of the nurses in every way that it was through his efforts and generosity that our trip was so pleasant and enjoyable.

After leaving San Diego we were traveling at a speed of about 12 knots; the sailing was ideal until we reached the Gulf of Tehauntepec off the coast of Mexico, where we struck quite a heavy wind storm which lasted about 16 hours. While most of the nurses were excellent sailors, I wish I could say so much for all; however this was the only stormy weather we encountered during the entire trip.

Our first stop was to be Panama, but one evening while off the coast of Central America we received a radio that we were to take a patient aboard from one of the sea planes lying on the shores of the bay of Hounda. This, of course, made it necessary for us to return about 55 miles. I shall never forget the beautiful little Bay of Hounda, which we reached next morning about 7 o'clock; the scenery was tropical, with waving palms and green vegetation covering the various islands. The natives came out to our ship in rowboats trying to sell their fruits, but, of course, no one was allowed to buy any of it.

Our patient was found to be very ill and was operated upon for appendicitis immediately, after which we resumed our voyage and reached Panama on January 14, where we transferred our very ill patients to the Ancon Hospital. The entire fleet was assembled in the harbor of Panama, and it was a most impressive sight. We spent five days there, then proceeded southward in formation again with the Pacific Fleet Train. The cruising along the coast of South America was ideal, the days being warm and the water smooth and calm.

A few days after leaving Panama we were to "cross the line," so, of course, everyone was living in fear and trembling, for we did not know what was in store for us, although we knew we were to be initiated into the "Royal Order of the Raging Main." Sunday, January 21, was the eventful day and we were on duty as usual. There had been a good deal of secret activity on the fo'castle for days previous, so just what preparations King Neptune had ordered we knew not. We appealed to our commanding officer for protection, but he told us King Neptune would reign supreme for that day and his orders would be null. About 10 a. m. the royal party assembled on the fo'castle, and we were the first subjects to be brought before his Royal Highness for sentence. I knew we must have looked, yes, and felt, seasick, for the royal doctor was immediately summoned

to determine our physical condition; he pronounced us unfit to take the full degree, and we were given a pill almost the size of an egg, which was a concoction of flour and quinine, after which we were admitted into the Royal Order and given a certificate signed by the royal scribe. We did not realize how fortunate we were till we witnessed the various initiations which followed. I believe, however, we are the first Navy nurses to have been initiated into the Royal Order while "crossing the line" on a United States Navy ship.

The remainder of our cruise was uneventful until we reached Valparaiso, Chile, January 30. The city of Valparaiso is very picturesque, lying in the foothills of the Andes Mountains; the Pacific Fleet was assembled in the harbor, which added to its beauty. This was the first time that the fleet had visited Chile, so one can not conceive of the lasting impression it had made on the Chilean people. The entire city was decorated in our honor, and entertainment of all kinds had been prearranged. After spending one day in Valparaiso, our commanding officer told us we were included in an invitation with the medical officers and the chaplains of the fleet to attend a banquet in Santiago the next day, and a special train would leave Valparaiso at 7 a. m.

We left the ship next morning at 6.30 a. m. and arrived in Santiago at 10.30 a. m. I shall never forget the lavish entertainment that was arranged for us. A committee met us at the depot with automobiles, and we were taken on a sight-seeing tour of the city, after which we were taken to Santa Lucia Hill, where the banquet was to take place. The scenery from Santa Lucia Hill is indescribable. The tables were arranged in a beautiful garden presenting a view of the snow-capped Andes, and such a wonderful banquet we had. I do not remember how many were in our party, but I am sure there must have been at least 100. After dining the remainder of the afternoon was spent driving to various places of interest. We fully intended to return to the ship that night, but found that we were to attend another banquet the next day, also a reception at the American Embassy, so we did not return till two days later. No one could have entertained us more lavishly, and had we remained there for days we could not have accepted all the invitations we received.

When we finally returned to the ship, we found that everyone had been very busy—not caring for patients however—but visitors had been coming aboard by the hundreds. The Chileans had never seen a hospital ship, and they could not see how we could care for patients in that manner, so, of course, were greatly interested in our modern methods. After one of the busiest and most enjoyable weeks we started on our return to the United States, reaching home March 4.

BOOK NOTICES

Publishers submitting books for review are requested to address them as follows:

The Editor,
United States Naval Medical Bulletin,
Bureau of Medicine and Surgery, Navy Department,
Washington, D. C.
(For review.)

MODERN METHODS IN THE DIAGNOSIS AND TREATMENT OF RENAL DISEASE, by *Hugh Maclean*, M. D., D. Sc., professor of medicine, University of London, and director of the medical clinic, St. Thomas's Hospital, honorary consulting physician to the Ministry of Pensions. Second edition. Lea and Febiger, Philadelphia, Pa., 1924.

This little book contains a short practical account of the modern conception of nephritis, some of the newer methods employed in investigating renal function, and their bearing on treatment. The book is designed for the general practitioner; therefore, only those tests have been included which the writer has found to be of practical clinical value and which are easily carried out. The work is based on the author's experience in the examination of thousands of patients for the British Ministry of Pensions and in the London hospitals.

In the discussion of acute nephritis attention is called to the fact that the blood pressure is often raised in this condition as it is in chronic nephritis. This increased blood pressure is almost invariably present when edema is marked, and it quickly returns to normal with the subsidence of the edema.

In the majority of cases of acute nephritis with edema, and in a few cases without edema, there is hydremia—an increase in the fluid portion of the blood—so that the percentage of blood solids is less than normal, as may be seen by hemoglobin estimation. This condition of the blood is often seen in chronic nephritis as well.

In a general way the edema runs a parallel course to the hydremia and blood pressure. The disappearance of edema, hydremia, and high blood pressure is generally preceded and accompanied by an increase in the amount of urine secreted. Broadly speaking, a

record of the daily body weight will indicate the extent to which the body is getting rid of excessive fluid, and it is found that there is usually a very close correspondence between the end of the period of raised blood pressure and the attainment of constant weight.

In all severe cases of acute nephritis the amount of urine secreted during the early stages of the disease is notably diminished. This oliguria is accompanied by retention of urea and other nitrogenous products in the blood. After a short time the usual course is for a marked polyuria to be established as a result of the diuretic action of the retained urea combined with the action of the high blood pressure.

The author emphasizes the importance of ascertaining to what extent the renal functions are interfered with in chronic nephritis. Broadly speaking, there are two chief types of chronic disease, one of which is characterized by a tendency to retain nitrogenous products, while the other is associated with retention of salt. The first is the usual type of chronic renal disease, generally called chronic interstitial nephritis. To avoid confusion with histological findings, however, it is best to consider this type of case purely with reference to the renal function of eliminating nitrogenous waste. Following the French school, the author refers to it as the *azotemic type*.

The other variety of chronic disease is of comparative rare occurrence, and is characterized by a failure on the part of the kidney to excrete salt. This defect is associated with marked edema and ascites, and represents the condition generally referred to as "chronic parenchymatous nephritis." Since its chief characteristic is an accumulation of fluid in the body, the author refers to it as the *hydremic type*.

This classification is entirely based on certain findings when the patients are examined by the chemical tests. Its conception is exceedingly simple, and it furnishes a useful basis from a clinical standpoint.

The author calls attention to the fallacy of attaching importance to the presence of albumin and casts in the urine. Albuminuria is by no means a rare condition and is often found in the absence of renal disease. Even when accompanied by casts, there is no proof that the patient is suffering from defective kidneys. On the other hand advanced renal disease may be present without albuminuria. Even in patients who formerly suffered from acute nephritis, the persistence of protein in the urine is no indication that the disease is progressive, for there are undoubtedly cases where marked albuminuria is found many years after the initial attack, yet the patient enjoys perfect health, and no deficiency of the kidneys is indicated by the usual tests for renal inefficiency.

Of all renal tests the most important in acute or chronic conditions in which the renal functions are grossly interfered with is the estimation of the retained nitrogenous bodies in the blood—i. e., urea, uric acid, creatinin and the purin bodies. The author believes that for practical purposes sufficient information can be derived from the estimation of the urea present, and the rapidity and ease with which this procedure can be carried out renders it of great value in renal work. The details of the method of estimating blood urea and nonprotein nitrogen are given.

Though blood urea estimation gives valuable information in the more or less advanced grades of nephritis, there remains a large number of cases in which the condition has not developed to an extreme degree, but in which the kidneys, though efficient enough to prevent an accumulation of urea in the blood, may yet be gravely involved. In these cases the author has found the urea concentration test and the diastatic test most helpful.

The urea concentration test is carried out as follows: The patient is asked to empty the bladder, and immediately afterwards he receives by mouth 15 grams of urea dissolved in 100 c. c. of water. The bladder is emptied one hour and two hours after the urea has been given and the specimen of urine examined for urea content. If either specimen gives a percentage above 2, the kidneys are held to be fairly efficient; the higher the concentration the more effective is the renal function.

The diastatic test depends on the presence of diastase (the ferment which changes starch into sugar) in the urine. Normally blood contains a definite amount of diastase, and when the kidneys are efficient a fairly constant amount is excreted daily in the urine. When the kidneys are defective, the amount is lower, the total quantity eliminated depending on the degree of deficient renal action. The diastatic activity of any specimen of urine is estimated in terms of the amount of starch which a definite volume of urine will change in a given time, the disappearance of the starch being indicated by failure of the mixture of starch and urine to give a blue color with iodine. The details for carrying out this test are given.

A high diastatic value is, in the majority of cases, an indication of efficient renal action. The author warns the reader, however, that the test should never be relied upon alone, for occasionally one sees patients in whom the kidneys are markedly involved and yet the diastatic test is normal or above normal. On the whole this test gives good results, especially with a 24-hour sample of urine.

In addition to the foregoing, the author discusses Ambard's coefficient of urea excretion, the various dye tests, and the urea concentration factor which is obtained by comparing the concentration

in the blood at a given time with that in the urine secreted over a short period. Normal kidneys are capable of concentrating urea 70 times or more its concentration in the blood. The figure may be low in nephritic cases, and when it gets below 10 the condition is grave.

The author suggests the following scheme for the examination of a patient for renal efficiency.

1. Examination of urine for albumin and casts.
2. Estimation of blood urea or nonprotein nitrogen.
3. Urea concentration factor.
4. Urea concentration test.
5. Diastatic test.
6. Presence or absence of edema.
7. Apex beat position and nature of cardiac sounds.
8. Blood pressure.
9. Condition of arteries.
10. General condition of patient.

The volume closes with some observations on the dietetic treatment of nephritis, in which the author sounds a warning against the use of a low protein diet for long periods of time.

A Magician Among the Spirits, by *Harry Houdini*. Harper and Brothers, New York, 1924

From long before the days when King Saul visited the witch of Endor down to the present hour there have always been multitudes interested in those who "peep and mutter" and claim to have intercourse with "familiar spirits." We no longer call such people witches or wizards, but mediums, using a name doubtless first adopted by one of the fraternity, since it carries implicitly the assumption that these individuals are but instrumentalities or agents through whom other invisible personalities or spirits act. Nor do we speak to-day of their familiar spirits, but of their controls, using again a word of favorable implication to the medium and of uncertain gender, since it denotes "Alfred" or "Katie" or any one of the numerous alleged spirits who use human beings as mouthpieces.

The literature dealing pro and con with the possibility of human contact with the invisible world, whether with disembodied spirits of those who have gone before or with spirits that have never lived on this earth in bodies of flesh and blood, fills many volumes and is dated in many centuries. Interest in the subject of spiritualism in modern times, however, goes back less than a century to the year 1848, when strange events began to occur in the household of a New England farmer, John D. Fox, as we are reminded by the master magician, Harry Houdini, in his recent book, "A Magician

Among the Spirits" (Harpers, 1924). Among those who have written on the subject, he is unique in his knowledge of magic, which has always been bracketed with occultism in the mind of scientist as well as ordinary layman. Yet he is very sympathetic toward the search for whatever truth may be found in the claims of spiritualists. Consequently, his book is especially valuable to anyone who wishes to know facts regarding the sweeping claims made by mediums and the host of avowed spiritualists.

It is perhaps not generally known that Houdini, now a man of 50, is the son of a clergyman, the Rev. Mayer Samuel Weiss. His career as an entertainer began when he was only 8 years old, and his ability in this work has brought him to a foremost place among the world's mystifiers. He has been a tireless delver into the realms of magic and may often be seen in the Congressional Library when he is playing in Washington. He has collected a library on magic and allied subjects which is second to no collection in the world, either private or public, and has bequeathed this to the Congressional Library upon his death. His dramatic library is the fifth largest in the world. But he has not only studied the mysterious; he has also experimented, until to-day there is no magician—using this word simply to denote the professional mystifier—who can so enthrall his audience as can Houdini. He is so successful in this that spiritualists have sometimes claimed that he obtained many of his effects through supernatural aid. He quotes in his book (p. 211) from "Spirit Intercourse," by J. Hewat McKenzie, president of the British College of Psychic Science, "Houdini, called the 'Handcuff King,' who has so ably demonstrated his powers upon public-hall platforms, is enabled by psychic power (though this he does not advertise) to open lock, handcuff, or bolt that is submitted to him * * *. This ability to unbolt locked doors is undoubtedly due to his mediumistic powers and not to any normal mechanical operation on the lock * * *. At times his body has been dematerialized and withdrawn * * *."

As against this unsought tribute, Houdini says: "I accomplish my purpose purely by physical and not psychical means * * *. My methods are perfectly natural, resting on natural laws of physics * * *. I do not materialize or dematerialize anything, I simply control and manipulate material things in a manner perfectly well understood by myself and thoroughly accountable for and equally understandable (if not duplicable) by any person to whom I may elect to divulge my secrets. But I hope to carry these secrets to the grave, as they are of no material benefit to mankind, and if they should be used by dishonest persons they might become a serious detriment."

As an evidence of Houdini's intention to guard his secrets, it might be noted that he never used anyone except his wife in carrying out his greatest acts of mystery. His professional standing is vouched for by the fact that he is president both of the Society of American Magicians and of the Magicians' Club of London.

Houdini's interest in spiritualism is not a mere whim. He tells us in the introduction to his book: "From my early career as a mystical entertainer I have been interested in spiritualism as belonging to the category of mysticism, and as a side line to my own phase of mystery shows I have associated myself with mediums, joining the rank and file, and held seances as an independent medium to fathom the truth of it all." He states that for a time he was content to allow his clients to believe his mysterious results to be the outcome of supernatural powers or agencies. He came at length to see the harmful results of such deception, and after the death of his mother, to whom he was more than ordinarily attached, he assures his readers, "I, too, would have parted gladly with a large share of my earthly possessions for the solace of one word from my beloved departed." In Chapter IX, in which he discusses his relations with Sir Arthur Conan Doyle, he describes a seance at which Lady Doyle professed to bring him such a message. "I was *willing* to believe, even *wanted* to believe. It was weird to me, and with a beating heart I waited, hoping that I might feel once more the presence of my beloved mother * * *. My mother meant my life; her happiness was synonymous with my peace of mind. For that reason, if for no other, I wanted to give my very deepest attention to what was going on. It meant to me an easing of all pain that I had in my heart. I especially wanted to speak to my mother, because that day, June 17, 1922, was her birthday." He describes the action of Lady Doyle as she was "seized by a spirit," and the subsequent written message given through her hands, purporting to come from Houdini's mother. But, as Houdini tells us—

"I sat serene through it all, hoping and wishing that I might feel my mother's presence. There wasn't even a semblance of it. The letter * * * purported to have come from my mother, I can not, as much as I desire, accept as having been written or inspired by the soul or spirit of my sweet mother."

In a letter to Sir Arthur, who was quite disappointed and hurt that Houdini did not accept this seance as positive proof of the claim of spiritualism, the magician, under date of December 15, 1922, writes:

"I know that you are honorable and sincere and think I owe you an explanation regarding the letter I received through the hands of Lady Doyle. I was heartily in accord and sympathy at that seance,

but the letter was written entirely in English, and my sainted mother could not read, write, or speak the English language * * *. I know you treat this as a religion, but personally I can not do so, for up to the present time I have never seen or heard anything that could convert me."

It may be that Sir Arthur is not aware, unless he has read this book, that Houdini's wife told him (p. 151) as Doyle asked him to come to the hotel for the seance (Hotel Ambassador, Atlantic City) that the evening before she had gone into detail with Lady Doyle about Houdini's great love for his mother and had related many intimate family matters. All this information was given to Houdini by his wife by means of a secret code while carrying on what appeared to be an ordinary conversation in the presence of Sir Arthur.

In view of his knowledge of magic and of his warm sympathy with efforts to prove the truth of spiritualism, if there be any truth, Houdini becomes a most valuable investigator in the realm of the occult, and particularly in the matter of spiritualism, which so many would have us accept now as a new religion, or at least as a tenet of religious belief. He leaves no doubt as to his conclusions after years of investigation. "I have never," he tells us (p. 165) "on any occasion in all the seances I have attended seen anything which would lead me to credit a mediumistic performance with supernatural aid, nor have I ever seen anything which has convinced me that it is possible to communicate with those who have passed out of this life." He does not claim that every effect produced in seances may be easily understood. "Were I at a seance and not able to explain what transpired, it would not necessarily be an acknowledgment that I believed it to be genuine spiritualism. The fact that I have mystified many does not signify that what I have done, though unexplainable to them, was done by the help of spirits" (p. 247).

Recognizing the difficulty of observing all the attendant phenomena at such sittings, Houdini states that were he challenged to duplicate any particular phase as presented by a medium he would demand that he see not less than three demonstrations.

"At the first, not wishing to accept anyone's word as to *what happened*, I should want to see the manifestation so that there would be no surprise attack on my mind afterwards. At the second sitting I would be prepared to watch what I had seen at the first sitting, and the third time I would try to completely analyze for duplication. If there were no fraud, then there could be no objection to the demonstrations" (p. 248).

Houdini has no patience with the magician who claims that he can duplicate the experiments of any medium. Often the effects produced by mediums are due to some accidental circumstance, are

done on the spur of the moment, and could never be duplicated even by themselves. But this does not prove supernatural agency at work, for magicians may deceive other magicians and perform tricks which can not be explained by their confreres. He mentions a notable case in which life-size heads of animals became possessed of lifelike movement while in a state of suspension without visible means of support. This trick was accomplished by Dr. Samuel C. Hooker in the presence of a dozen or more expert professional magicians, no one of whom could offer a satisfactory solution. "The simple fact that a thing looks mysterious to one does not signify anything beyond the necessity of analytic investigation for a fuller understanding" (p. 247).

Such are the conclusions of a man who has given his life to the study and the production of mysteries for the entertainment of the public. We may not believe that such a man is as capable of investigating spiritualistic phenomena, as are scientific men of the reputation of Sir Oliver Lodge. Certainly his book is couched in language much less technical than most books on spiritualism. But anyone who has watched even a second-rate magician at work must admit that unless an investigator has expert knowledge of the tricks used in that profession he is incapable of fathoming any possible fraud on the part of mediums, who usually work in specially prepared cabinets, dimly lighted or totally dark. For this reason is not an expert magician exactly the person to conduct such an investigation of mediums who claim to possess supernatural powers? Certainly such investigators are feared by the mediums, for usually a magician is barred from committees of investigation, or when not barred the medium fails to produce the effects, claiming that this is due to the "atmosphere of incredulity" of the investigator.

The average person after reading Houdini's book is much more likely to attribute this failure to the impossibility of trickery under the sharp eyes of the magician, for in the various chapters Houdini considers such famous mediums as the Fox Sisters, the Davenport Brothers, D. D. Home, Eusapia Palladino, Ann O' Delia DissDebar, and Doctor Slade, in some cases proving by their own confessions that they produced their effects without any supernatural aid, in others giving their court records, and in others explaining how their particular phenomena were or might have been produced.

He also devotes a chapter to the discussion of ectoplasm, of which we hear so much in modern spiritualism. He was one of the committee appointed by the Society for Psychical Research to investigate Mme. Bisson and Mlle. Eva. The latter was always stripped and searched by lady members of the committee and reentered the seance room dressed in tights. She was then put into a mesmeric sleep by Mme. Bisson, and after about three hours she would bring

forth the alleged ectoplasm. At one seance a black veil was sewed to the tights, completely covering Eva's head, so that it would be impossible for her to get anything from her hands or from the neck of her tights to her mouth. On this occasion she produced the "ectoplasm," which Houdini states, "was a heavy froth, * * * adhering to her veil on the inside. She produced a white plaster and eventually managed to juggle it over her eye. There was a face in it which looked to me like a colored cartoon and seemed to have been unrolled. The last thing she produced that evening was a substance which she said she felt in her mouth, and asked permission to use her hands to show. This was granted, and she took a load from her mouth, behind the veil which was wet and looked soaked. It appeared to be inflated rubber. No one saw a face painted on it. Presently it seemed to disappear. They (the others present) said it 'vanished suddenly,' but my years of experience in producing the Hindoo needle trick convinced me that she 'sleight-of-handed' it into her mouth while pretending to have it between her fingers. I know positively that the move she made is almost identical with the manner in which I manipulate my experiment" (p. 170). The scientists at the Sorbonne stated that at 15 seances with Mlle. Eva there was nothing beyond the simple act of regurgitation in this production of ectoplasm. Houdini believes that all mediums claiming to be able to produce ectoplasm—including Stamislawa, Kluski, Stamislaski, Cuzek, Goligher, Nielsen, Seibert, and Willy Sch—will soon be authentically classed as questionable. His concluding remarks apropos ectoplasm are worth quoting. "Up to the present day nothing has crossed my path to make me think that the Great Almighty will allow emanations from the human body of such horrible, revolting, viscous substances as Baron von Schrenk Notzig claims—hideous shapes which, like genii from the bronze bottle, ring bells, move handkerchiefs, wabble tables, and do other flap-doodle stunts" (p. 179).

His conclusions about "spirit photography" are no more flattering than those just quoted regarding ectoplasm. After examining the phenomena personally and through the reports of many committees of investigators, Houdini is convinced that all such photographs are simply double exposures. "With spirit photography, as with all other so-called psychic marvels, there never has been nor is now any proof of genuineness beyond the claim made by the medium. In each and every case it is a simple question of veracity, and when the most sincere believers in spiritualism unhesitatingly admit, as they do, that all mediums at times resort to fraud and lying, what dependence can possibly be placed in any statement they make? There can be no better evidence of rottenness in the whole structure than the fact that for upwards of 40 years

there have been standing offers of money in amounts ranging from $500 to $5,000 for a single case of so-called phenomena which could be proven actually psychic. Knowing the character of mediums as I do, I claim if proof were possible there is not a single medium, including spirit photographers, who would not have jumped at the chance to win such a prize. If there are any such who are operating honestly, let them come forward with proof and take the prize" (pp. 136–137).

To anyone who wishes a review of modern spiritualistic claims and phenomena, Houdini has done a service in writing this book. His unequivocal disclaimer of anything "spiritual" about the work of mediums will carry weight with those who recognize the value of such a mind as his, trained in magic, when it comes to the investigation of the occult. That he will convince anyone converted to spiritualism is doubtful, for, as he points out repeatedly, the deluded followers of mediums have time and again confessed their belief in the very mediums who have admitted trickery when cornered in court or by investigations. Such people will probably concur with Doctor McKenzie, who says that Houdini himself is a medium, but won't admit it. To such minds no proof of their delusion carries weight; but by all others "A Magician Among the Spirits" will be counted a sane and convincing refutation of the claims of modern spiritualists.

THE PHYSIOLOGY OF EXERCISE, by *James H. McCurdy, A. M., M. D., M. P. E., director of the physical education course in the International Young Men's Christian Association College, Springfield, Mass.* Lea and Febiger, Philadelphia, Pa., 1924.

The effect of athletic sports on health and longevity has been the subject of dispute from time to time, and much erroneous information on this subject has appeared in magazines dealing with physical culture. In this book will be found a discussion of the best types of exercise suited to various individuals, the right methods of procedure, and much data upon the results of the different types of exercise upon the organic and neuromuscular systems.

In the first seven chapters the author discusses certain general introductory material giving the essential setting of the physiology of exercise in a physical education program and the effects of general elementary types of exercise on the various organs of the body. The remainder of the book deals with the effect of complicated activities, such as gymnastics, football, basket ball, track athletics, Marathon running, rowing, swimming, aviation, and mountain climbing. There is also a discussion of the various physical efficiency tests in use and the physiology of "training," in which

fatigue and staleness, longevity of athletes, muscular soreness and stiffness, breathlessness and second wind, diet, breaking training, and the effects of training are considered.

El Problema Del Cancer, por *William Seaman Bainbridge, A. M., Sc. D., M. D., C. M., LL. D., catedrático de patologia quirúrgica del New York Polyclinic Medical School and Cancer Hospital, Traducción, anotada de la tercera edición inglesa, corregida y ampliada por el autor, de los doctores José Calico, ex-assistant de la Charité, de Berlin, y Lorenzo G. Tornel, Profesor A. de la Clinica Quirúrgica de la Facultad de Medicina de Barcelona, profesor de Cirugía de la escuela de enfermeras de la Cruz Roja: Apéndice, La Terapéutica física de las neoplasias malignas por el doctor Vincent Carulla Riera, Jefe del Servicio de Terapéutica Física de la Facultad de Medicina de Barcelona.* Editorial Cervantes, Barcelona, 1924.

In the issue of the Bulletin for November, 1922, there appeared a notice of the French edition of "The Cancer Problem," by Dr. William Seaman Bainbridge, which is published in this country by the Macmillan Co., of New York. A Spanish translation of this book has recently come from the press of El Editorial Cervantes, of Barcelona, which makes this valuable treatise on cancer available to the medical profession of the Spanish-speaking countries.

THE DIVISION OF PREVENTIVE MEDICINE

Lieut. Commander J. R. PHELPS, Medical Corps, United States Navy, in charge

Notes on Preventive Medicine for Medical Officers, United States Navy

THE WORK OF BOARDS OF REVIEW AT NAVAL TRAINING STATIONS DURING NOVEMBER, 1924

The work of boards of review at naval training stations will be watched with interest in view of the great benefit which may be expected to accrue to the health and efficiency of the Navy.

The vital statistics of the Navy will undoubtedly begin soon to reflect the good results of promptly eliminating from the service recruits having physical or psychological defects which, although apparently of minor importance at the time of enlistment, nevertheless spell trouble to the experienced medical officer who has acquired his knowledge of blue-jacket psychology during periods of hard work in the Fleet alternating with liberty periods.

Vital statistics are not always easily visualized, and as a rule careful analysis is necessary before the story the figures can tell may be appreciated. But apart from the measuring value of statistics it will not be difficult for one who has frequently had his temper ruffled on board ship by "sick-bay hounds" of little or no use to the ship who exasperatingly turn up again and again, not really disabled, not really unfit to do the work that is required of them, but far from being healthy human beings if mental health is reckoned as an essential feature of health. From the philosophical viewpoint they must be regarded as pathetic figures hovering in the borderland between health and disease, unable to adapt themselves to the conditions under which they must live and work, now advancing a flat foot as a plausible means of escape from bewildering difficulties, again returning, not consciously aware perhaps that the unconscious mind has fastened upon a varicocele, an old injury to a joint, a strain of the back, or what not as a possible outlet. It is probable that they suffer more than the medical officer and hospital corpsmen who must deal with them, but that is saying a good deal. Who has not seen a man of this sort who has been turned away again and again with well-intentioned advice, let us hope, come down some

morning with a definite condition, acute tonsilitis, for example. Did he not bear himself with obvious pride because at last he could "deliver the goods" and present symptoms that would unquestionably gain him admittance to the sick list? True it probably continued to be a mystery to him why he had previously failed to make the list, although suffering more.

Many men psychologically defective have physical defects which serve to confuse the picture and make judgment difficult. If the physical defect complained of is ill defined or of minor degree, it is problematical whether the medical officer of the ship will accomplish what to him appears to be the only logical disposition of the case—elimination from the service—by transfer to hospital. On the other hand, the mental disorder is often too ill defined to justify the medical officer in taking up the case under a mental-disease title. From a practical viewpoint the medical officer, the hospital corpsmen, the division officer, the chief master-at-arms, and probably the executive officer judge the man simply, but nevertheless accurately, as worthless from a service standpoint.

The difficulty is to pin some diagnosis on him that will stick and insure elimination. It is a great step forward that boards of review are operating now to reduce the numbers of such men to be dealt with in the future on board ship.

With regard to discharge for inaptitude, the best interests of the Navy, so far as can be judged from the standpoint of preventive medicine, dictate that the commanding officer should be given comparatively free jurisdiction in disposing of men who are recognized by the executive officer and medical officer as unfit for the service. Cases are continually being dealt with at the mast on board a large ship where all concerned, the commanding officer, the executive officer, the reporting officer, the chief master-at-arms, and the medical officer, if he has been called upon for an opinion, must believe that nothing but real service to the Navy would result from discharging the man forthwith. It must be so. No matter how carefully cases are considered by boards of review, a certain number of men who will later demonstrate their unfitness will not pass before the board while at the training station. Stress on board a ship in active service will break a certain number of men who somehow failed to become entangled in mental conflict at the station. Besides, it is too much to expect infallible judgment on the part of boards of review which must act without actual knowledge as to how the men they must pass upon will react to service stress. After they have reacted the ship's medical officer is in a position to know.

With regard to transferring men to hospital with indefinite grounds for medical survey, the medical officer must too often expect to find that the man has returned to the ship in the course of a few

days. The man will be studied in hospital in an environment that is acceptable to him until the moment when he is notified that he is being returned to duty. Freed from stress he is likely to make a good showing for himself. Unless the ship has means of discharging the man, or he runs away, as happens in many of these cases, or he finally comes before a court-martial and is found guilty of a charge justifying the court in sentencing him to be discharged from the Navy, the medical officer's only recourse is the unfair hit-and-run play of sending the man to hospital the day before the ship sails.

Men unfit for the naval service by reason of defective intellect and emotional disorder, regardless of cause, whether it be heredity, faulty training, or accidental causes such as falling into bad company, or vicious circles induced by "getting in bad" somehow without exactly knowing how, are sure to make work for the medical department out of proportion to their number and likewise materially to increase the number of court-martial trials and desertions charged to the ship. Is it to be wondered at?

What conclusions can be reached? First, that in spite of the best efforts that can be made in the matter of selection, short of sweeping elimination by boards of review that would undoubtedly result in the discharge of a certain number of men who could make good in the service, the cruising ship will continue to have its troubles with men out of adjustment to their mental environment and incapable for one reason or another of accomplishing satisfactory adaptation. Second, that due allowance should be made for the probable effect of service stress when examining men who are not being subjected to such stress at the time of examination. Third, the future effects of minor physical defects such as flat foot of slight degree, varicocele, and lesions of the bones, joints, and muscles, which in themselves do not seem capable of causing disability, should be weighed in terms of the vagaries of the subconscious mind rather than estimated from the viewpoint of pathology or surgery. The fewer clinically recognizable defects the individual has the less likely the case is to be confusing if the individual breaks under stress. Fewer admissions to the sick list and fewer sick days will be charged under fewer diagnostic titles before the case is recognized for what it is and consequently disposed of by proper advice, change of duty, and if need be by discharge from the service.

The following reports of boards of review for the month of November, 1924 are of interest. The compilation of statistics based on such reports from month to month will eventually permit the construction of an experience table which will serve as a valuable standard indicating what percentages of total recruits accepted may normally be expected to be found unfit upon review.

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Combined figures for the naval training stations at Newport, R. I., Hampton Roads, Va., Great Lakes, Ill., and San Diego, Calif., for November, 1924, are as follows:

ALL NAVAL TRAINING STATIONS

	Number	Percentage of recruits received	Percentage of recruits reviewed
Recruits received during the month	1, 155		
Recruits appearing before board of review	44	3. 81	
Recommended for inaptitude discharge	30	2. 60	68. 18
Recommended for medical survey	0	0	0
Recommended for transfer to hospital	0	0	0
Recommended for retention under training	14	1. 21	31. 82

UNITED STATES NAVAL TRAINING STATION, HAMPTON ROADS, VA.

Recruits received during the month	267		
Recruits appearing before board of review	19	7. 12	
Recommended for inaptitude discharge	11	4. 12	57. 89
Recommended for medical survey	0	0	0
Recommended for transfer to hospital	0	0	0
Recommended for retention under training	8	3. 00	42. 11

UNITED STATES NAVAL TRAINING STATION, GREAT LAKES, ILL.

Recruits received during the month	262		
Recruits appearing before board of review	10	3. 82	
Recommended for inaptitude discharge	8	3. 05	80. 00
Recommended for medical survey	0	0	0
Recommended for transfer to hospital	0	0	0
Recommended for retention under training	2	0. 76	20. 00

UNITED STATES NAVAL TRAINING STATION, SAN DIEGO, CALIF.

Recruits received during the month	392		
Recruits appearing before board of review	14	3. 57	
Recommended for inaptitude discharge	10	2. 55	71. 43
Recommended for medical survey	0	0	0
Recommended for transfer to hospital	0	0	0
Recommended for retention under training	4	1. 02	28. 57

UNITED STATES NAVAL TRAINING STATION, NEWPORT, R. I.

Recruits received during the month	234		
Recruits appearing before board of review	1	0. 43	
Recommended for inaptitude discharge	1	0. 43	100. 0
Recommended for medical survey	0	0	0
Recommended for transfer to hospital	0	0	0
Recommended for retention under training	0	0	0

For the information of medical officers on recruiting duty the reasons assigned for recommending inaptitude discharge in the cases so disposed of by the boards of review are given below:

United States naval training station, Newport, R. I.:

1. Constitutional inferiority (mental)—moron, I. Q., 29, Binet-Simon scale.

United States naval training station, Hampton Roads, Va.:

1. Psychoneurosis; hysteria. Enlisted at Jacksonville, Fla.
2. Enuresis. Enlisted at Jacksonville, Fla.
3. Constitutional psychopathic inferiority—feeble-minded. Enlisted at Philadelphia.
4. Color blindness. Enlisted at Raleigh, N. C.
5. Epilepsy. Enlisted at Richmond, Va.
6. Constitutional psychopathic state; inadequate personality. Enlisted at Atlanta, Ga.
7. Disability from old fracture; transverse process of fifth lumbar vertebra. Enlisted at Louisville, Ky.
8. Chronic nephritis. Enlisted at Atlanta, Ga.
9. Color blindness. Enlisted at Jacksonville, Fla.
10. Somnambulism. Enlisted at Newark, N. J.
11. Choroiditis, both eyes. Enlisted at Jacksonville, Fla.

United States naval training station, Great Lakes, Ill.:

1. Ichthyosis.
2. Deformed feet; second toe overrides great toe on each foot.
3. Defective vision. O. D., 10/20; O. S., 12/20.
4. Defective vision. O. D., 12/20; O. S., 12/20.
5. Defective vision. O. D., 13/20; O. S., 13/20.
6. Poor physique and defective vision. O. D., 13/20; O. S., 13/20.
7. Defective teeth; missing, 3, 14, 19; should be extracted, 5, 18, 20, 30, 31.
8. Poor physique and defective teeth; teeth missing, 7, 9, 10; extraction indicated, 8.

United States naval training station, San Diego, Calif.:

1. Scar of right eye from a burn; ptosis, symblepharon, epiphora, and loss of eyelashes.
2. Hernia, right inguinal; enuresis.
3. Undescended left testicle; general inaptitude.
4. Color blindness.
5. Chronic gonorrhoea; flat feet; hammertoes; nine teeth missing and four others crowned.
6. Asthma.
7. Chronic conjunctivitis and blepharitis.
8. Chronic gonorrhoea.
9. Stammering.
10. Chronic gonorrhoeal urethritis and arthritis of right knee.

EPIDEMIOLOGICAL ASPECTS OF EXCESSIVE ECONOMY IN THE USE OF FUEL FOR PROVIDING HEAT, LIGHT, AND FRESH WATER ON BOARD SHIP, WITH PARTICULAR REFERENCE TO THE BATTLESHIP—ATTITUDE OF THE BUREAU OF NAVIGATION

Medical officers will be interested to read the indorsement printed below, which was placed by the Bureau of Navigation upon the annual sanitary report of the Scouting Fleet for the year 1923. The views expressed therein should serve to encourage medical officers

to keep at the task of studying all conditions which make for the occurrence and spread of disease and to neglect no opportunity of making proper recommendations for the correction or improvement of conditions which are obviously of epidemiological importance, even though it may be felt that no immediate remedial action is likely to be secured.

The improvement of living conditions on board ship has gone on apace with other evolutionary changes and doubtless will continue. Nevertheless, in recent years the problem of combating communicable diseases has become more complicated and difficult in fighting ships, especially in ships of the battleship type. Conditions on board a transport may of course be such as to involve serious medical, sanitary, and epidemiological problems from time to time, but ships other than transports are referred to here. While defective hygiene and sanitation have a causative relationship to many diseases, ordinarily under service conditions these factors operate for the most part to increase the occurrence and spread of common diseases of the respiratory tract, communicable diseases of the skin, and the too-common coccal infections, cellulitis, abscesses, wound infections, etc.

There are several reasons why it is more difficult to keep the incidence of these diseases low on board of the battleship than in vessels of other types. In the first place the crew is large, and under the best conditions a great deal of overcrowding as measured by general public health standards must be endured. The effects of overcrowding may not be very serious in a small ship carrying a crew of from one to two hundred men. But in the battleship the combined effects of overcrowding a large population group may make the health problem a difficult one to solve at any time. There is opportunity for the introduction of disease-producing microorganisms on a more extended scale than in the case of a small crew, and the possible range of transfer by direct and indirect contact within the group is also more extensive. There is likely to be opportunity for the causative agent of a communicable disease, against which impregnable mass immunity does not already exist, to run through a greater number of generations in a large crew before the spread of infection, as measured by definite clinical cases, is brought to an end by natural limiting biological reactions assisted by the application of such artificial preventive measures as may be practicable.

Another important factor is the epidemiological effect of turnover among the crew. The battleship is more constantly taking new men into the crew than ships of other types. Indeed, not only are new men who must be assimilated more numerous in point of actual numbers, but the rate of turnover is often greater than in ships of

other classes; and of the newcomers, proportionately more of them are boys fresh from the training station, rather than men comparatively well seasoned by service in some other ship. This, of course, tends in itself to keep the rate of turnover fairly high, as well as to furnish a constant supply of individuals relatively susceptible to communicable disease. A good deal of weeding out must usually go on among the new men, and those who make good must be fed on to the trade schools and turned over to fill up the complements of other ships.

In the battleship, therefore, sanitary provisions, including such features as the steam laundry and machinery for sterilizing mess gear, as well as the usual facilities for promoting personal hygiene, although they also add to comfort and promote contentment or diminish labor and reduce disorder, must from the health standpoint be regarded as necessities rather than conveniences or luxuries.

The larger the crew the greater the degree of overcrowding, and the higher the rate of turnover the more important it becomes to have means for carrying out the various and sundry methods of concurrent disinfection. Concurrent disinfection is a term broad enough to include bathing, washing of clothes, abolition of the common drinking cup and sterilization of mess gear, enforcement of sanitary regulations in barber shops, etc. In civil public health practice pasteurization of milk may be classed as a method of concurrent disinfection. The term is not limited in its application to bedside disinfection. Any method of procedure which accomplishes the destruction of disease-producing microorganisms from a patient or carrier before they have had opportunity to reach a portal of entry of a new susceptible host may for practical purposes be included under this definition. The Chapin technique of cubicle isolation in the management of communicable diseases essentially represents the application of methods of concurrent disinfection with such thoughtfulness and painstaking attention to details that nearly 100 per cent efficiency may ordinarily be expected in an open hospital ward.

A regular and liberal allowance of water for the crew and insistence upon proper personal hygiene in all parts of the ship is essential to success in keeping the incidence of communicable diseases low. It would seem unnecessary to argue about the importance of personal cleanliness, but the sanitarian of this generation must apparently keep on reiterating that it is persons, not things, which are primarily and often solely responsible for the spread of disease. It is hard to get rid of erroneous ideas handed down from previous generations and to modify customs and methods that have no very direct bearing on the promotion of health and the prevention of dis-

ease. Often the layman is anxious to put into effect all necessary sanitary measures as well as some which were regarded in the past as of the greatest importance but are now known to have no direct bearing on the prevention of disease—terminal disinfection, for example, with formaldehyde fumigation of walls and ceilings, repainting, and destruction of many articles in which germs are thought to linger.

The great need is of course to make it universally understood that, important as good sanitation is for many reasons, hardly a beginning can be made in the attack on diseases spread by direct and indirect personal contact by enforcing cleanliness of the abode and sanitary disposal of wastes. Not infrequently strong disinfectants are regularly and persistently applied to the floor or deck and even to water-closet bowls or urinals, and yet no adequate effort is made to prevent the transfer of disease-producing microorganisms by door knobs and many other articles which are actually handled frequently and repeatedly by many men in common. It is not unlikely that some of our ships would be safer habitations to-day if as much attention were paid to securing regular effective disinfection of mess gear, including glasses, knives, spoons, and forks, as is paid to disinfecting the decks and scrubbing articles which, although they may require scrubbing for other good reasons, play no important part in the spread of disease.

Predisposing influences play a large part in determining whether or not infection will follow effective exposure to the causative agents of certain diseases of the respiratory type, especially with such diseases as pneumonia, cerebrospinal fever, and common colds. The timely regulation of artificial heat in living compartments to meet changing weather conditions has an important bearing upon predisposition to infection. The general or generous distribution of lights of adequate candlepower in various parts of the ship, so that members of the crew may read or write or attend to personal matters after working hours in small groups in their own parts of the ship, has a direct bearing upon the spread of infection, and by keeping their quarters comfortably heated and well lighted the men may often be kept from subjecting themselves otherwise to predisposing influences.

It is in the battleship, especially, that the effects of engineering competition are most likely to be serious if competition leads to curtailment of fresh water, heat, and light below reasonable hygienic requirements. There seems to be no question but that such curtailment has occurred at times in certain ships, although so far as can be judged from the annual sanitary reports of individual ships, competition has not generally led to such unfortunate results.

The Bureau of Navigation believes that fuel consumed for lighting, heating, ventilating, and for providing water for cooking, drinking, and bathing should be eliminated from engineering competition or else given a count relatively negligible. Unquestionably that is very desirable from the health standpoint, and it is to be hoped that some scheme can be worked out whereby fully sufficient or preferably more than sufficient amounts of fuel to meet hygienic needs can be allowed all ships and charged off exclusive of the amounts on which competition is based.

When left to individual ships to decide how much fresh water, heat, and light should be provided, difficulties are likely to arise which never would arise with all due regard for economy if the element of competition were lacking.

Unfortunately, from the standpoint of naval hygiene, satisfactory minimum standards to cover all conditions can not be fixed for quantities of heat and light that will not appear under some conditions unreasonably high to the engineer officer who must endeavor to save fuel at all times. Varying amounts of heat are required to meet varying conditions, and consequently frequent occasions for debate arise. When the weather is continuously cold there is likely to be plenty of heat and not infrequently more than is good for health and comfort. The great danger is that there will be delay in turning on the heat promptly to regulate the temperature in living spaces when the weather suddenly changes from warm to cold.

At first glance it would seem a simple matter to fix a minimum standard allowance of fresh water for the crew. In reality it is not. The best interests of hygiene require a free spigot for the crew. Even a liberal bucket allowance is unsatisfactory, because when any real attempt is made to measure the water issued to the men restrictions as to the time for drawing and the number of times water can be drawn each day tend to interfere with the proper and timely use of water. When the fresh-water problem is handled on any other basis than an actual allowance of water, the ship's per capita consumption per day must enter into the question. That means that water used and wasted in the galley, scullery, laundry, officers' quarters, sick bay, etc.; fresh water used for scrubbing paintwork with or without the first lieutenant's permission; unmeasured scuttlebutt overflow water, water wasted through leaks in the fresh-water pipe system, wastage from allowing tanks to overflow, etc., must be taken into consideration, as well as water that is supposed to be used and wasted by officers and members of the crew. There are so many variables involved, some of which at least can not be closely measured, that the question tends to become on board ship the subject of unending debate. From the standpoint of hygiene it seems perfectly clear that putting the crew

on a bucket allowance should be the last step taken in attempting to reduce what appears to be excessive per capita consumption of water, rather than the first step. There are so many ways in which water may be wasted and the quantity of water required depends upon so many varying conditions, including the weather and the ship's work, that it is not satisfactory to fix a minimum standard for per capita per day consumption above which any quantity used is to be regarded as excessive use of water. If a minimum standard is to be advocated it must not be less than 15 gallons per capita per day, and it is clear enough that that figure might be too low under some conditions or at any time if there is more than average loss by leakage and wastage. However, under ordinary conditions without undue loss from leakage or overflow of tanks and with reasonable economy in the use of fresh water for scrubbing paintwork, etc., it is often possible for the crew to have a free spigot without having the per capita per day consumption average over 10 gallons. As a matter of fact, the quantity of water actually used (or wasted) by the crew is frequently much overestimated. With a well-disciplined crew the difference between the amount of water actually used to good advantage and the balance wasted is not likely to be much greater with a free spigot than with a bucket allowance. From the preventive medicine standpoint the price in defective hygiene is too much to pay for the comparatively small amount of water saved, especially if there is reason to believe that the old saying applies, "saving at the spigot and allowing the leak at the bung to continue."

The indorsement referred to above, which was placed by the Bureau of Navigation upon the annual sanitary report of the Scouting Fleet, 1923, is as follows:

"1. Forwarded. The Bureau is impressed by the paragraph in this report quoted as follows:

"In my extended inspections in the fleet and by much questioning and consultation with many officers and including reviews of reports on the subject, one questions whether we are arriving at real economy in the maddening engineering competition for 'E's,' especially when we consider the deleterious effects on the health and morale of a selected personnel, by permitting a reduction of the standard allowance of heat, ventilation, water, and light. Years of sea service and observation have shown a steady increase in the curtailment of these vital necessities to the comfort, contentment, and health of the command. Each cruise on a ship seems to find each engineer officer confronted with the economy record of his predecessor, and he feels it is up to him 'to make face' by still greater economy, and so he pares still further the fuel consumption to the degree or capacity of endurance."

It is agreed with the commander in chief, United States Fleet, that "sanitary conditions must be made the best military necessities will permit," but by following the suggestion contained in the quotation o fthe fleet surgeon much can be done to ameliorate living conditions and better sanitary conditions. The bureau believes that fuel consumed for lighting, heating, ventilating, and providing water for cooking, drinking, and bathing should be eliminated from the engineering competition, or else given a count relatively negligible. The competition on electric-drive ships has reached a point where health and comfort may be, and no doubt often are, not given sufficient consideration. In view of the fact that money is usually returned to the Treasury in the appropriation "Fuel and transportation," this curtailment of comfort and impairment of health is unnecesary. The competition should be designed primarily to secure efficiency in operation. Having this, securing economy at the expense of the officer and enlisted personnel, already leading an unnatural life aboard ship, serves no useful purpose. The bureau is of the opinion that the Congress does not begrudge funds which will make life aboard ship more comfortable or more healthy.

"2. The bureau considers that battleships and lighter vessels should carry their war complements. They have to carry and accommodate them in war and should be perfected in doing so during peace. In no other way can they be ready at the outbreak of war for war operations. Each battleship should be supplied with enough folding cots to berth the excess men.

"3. It is requested that the material bureaus consider the detailed recommendations of this report on ventilation and refrigeration in their relation to the health and comfort of the personnel.

"4. For a number of years it has been the desire of the Bureau of Navigation to abolish receiving ships and substitute barracks on shore, to be known as 'personnel depots,' and the annual report of the chief of bureau to the Secretary of the Navy for the fiscal year 1923 renewed this recommendation. These depots would be located immediately adjacent to navy yards, and, if of sufficient capacity, would undoubtedly be utilized to provide for quartering and messing the crews of vessels undergoing extensive overhaul.

"5. If it is desired to reduce the number of men living on battleships during periods of overhaul, arrangements can be made by this bureau to have a part of the crew quartered and subsisted on such receiving ship as might be available near the navy yard where the overhaul would be conducted. It may be mentioned that the surplus crews of the Scouting Fleet during the recent midshipmen's practice cruise to the number of 1,300 are being accommodated conveniently at the naval operating base, Hampton Roads.

"6. In connection with the crowded conditions for sleeping quarters, it is recommended that a supply of cots be provided for such ships as have not adequate hammock berthing space."

PROMPT TRANSFER OF HEALTH RECORDS

Medical officers continue to complain to the bureau of delay in the arrival of health records after the transfer of men to their organizations.

That is a matter of considerable importance from the standpoint of preventive medicine, for while the men themselves are, of course, available for examination for the detection of active communicable disease, unnecessary work and reduplication of effort is involved if the men are examined prior to receipt of their health records.

At best, therefore, there is interference with or delay in the application of required systematized measures of prevention. It must not be forgotten that the pillar of preventive medicine in the Navy is fine organization of the Medical Department and smoothness of operation. Anything which tends to cause postponement in the handling of new men joining the command potentially lessens the effectiveness of the Medical Department.

The bureau therefore endeavors to determine the cause of delay in connection with reported instances and to secure the necessary action to prevent recurrences. Not infrequently it is found that the records were promptly prepared for transfer in the medical department of the organization from which the man or men came, but unnecessary delay in forwarding occurred after the papers left the medical department. Medical officers are urged to look into this question and take such action as may be practicable to expedite the transfer of health records at all points throughout the service in order that these delays so exasperating to medical officers responsible for efficient health service in large organizations, may be overcome or reduced.

TRANSFER OF MEN OVERDUE FOR COWPOX VACCINATION OR INOCULATION WITH ANTITYPHOID VACCINE

A number of medical officers during the past few months have specifically reported instances in which men long overdue for vaccination against smallpox and inoculation with antityphoid vaccine have been transferred to their care under such conditions as to make it extremely improbable that any good reason existed for neglect to carry out the required procedures.

Recently the commanding officer of the U. S. S. *Oklahoma* reported in detail the cases of four men long overdue for inoculation who were transferred from the U. S. S. *Pyro* via the U. S. S. *Maryland* with three weeks stay on board the *Maryland*.

A memorandum furnished the division of preventative medicine by the division of physical qualification and medical records, which handles such reports, indicates that the bureau has been receiving reports such as that from the *Oklahoma* for several weeks. The memorandum stated that the situation has concerned the receiving barracks at San Francisco and Mare Island recently.

With regard to the cases cited by the commanding officer of the U. S. S. *Oklahoma*, the correspondence was referred to the Chief of the Bureau of Navigation with the following indorsement:

"1. Forwarded, inviting attention to the within reports relative to the failure to administer cowpox vaccination and antityphoid prophylaxis, with the recommendation that the correspondence be forwarded to the commanding officer of the U. S. S. *Pyro* and the commanding officer of the U. S. S. *Maryland* for an explanation as to why these men were not given the treatment required by the Navy Regulations when it was due. It is further recommended that such disciplinary action as seems warranted be taken on the ground of neglected duty should the failure to administer the prophylaxis be not satisfactorily explained.

"2. The bureau for some weeks has been receiving continuously reports similar to the attached, several of which have originated on the U. S. S. *Oklahoma*, and the bureau is anxious to take action to discontinue the neglect, if it can be called neglect, on the part of medical officers to carry out the full provisions of the regulation relative to these vaccinations for the protection of the health of the Navy as well as the individual."

HOW LONG AFTER AN IMMUNITY REACTION IS THE MEDICAL OFFICER JUSTIFIED IN REGARDING THE INDIVDUAL WHO HAS GIVEN SUCH A REACTION AS HAVING PROTECTION AGAINST SMALLPOX?

This question was recently put to the Bureau of Medicine and Surgery by the medical officer of one of the ships in the Battle Fleet. The question was, "How long under ordinary circumstances in the naval service will the medical officer be justified in accepting an immunity reaction as protection against smallpox?"

The bureau's reply was as follows:

It is not practicable to answer categorically the question put in paragraph 2 of your letter. This subject was discussed at length in an article entitled "Remarks on the Epidemiology of Smallpox and

the Preventive Value of Vaccination with Cowpox Virus," which appeared in the March, 1924, number of the United States Naval Medical Bulletin.

Unless it is known that the virus which excites the immunity reaction is fully potent one can not be certain that the immediate reaction means that the individual has protection even at the time the immunity reaction is provoked, and, of course, under those conditions the duration of immunity can not be predicted. A relatively nonpotent cowpox virus may give a typical immediate reaction, whereas if a fully potent virus had been used there might have been an accelerated reaction instead of one that passes for an immunity reaction.

Let it be assumed that a man upon the ship is inoculated with virus which was obtained directly from the distributor without delay in transit and which was placed in cold storage immediately upon its receipt on board ship and was kept cold until used. Now, provided the man has one or more pitted scars indicating that he has had a primary take in the past, if he gives a reaction of immunity—that is, a definite reaction which reaches its greatest intensity in less than 48 hours, and it may be within 24 hours, and thereafter gradually subsides—it is justifiable to regard the man as having protection against smallpox. Unless the ship is later brought into contact with smallpox, making it advisable to check up on the immunity status of the crew with special care, that man need not be revaccinated so long as he remains on board or until he reenlists. In the case of a man who does not present a pitted scar indicative of a previous primary take, one would not feel quite so certain with a single reaction of immunity. To feel sure that he is protected, one would like to know that he will still fail to have a take with potent virus a few months later.

What shall be done about men reporting on board whose health records indicate a previous reaction of immunity? Ordinarily one can not know that the virus used to provoke the reaction was potent. One can not feel altogether certain of the accuracy of the recorded observation. So far as the Manual of the Medical Department is concerned the cirsumstances may be such that the requirements can be regarded as having been complied with if the man is passed without revaccinating him, but if the medical officer is to assure himself that the man is not susceptible to smallpox the only safe rule to follow is to test him for immunity. Cases are altered by so many circumstances that it is not advisable to attempt to cover all contingencies with instructions. The question resolves itself into this—where there is doubt as to protection, revaccinate. If the man is immune he suffers no inconvenience. If it happens that he

has an accelerated reaction of considerable intensity spread over several days, there is proof that revaccination was necessary. This doesn't mean that it is necessary or advisable to revaccinate the entire crew of a ship every time possible contact with smallpox occurs, utterly regardless of painstaking work that has been going on as a matter of routine to insure the protection of each and every man on board.

A CASE REPORTED AS SMALLPOX BY THE U. S. S. "OKLAHOMA"

The patient, an engineman, third class, 21 years of age, with one year and eight months previous service, was possibly exposed in Bremerton, Wash., May 4, 1924, exactly three weeks before he was taken sick. That was the last time he was ashore before symptoms developed. He had not been in Seattle for five or six weeks. No case of communicable disease had been reported in Bremerton. It was hard to believe that the disease was smallpox, but the symptoms, and especially the skin lesions, were considered to be more or less typical.

The patient was transferred to the U. S. S. *Relief*, where the disease was considered to be a mild form of smallpox.

The patient was admitted to the sick list May 25, 1924, with a temperature of 100.8° F. and some confluent lesions on the body near the left iliac crest. In the course of 24 hours a generalized papular eruption appeared on the face, trunk, extremities, and plantar surfaces, distributed as follows:

Forehead.—Lesions relatively numerous.

Folds of skin behind the ears.—Occasional lesion.

Neck.—Occasional lesion.

Chest.—Thickly studded with lesions.

Abdomen.—Thickly studded.

Shoulders.—Occasional lesion.

Lower back.—Occasional lesion.

Axillæ.—Occasional lesion.

Upper arms.—Occasional lesion.

Lower arms.—Lesions relatively numerous.

Wrists and dorsal surfaces of the hands.—Lesions relatively numerous.

Palms.—Occasional lesion.

Ankles and areas back of the feet.—Occasional lesion.

Soles of the feet.—Occasional lesion.

Vaccination history.—One vaccination scar acquired previous to entering the naval service. Vaccinated September 21, 1922, and the result recorded as an immunity reaction. Information as to prob-

able potency of the virus and intensity and duration of the reaction not obtainable.

Discussion.—The Bureau of Medicine and Surgery, of course, desires to record all cases of smallpox that may occur, together with the conditions and circumstances under which infection developed, including vaccination history. At long range and with only the evidence presented above to judge from it would seem that this case was a case of chicken pox rather than smallpox for the following reasons: The patient already had an eruption on the body when first seen with a temperature of 100.8° F., and there is no indication that there was noticeable prostration at the time of onset. The first appearance of the eruption on the body near the left iliac crest is in favor of chicken pox, and likewise the rapid development of the eruption in the course of 24 hours. The distribution of the eruption after it was out was quite characteristic of chicken pox and not characteristic of smallpox, notably lesions in the folds behind the ears and in the axillæ, as well as the concentration of lesions on the chest and abdomen. The long period of incubation also favors the diagnosis of chicken pox. Additional information has been requested from the *Relief*.

THE EFFECT OF VACCINATION UPON THE 1924 EPIDEMIC OF SMALLPOX IN DETROIT, MICH.

The following discussion of the effect of vaccination in the control of smallpox in Detroit was published by the health department, city of Detroit, in its Weekly Health Review for the week ended December 6, 1924. From a broad epidemiological viewpoint the remarks relative to change in virulence as noted among cases recorded during the progress of the epidemic are particularly interesting. The article is as follows:

"To most people the world over vaccination is accepted as an effective and the only sure means of preventing smallpox. Notwithstanding this fact it sometimes takes a severe lesson to bring about the actual practice of a generally accepted truth. Detroit has recently had such a lesson and can therefore speak with some degree of authority.

"Starting in September, 1923, smallpox became unusually prevalent. Many cases of a mild type occurred through February. During March there was a decrease in the incidence of the disease. April saw the introduction of hemorrhagic (commonly called black) smallpox, resulting in a second rise in the number of cases. The disease continued to rise until its peak was reached about May 25. The

outbreak had a sudden termination, and smallpox returned to normal at the end of June.

"From January 1 through October there were 1,592 cases of and 164 deaths from smallpox. An intensive study has been made of the situation from April 13 through August, during which time there were 784 cases and 139 deaths.

"During the outbreak approximately 20 per cent of Detroit's population was unvaccinated (had never had successful vaccination scars) and an additional 41 per cent needed revaccination (the scars being more than 5 years old). This is a sad commentary on the state of vaccination of our city, but we strongly suspect that a similar situation would be found to exist in other cities were careful surveys to be made.

"General vaccination and revaccination of the population is the only means of stopping a smallpox outbreak. It can't be done by merely urging vaccination. Vaccination must be made in large numbers. Vaccination was talked about from the very inception of the outbreak, but, with the exception of the school children, no very large proportion of the population was actually vaccinated until May. During the entire outbreak a total of approximately 817,000 vaccinations were performed. Of these about 500,000 were done in May and the very first few days of June. Smallpox had constantly increased up to the end of May. The outbreak terminated the latter part of June."

"Perhaps the most convincing effect of vaccination is seen in the incidence of smallpox among school children. Foreseeing the difficulty which was coming, compulsory vaccination of school children was instituted and carried on in February and March. Smallpox among school children between the age of 5 and 14 represented in Detroit but 5.6 per cent of the cases, as compared with 24.5 per cent for the State of Michigan as a whole. But 28 cases occurred among children of these ages in Detroit. Had the State distribution of cases obtained in Detroit, there would have been 192 cases instead of 28. Of the 28 cases, in all but two instances the parents had refused to have their children vaccinated, preferring to keep them out of school for the 21-day period. One of the two exceptions was a child whom the school physician missed, and the other was erroneously passed by the physician as having a successful vaccination. For definite protection one should have a successful vaccination scar of less than five years' duration. No one contracted smallpox in Detroit who had such a successful scar, 12 developed the disease who had scars of from 6 to 10 years' duration, 35 with scars from 11 to 25 years old, and 66 with scars over 25 years old. The older the scar

the more chance there is of having lost its immunizing power. Negative vaccinations do not mean that you are immune. One man was vaccinated five times. The first four were negative; the fifth took and produced a scar. A woman had been vaccinated eight times unsuccessfully within two years. She contracted smallpox.

"To definitely avoid smallpox, one must have protection at the time of exposure. While vaccinations performed at the time of or after exposure tend to decrease the virulence of the disease, and in some instances definitely prevent its onset, there is no certainty that they will do so. Eight persons who were vaccinated from two days previous to three days after exposure contracted smallpox. Four of these were successful takes. Sixty-two cases developed in persons vaccinated from four to eight days after exposure. Fifty-four of these vaccinations were successful. The number of cases developing increases as the time of vaccination after exposure increases.

"Smallpox tends to run true to type or to increase in severity if uninfluenced by vaccination. Of 51 secondary cases exposed to various types of smallpox who had never been successfully vaccinated either previous to or after exposure, only one contracted the disease in a less severe form than the type to which he was exposed. One exposure to confluent smallpox came down with the disease in the discrete form. On the other hand, there were many instances in which the disease increased in virulence. Four persons contracted hemorrhagic from discrete, eight confluent from discrete, and three hemorrhagic from confluent. As previously mentioned, vaccination tends to decrease the virulence of the disease. A total of 23 persons who either had old scars (more than 5 years old) or had been vaccinated close to the time of exposure contracted discrete from hemorrhagic smallpox, 14 confluent from hemorrhagic, and 29 discrete from confluent.

Unvaccinated persons exposed to smallpox, according to local figures, are more than six times as likely to contract the disease as persons having old scars (more than 5 years old). Of 928 persons exposed to smallpox having scars less than 5 years, none contracted the disease. There were 1,296 people with old scars (more than 5 years old) exposed, of whom 27, or 2.09 per cent, developed smallpox, and of the 1,350 exposures who had never been vaccinated, 180, or 13.34 per cent, came down with the disease.

Almost anyone may safely be vaccinated against smallpox. At the Herman Keifer Hospital during the outbreak 3,346 persons were vaccinated, including 90 cases of erysipelas, 773 obstetrical cases, 676 new babies, 21 venereal cases, and numerous cases of diphtheria, scarlet fever, measles, tuberculosis, etc., with no untoward results.

NOTES RELATIVE TO SCARLET FEVER AND TO EPIDEMIC HICCOUGH FROM THE SANITARY REPORT OF THE UNITED STATES NAVAL TRAINING STATION, NEWPORT, R. I., FOR THE MONTH OF NOVEMBER, 1924

Scarlet fever.—After an absence of nearly three months scarlet fever again appeared at this station in the persons of two members of the Tenth Company quartered in Barracks B. These cases were transferred from this station to the United States naval hospital, Newport, R. I., under the diagnosis of catarrhal fever, acute, on November 17 and 19, respectively. On the morning of November 20 the diagnosis of scarlet fever was made in each case at the hospital, and this station was notified of the change in diagnosis by telephone.

Action was taken immediately at this station toward preventing the spread of the disease as follows:

The entire Tenth Company was placed in quarantine in one of the unoccupied buildings of Barracks A.

Throat and nasopharyngeal cultures were made on blood-agar media in the cases of all contacts for the detection of carriers of the streptococcus hemolytica.

The Dick test was performed on all contacts.

Sanitary instructions and recommendations were submitted to the commanding officer, approved, and published.

On November 21, 1924, all members of the Tenth Company (contacts) were recommended to be released from quarantine except those contacts found to be positive for the Dick test or carriers of the streptococcus hemolytica. In accordance with the recommendation to that effect, the majority of the contacts were returned to duty after but one day of quarantine. The successful conclusion of these measures was evidenced by the absence of any other cases of scarlet fever. This episode is reported in detail as illustrating the value of the Dick test in conjunction with throat culturing in the cases of contacts. The economic saving in avoiding unnecessary quarantine is apparent, and the detection of susceptibles and carriers is of vital importance in controlling the epidemic tendencies of this disease which are emphasized in barracks.

It is believed that this is the first time that the Dick test has been put to practical use in the naval service.

Epidemic hiccough.—Fifteen cases occurred at the station during the early part of November at the same time that this affection was reported present in other localities on this seaboard. Because of the lack of definite knowledge as to the etiology of this disease, its suspected connection with either epidemic encephalitis or influenza, and

the communicability of the disease itself, *all* cases were placed in isolation immediately upon detection.

The cases were widely separated as to point of origin.

The symptoms presented were mild fever and persistent hiccough, which when controlled had a tendency to relapse. The attacks of hiccoughing extended over periods of time from 24 hours to 5 days. The treatment included isolation, rest in bed, disinfection of the throat and nasopharynx, and the administration of nerve sedatives. None of these cases was serious; but one was transferred to hospital and none sent to duty until five days after the disappearance of all symptoms. The first case was admitted on October 31, 1924, and the last case was discharged to duty on November 15, 1924.

A CASE OF GONORRHEAL OPHTHALMIA ATTRIBUTED TO USE OF A WASH BUCKET IN COMMON WITH OTHER MEN

The patient, a seaman, second class, was admitted to the sick list on board the U. S. S. *West Virginia*, with gonococcus infection of conjunctiva, October 5, 1924.

He had been under treatment for gonorrheal urethritis from August 27 to October 2, 1924, when he was discharged as cured, the urine having been free from shreds for two weeks. Investigation by the medical officer showed that the patient had used a wash bucket in common with other men of his division, some of whom had active gonorrhea, and, notwithstanding the possibility of infection from his own tissues, the bucket was believed to be the source of his infection.

A CASE OF GONORRHEAL OPHTHALMIA PROBABLY CONTRACTED BY USING ANOTHER MAN'S TOWEL

This case occurred on board the U. S. S. *Percival*. The patient was a seaman, second class. There were three men with active gonorrhea on board. The patient used a towel belonging to one of them. It is thought that his infection occurred on board ship, as the ship was engaged in maneuvers off Culebra at the time of exposure.

The infection was virulent, resulting in perforation of the cornea and prolapse of the iris, and, with repeated recurrence of acute inflammation, enucleation became necessary. After 49 sick days he was examined by a board of medical survey and recommended for discharge with permanent disability.

STUDY OF CHLORIN GAS AS A THERAPEUTIC AGENT IN RESIRATORY DISEASES BY THE HEALTH DEPARTMENT OF THE CITY OF NEW YORK

The following article was published in the Weekly Bulletin of the department of health, city of New York, for the week ended November 29, 1924:

"Dr. Frank J. Monaghan, the commissioner of health of this city, upon the publication of a paper by Vedder and Sawyer, of the Army Medical Corps, on 'Chlorin as a Therapeutic Agent in Certain Respiratory Diseases,' in the Journal of the American Medical Association of March 8, 1924, recognized at once that if their observations were substantiated by others, chlorin gas could be made to serve as a valuable means for preventing the annual toll of deaths due to the acute respiratory diseases.

"Commissioner Monaghan took steps to establish two clinics for the purpose of investigating the merits of these claims, so that this and other communities might profit by the use of this gas, if it was found to be as valuable as had been asserted.

"Care was taken to exclude from this treatment cases of hay fever and tuberculosis. Our experience in treating 13 individuals who had asthma gave us cause for alarm in at least two instances and led us to the conclusion that it was dangerous and that it would be therefore unwise to admit other cases. Similar reasons determined our exclusion of cases of pulmonary tuberculosis.

"Shortly after our experimental work was begun, we instituted a follow-up method in order to ascertain from each of the patients who had been treated whether they had been cured or in any way benefited so that we might be able to make as accurate an appraisal as possible of the merits of the treatment. As the result of intensive follow-up work, we received 506 letters from the 671 patients who suffered from respiratory disease whom we had treated with chlorin gas. We also received 35 reports from persons suffering from asthma, hay fever, sinusitis, and deafness, respectively. There were also 18 cases of whooping cough that were treated under our auspices. The total number reported upon is 559 cases.

"It is contended by some that the public is demanding chlorin treatment, and this argument is urged as an excuse for buying apparatus with which to give the treatment. We have found no such popular demand, nor do we believe that a mere demand of the people should lead us to give a treatment for which as yet there has been no scientific warrant. Vedder and Sawyer claimed most excellent results, notwithstanding the fact that most of their patients had but a single treatment. In our service a very decided majority had received

two or more treatments on successive days. Whereas Vedder and Sawyer reported 71.4 per cent of their 931 patients cured, we found only 6.5 per cent of our 506 patients cured. We can not attach very much importance to the 53 per cent of cases that reported improvement. Those who have had much experience in the treatment of respiratory infections are well aware that in the majority of instances when cases do not develop serious manifestations they tend to improve of their own accord, no matter what method of treatment is employed. Any method of treatment which is claimed to be especially effective must be shown to exercise a prompt and decisive influence upon the symptoms of a large number of cases of acute respiratory disease. One can not demand quite as much in chronic cases. If the studies of other observers should bring forth results that approximate the percentage of cures claimed by Vedder and Sawyer, the later will richly deserve applause and commendation, nor will we be tardy in acclaiming their achievement. So far as we have gone we regret that we have not been able to confirm the results reported by Vedder and Sawyer. On the contrary, we deem their claims to be unjustified and deprecate the large and unwarranted claims which have appeared in some places and which have been inspired by those interested in the sale of devices for administering this treatment.

"Eighteen cases of whooping cough under care at the Riverside Hospital of the department of health were studied, together with 12 control cases to note the response of the former group to this treatment. Twenty treatments of one-hour duration each were given at daily intervals to these 18 cases. There was no appreciable difference noted after the first five treatments. Thereafter the frequency of the paroxysms abated slowly from an average of 25 per day per case to an average of 12 a day at the end of 20 treatments. However, the frequency and force of the paroxysms diminished in practically equal measure among the 12 control cases that were under observation. On the basis of a larger experience than that on which Vedder and Sawyer made their claims, we must conclude that the treatment was entirely without effect in whooping cough."

NOTE RELATIVE TO TETRAETHYL LEAD POISONING

The following paragraphs were taken from the Industrial Hygiene Bulletin for December, 1924, published by the New York State Department of Labor:

"Tetraethyl lead poisoning recently has attracted so much public attention that it is most important that this type of acute poisoning

should be differentiated clearly by symptoms from ordinary chronic lead poisoning. The symptoms are absolutely different.

"Tetraethyl lead poisoning in its worst form gives an acute encephalopathy. *Autopsies reveal an injection of the meninges of the brain, particularly at the base, with also some congestion of the cortex.* The symptoms are both subjective and objective. The patient first complains of persistent insomnia and usually of more or less nausea with vomiting. He feels restless and nervous and tired. He loses all appetite and begins to lose weight. Subjectively, one of the first symptoms noticed is a marked drop in systolic blood pressure, which frequently falls below 100 and sometimes below 90. There may be some diminution in the pulse rate, and in some cases a subnormal temperature. Lead is found in the stools, and some patients recently examined have shown strippling of the red blood corpuscles, although this is not invariably present. Considerable anemia develops, though no paralysis. In the extremely severe cases there is acute delirium of sudden onset of the type familiar with delirium tremens—that is, with violent jactitation, delusions of persecution, efforts to get up and run amuck, smashing through windows, and shouting with acute maniacal raving. Death ensues from exhaustion.

"Tetraethyl lead is a remarkably active poison, taking first place among the metallic poisons. It was first made by chemists in 1854. Since that time there have been occasional instances of poisoning of greater or lesser severity among the workers in chemical laboratories. Quite recently the posibility of using this substance in improving the efficiency of all gasoline motors, and thereby conserving the world supply of gasoline fuel by about one-quarter, has been discovered. Moreover, the addition of this substance to gasoline would make possible the use of high compression engines. Hence, the attempt to manufacture it on a commercial basis. It should be emphasized that it only can be used in gasoline motors in extremely diluted form, usually 1 to 1,000.

"The possible dangers in the manufacture of tetraethyl lead, however, are three—namely, through direct absorption through the skin which takes place with extraordinary rapidity; second, through inhalation of toxic fumes; and, finally, through accumulation of ordinary lead dust, the latter being capable only of chronic lead poisoning.

"The chemical substances used in the manufacture of tetraethyl lead are lead, ethyl chloride, and metallic sodium."

FORM USED AT THE MARINE BARRACKS, QUANTICO, VA., FOR RECORDING A SUMMARY OF VITAL STATISTICS EACH WEEK

OFFICE OF THE POST SURGEON,
MARINE BARRACKS, QUANTICO, VA.,
——— ——— *192*

To: Sick quarters.
Sanitary inspector.
Dispensary No. 1.
Dispensary No. 3.
Dispensary No. 4.
Dispensary No. 6.
Dispensary flying field.
FILE.

Subject: Statistical data for week ending ——— ———.

(*a*) Noneffective rate:
Fifth Regiment----------
Sixth Regiment----------
Tenth Regiment----------
Engineer Battalion----------
Aviation----------
All others combined----------
Mean rate for whole post----------
(*b*) Annual rate per 1,000, all causes (admissions)--------
Annual rate per 1,000, all causes. (discharges)--------
Annual rate per 1,000, admissions:
Class VIII (A)----------
Class VIII (B)----------
Class X----------
Class XII----------
Remarks----------

ADMISSIONS FOR INJURIES AND POISONINGS, JANUARY TO NOVEMBER, INCLUSIVE, 1924

Form F cards received in the bureau between January 1, and November 30, 1924, notified injuries and poisonings as follows:

	Within command			
	Connected with actual performance of work or prescribed duty	Not connected with work or prescribed duty	Leave, liberty, or A. W. O. L.	Total
Injuries	3, 227	1, 720	985	5, 932
Poisonings	20	132	26	178
Total admissions	3, 247	1, 852	1, 011	6, 110

Of these admissions, 83.45 per cent were for injuries and poisonings occurring within the command, and 16.55 per cent for cases incurred while on leave or liberty.

Of the cases incurred within naval commands, 63.68 per cent were connected with the actual performance of prescribed work or duty, and 36.32 per cent were not so connected. Of the total admissions for injuries and poisonings, 53.14 per cent were connected with the actual performance of work or prescribed duties—i. e., the result of true naval industrial hazards. The remainder were incidental to liberty, athletics ashore or afloat, skylarking, quarreling, falls other than those connected with work, etc.

Poisoning by a narcotic drug or by ethyl alcohol is recorded under the title "Drug addiction" or "Alcoholism," as the case may be. Such cases are not included in the above figures.

The following cases selected from reports received during the past month are worthy of notice from the standpoint of accident prevention:

Destroyer.—While turning over the propeller of a torpedo, a torpedoman's hand slipped, causing fingers to be caught in the tips of the propeller blades, resulting in a fracture of the right index finger. The report stated that recommendation had been made to the effect that a crank could be adopted to safeguard against such an accident.

Torpedo station.—Burn of face, hands, and legs resulted when gasoline exploded in the presence of an open light. Case hospitalized.

Ship.—Contusion of left lumbar region caused by falling through an unprotected and unguarded open cargo hatch. Man was incapacitated five days.

Battleship.—A fireman was engaged in repairing a steam line when another person carelessly turned steam into the line, causing a burn of the legs of the repair man.

Destroyer.—A wrench negligently dropped from the bridge struck and crushed the great toe of a man working on the deck beneath.

Ship.—While cutting rawhide toward self, the knife slipped and caused a lacerated wound of the eyelid and eyeball which will necessitate discharge by medical survey.

Miscellaneous.—Gasoline ignited from heat of motor which had been left running while man was wiping an automobile with gasoline. All of the left side of the body and left ankle were burned, necessitating 37 sick days.

Battleship.—Contusion of eye incurred by running into a coffee pot hook which had not been put out of the way in a dark gun room.

Ship.—Fellow worker released wrong line of staging and caused man to fall 10 feet into a dry dock and to suffer a contusion of hip.

Battleship.—By elevating guns without warning in a turret, the toes of a man were caught between deck and loading platform. The distal end of each toe was crushed.

Destroyer.—Because a seaman did not take sufficient turns with line on davit while lowering a boat, the line ran through his hand, abrading the palmar surface of the fingers.

Ship.—Due to the negligence of others (character of negligence not stated), a man fell through an unprotected hatch, striking and contusing head and shoulders.

Ship.—Chronic lead poisoning incurred during extensive chipping and painting in connection with the decommissioning of the ship.

Marines.—Marine on guard fell into a ditch in the darkness. No means were taken to prevent falls thereinto, and apparently the guard had a very incomplete (if any) knowledge of the location of the ditch. Contusion of the chest incurred, which required 20 days on the sick list.

Battleship.—A 30–30 subcaliber rifle mounted on a 5-inch gun and not thought to be loaded was accidentally discharged while a man was leaning against the gun, causing a gunshot wound of the arm.

Marines.—Hand grenade exploded while being carelessly tampered with, causing multiple injuries and 42 sick days.

Ship.—Patient fell through an open hatchway at night. The hatchway was not indicated by a light and was surrounded by only one rope which was insufficient to prevent the man from falling. Contusion of back with 40 sick days resulted.

Submarine base.—While doing electric welding without wearing protective goggles, a piece of steel lodged in worker's eye.

Navy yard.—Because of rotten planking in dock, man fell through hole and sprained ankle, which required 20 days' treatment in hospital.

Battleship.—A paint drum slipped from a poorly secured line and fell two decks, striking man below a glancing blow on the head.

Fortunately this injury was slight, but the accident was the result of gross carelessness and fraught with much danger.

Battleship.—While using gasoline to clean his trousers, which the victim was wearing at the time, another man threw a lighted match, causing the gasoline to ignite and burn the patient's leg. Form F cards continue to indicate that gasoline is being handled carelessly in the Navy. Many men apparently have yet to learn that *gasoline will ignite and explode when the fumes come in contact with an open flame or spark.*

HEALTH OF THE NAVY

This report is for the month of January. The general admission rate, all causes, was 587 per 1,000 per annum, a low rate for a mid-winter month. The median January rate for the preceding five years, owing to the prevalence of influenza in most of those years, is 804.

Acute infectious diseases of the respiratory type reached a prevalence about equal to expected rates. There is nothing worthy of note to be said regarding either the prevalence or distribution of acute tonsillitis, acute bronchitis, and catarrhal fever cases.

For the entire Navy 312 cases of influenza were reported, as compared with 284 cases in January, 1924, the month of greatest prevalence last year. The U. S. S. *McDermut*, a destroyer on special experimental duty on the West Coast, reported 15 cases. The U. S. S. *Whitney*, a destroyer tender, carrying 444 men, reported 18 cases. In general, few or no cases were reported by ships. Few cases occurred at shore stations in the United States—50 in all, of which 15 occurred at the marine barracks, Quantico, Va.

The following table shows admission rates per 1,000 per annum, entire Navy, for the principal communicable diseases, January, 1925. For comparison, corresponding median rates are given for the same month, 1920 to 1924, inclusive:

	January, 1920–1924	January, 1925
Cerebrospinal fever	0	0
Diphtheria	1. 45	. 31
German measles	. 38	. 11
Influenza	40. 11	31. 09
Malaria	13. 88	13. 42
Measles	14. 36	. 41
Mumps	10. 45	15. 32
Pneumonia	5. 58	5. 52
Scarlet fever	3. 20	1. 63
Smallpox	. 19	0
Tuberculosis	4. 04	3. 06
Typhoid fever	. 10	0

TABLE No. 1.—*Monthly report of morbidity in the United States Navy and Marine Corps for the month of January, 1925*

	Forces afloat	Forces ashore	Marines Corps	Entire Navy
Average strength	76,964	40,504	20,695	117,468
All causes:				
Number of admissions	3,093	2,661	1,022	5,757
Annual rate per 1,000	482.25	788.37	592.61	587.80
Disease only:				
Number of admissions	2,681	2,345	894	5,026
Annual rate per 1,000	418.01	694.75	518.39	513.43
Communicable diseases, exclusive of venereal disease:				
Number of admissions	1,208	1,378	315	2,586
Annual rate per 1,000	188.35	408.26	182.65	264.17
Venereal diseases:				
Number of admissions	1,132	417	168	1,549
Annual rate per 1,000	176.50	123.54	97.41	158.24
Injuries:				
Number of admissions	406	308	127	714
Annual rate per 1,000	63.30	91.25	73.64	72.94
Poisons:				
Number of admissions	6	8	1	14
Annual rate per 1,000	0.94	2.37	5.80	1.43

TABLE No. 2.—*Deaths reported, entire Navy, for the month of January, 1925*

	Navy (strength, 96,773)	Marine Corps (strength, 20,695)	Total (strength, 117,468)
Pneumonia, lobar	4	0	4
Tuberculosis	2	0	2
Syphilis	1	0	1
Other diseases	6	4	10
Drowning	9	0	9
Other accidents and injuries	12	1	13
Poisoning	2	0	2
Total	36	5	41
Annual death rate per 1,000, all causes	4.46	2.90	4.19
Annual death rate per 1,000, disease only	1.61	2.34	1.74

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1925

NAVY DEPARTMENT,
Washington, March 20, 1907.

This UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

Owing to the exhaustion of certain numbers of the BULLETIN and the frequent demands from libraries, etc., for copies to complete their files, the return of any of the following issues will be greatly appreciated:

Volume VII, No. 2, April, 1913.
Volume VIII, No. 1, January, 1914.
Volume VIII, No. 3, July, 1914.
Volume VIII, No. 4, October, 1914.
Volume X, No. 1, January, 1916.
Volume XI, No. 1, January, 1917.
Volume XI, No. 1, January, 1917.
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PREFACE

THE UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April, 1907, as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, reports from various sources, historical essays, notes and comments on topics of medical interest, and reviews or notices of the latest published medical books.

The bureau extends an invitation to all medical officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit and will recommend that copies of such letters be made a part of the official record of the officers concerned.

The bureau does not necessarily undertake to indorse all views or opinions which may be expressed in the pages of this publication.

E. R. STITT,
Surgeon General United States Navy.

NOTICE TO SERVICE CONTRIBUTORS

Contributions to the BULLETIN should be typewritten, *double spaced*, on plain paper, and should have wide margins. Fasteners which will not tear the paper when removed should be used. Nothing should be written in the manuscript which is not intended for publication. For example, addresses, dates, etc., not a part of the article, require deletion by the editor. The BULLETIN endeavors to follow a uniform style in headings and captions, and the editor can be spared much time and trouble, and unnecessary changes in manuscript can be obviated, if authors will follow in these particulars the practice of recent issues.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received two months prior to the date of the issue for which they are intended.

The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustrations, if not original, should be accompanied by a reference to the source and a statement as to whether or not reproduction has been authorized.

The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc. All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.*

U. S. NAVAL MEDICAL BULLETIN

VOL. XXII APRIL, 1925 No. 4

SPECIAL ARTICLES

A MATHEMATICAL ROOT CANAL GAUGE

By H. E. HARVEY, Lieutenant Commander, Dental Corps, United States Navy

It is believed that the assertion may be safely made that the majority of dental surgeons feel the need of an appliance with which to measure the depths reached by dental instruments which are introduced into root canals during the operations of exploring, enlarging, and filling. Of special importance is the need for a comparison between the relative distances penetrated by the initial fine instruments and by the files and reamers which are used later to enlarge the lumina of canals.

A common way to determine and compare this distance is by piercing a small piece of rubber dam for utilization as a washer on the canal instrument. This, however, proves to be unsatisfactory inasmuch as it is extremely unstable and bends or slips easily. Furthermore, the measurement obtained can not be conveniently recorded for future use or transferred with precision to other instruments.

An endeavor to overcome these difficulties and to obtain a gauge which would record the actual length of penetration and automatically transfer this exact measurement to any number of other instruments resulted in the construction of the home-made appliance illustrated in Figure 1. This appliance was made from the small tin box in which is sold a popular brand of dental films. The box is approximately 1¾ by 1¼ by 1 inch. As will be seen, it can be constructed in a few minutes by removing the lid and cutting one hole and two slots in the end of the box. The hole is made with a No. 4 round burr and the slots, which are one-fourth of an inch in depth, with Nos. 559 and 561 fissure burrs. The lid is replaced so that one end of it projects down inside the box and the gauge is completed.

To secure a measurement, a broach is equipped with a washer made by piercing in the center, at right angles to its surface, a piece of 18

or 19-gauge rubber bandage gum, one-third of an inch in diameter. This broach is introduced into the canal to the desired penetration and the washer is adjusted so that it just touches the occlusal surface or other landmark of the tooth. It is withdrawn without disturbing the position of the washer. The broach is inserted through the hole in the end of the box until the washer comes in contact with the box. The end of the lid, which projects down in the box, is then moved to touch the end of the instrument. To transfer this measurement to another instrument equipped with a washer, it is inserted in the hole or one of the slots and forced through the washer until the point rests against the end of the lid without undue pressure being exerted upon the instrument handle. The lid should be bent a little on the sides to hold securely at any position.

There are several objections to this crude gauge, the principle one being that no mathematical record is conveniently obtainable. Incidentally, it does not present a pleasing or scientific appearance. The usefulness of this home-made device is practically limited to the treatment of a single canal, as movement of the lid requires further exploration to duplicate the original measurement.

The writer has devised a mathematical root canal gauge for use in connection with measuring, enlarging, and filling root canals. It has been used in the office for some months in all canal operations, with increasing satisfaction.

As will be noted in Figure 2, this mathematical gauge, which was constructed for the writer by Brown & Sharpe, of Providence, is a measuring device of the simplest type, yet designed to record, in millimeters and inches, the depth to which a dental instrument is inserted into a root canal. It is constructed to transfer automatically this, or any given measurement, to other instruments. The gauge consists essentially of two plates, each about an inch square, held face to face in a device which permits of their being separated from each other with a registration of the distance between them. The plates and thumb-screw nuts are removable for sterilization.

In effecting and transferring measurements, washers of pure rubber bandage gum are utilized. These washers, of 14 to 19 Brown & Sharpe gauge (one-sixteenth to one thirty-second of an inch in thickness), are cut in squares one-third of an inch in diameter and pierced in the center with the instrument. Their thickness is sufficient to prevent displacement unless considerable force is directly applied and they will stand at right angles to the long axis of an instrument, returning to that position if bent.

The washers may be boiled repeatedly or autoclaved without rapid deterioration and may be sterilized on the instruments. All instruments for root canal treatment, such as smooth and barbed broaches, files, reamers, root canal pluggers, Gates-Glidden drills,

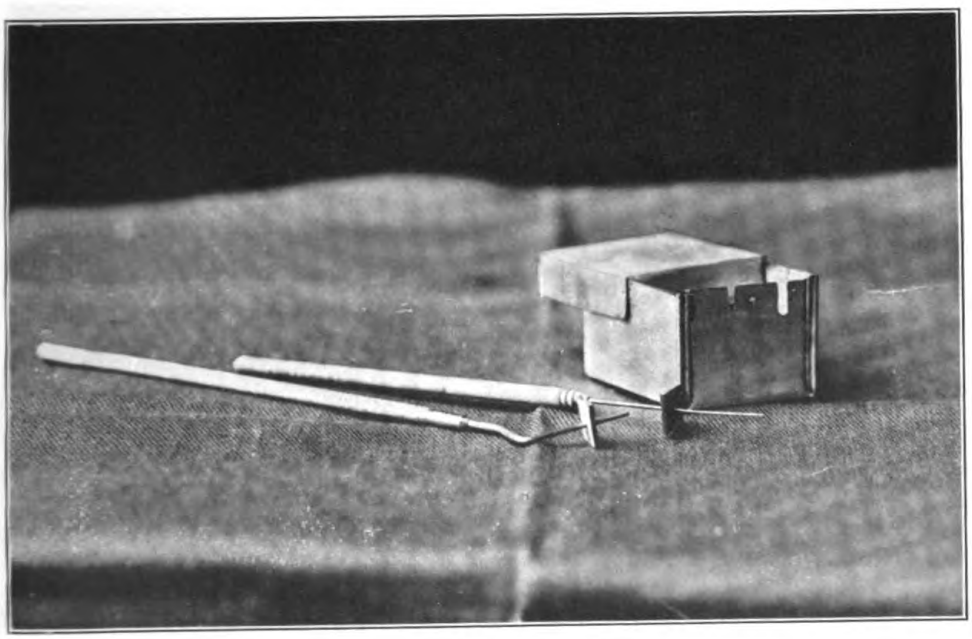

Fig. 1.—Improvised root-canal gauge

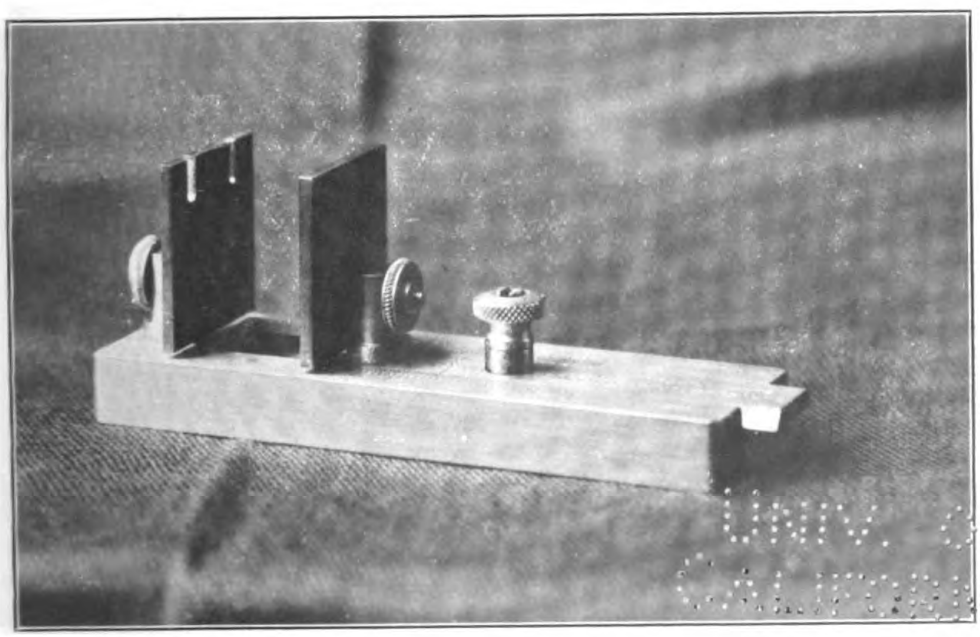

Fig. 2.—Mathematical root-canal gauge

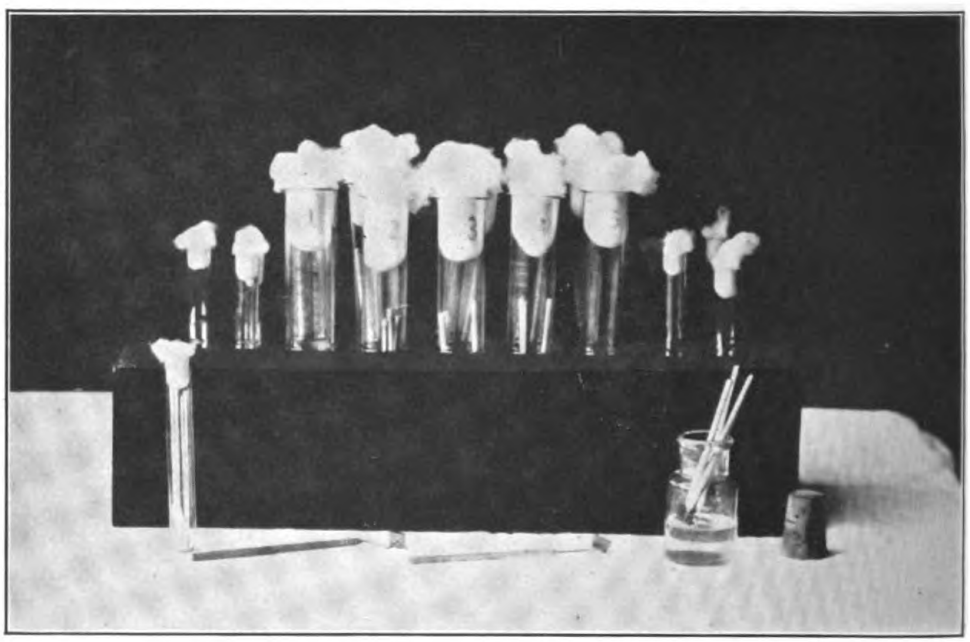

Fig. 3.—Aseptic instrument holder

and engine instruments, should be thus equipped and sterilized in order that they may be ready for immediate use. When used on revolving engine instruments, care should be taken that the washers do not quite touch the landmarks.

Pure elastic rubber of any thickness over 20-gauge is suitable material for washers. Rubber of one-eighth inch thickness is extremely stable, but too much force is required to move it conveniently on the long axis of the instrument. In preparing washers for larger size instruments, such as canal pluggers, a hole slightly smaller in diameter than the instrument should be punched in the center of the washer with a rubber dam punch. This eliminates the tendency of the washers to belly in or out and permits them to maintain straight surfaces at right angles to the shafts of the instruments. The use of washers and the gauge will determine the penetration of various sized canal pluggers and will indicate which instruments may be used to pack or place filling materials in the apical end of a canal.

To pierce a washer at right angles to its surface, remove it from the alcohol bath and place it while still wet, over the hole in the gauge plate which is held horizontally toward the light. The light spot reflected through the moist rubber will indicate the place to insert the instrument. For a very fine instrument, a hole should be pierced with a root canal file and the washer held toward the light and stretched with both hands while the instrument is inserted by an assistant. Further manipulation with the fingers or pliers is not required, as the washer can be shifted by placing the instrument in a slot in the gauge plate with the washer on either side of the plate, depending upon the direction in which it is to be moved.

To secure a measurement, a broach equipped with a washer is inserted in the canal to the desired distance or about to the apical foramen, where indicated, and the washer adjusted to touch, without pressure, the occlusal surface or other landmark of the tooth. It is then withdrawn without disturbing the position of the washer and inserted through the hole in the plate until the washer rests against the plate. The opposite plate is then moved to touch the end of the projecting instrument and the set screw secured at this distance.

The scale on the base of the gauge will give a reading in millimeters and inches of the distance or depth of penetration, which is the distance from the point of the instrument to the washer. The length of average canals will permit washers one-third of an inch in diameter to remain at a sufficient distance from the ends of the instruments not to obstruct a view of their introduction into the

30683—25——2

pulpal ends of the canals. All instruments for posterior canals except pluggers are bent, about an inch from their ends, to a definite angle approximating 55 degrees.

The measurement of a canal should be recorded on a work chart. A convenient way of doing this is to designate letters to represent canals in certain anatomical relations. For example, "A" would mean the canal in a single-rooted tooth or the anterior buccal canal in any other tooth. The letter "B" would represent a lingual or anterior lingual canal. "C" would indicate a distal or disto-buccal, and "D" a disto-lingual canal. The gauge registers in one-fiftieth inch and one-half millimeter and records should follow the system preferred. The record should show the number of the tooth, followed by the letter designating the canal and the figure indicating depth of penetration, with an "x" to denote that the apical foramen has been reached.

To illustrate: 3–A–50x, B–47x, C–40 would indicate that the upper right first molar had been explored as indicated, the figures representing one-fiftieth inch and the "x" indicating that the apices of canals "A" and "B" had been reached.

To transfer a measurement, the gauge being set either by scale or actual measurement, an instrument equipped with a washer is inserted in the perforated plate and pushed through the washer until its point remains in contact with the other plate, without pressure being exerted on the instrument handle. To illustrate, when the scale is set at forty-four-fiftieths and secured with the set screw, thereafter instruments inserted to rest against the opposite plate will have their washers at this distance from the ends.

After a canal measurement has been ascertained, the washers are set to that distance on all instruments immediately before starting an operation.

An actual trial of the thickness of rubber suggested for washers will demonstrate that they can not be displaced without the exertion of considerably more force than should be used in root canal operations. Application of force sufficient to move the washers on instruments will cause complete surface distortion, leaving no doubt to an observer that pressure is being applied. As in the use of any instrument of precision, the washers should be used with care and permitted to touch but lightly the landmark when a measurement or check is made. A change in the level or form of the washers while the instruments are in the canals denotes that the landmark is being more than lightly touched.

Rubber deteriorates with age, and for this reason recently made bandage gum should be procured from a reputable manufacturer and washers discarded when they lose their friction on instruments.

Washers in use in this office have been boiled on an average of at least once daily for several months without apparent change, for they still retain smooth surfaces and remain at right angles to the instruments.

A series of tests was made by sterilizing washers on broaches daily for 10 days. This was done in the operating-room autoclave along with surgical dressings, for the sterilization of which a pressure of 20 pounds is held for 20 minutes. After the first sterilization, washers of 25 gauge rubber—which, incidentally, is thicker than the material used for medium rubber dam—were distorted and useless. Washers of 19 gauge upon the conclusion of the tests remained smooth and firm and held their positions at right angles to the instruments. Friction was impaired although it was still present in some degree.

In canals having a diameter of 0.011 inch or over at the apical end, the exact length can usually be obtained by using a Donaldson hook broach with a washer, hooking over the apical edge and bending a little where necessitated by a craterlike formation. This is of value in enlarging the canals.

The gauge is, perhaps, of most value in the assistance it renders while enlarging canals, for visible evidence is given at all times of the comparative penetration of succeeding instruments with the original measurement. It is useful in comparing actual measurements with radiographic findings. The length of a diagnostic wire, determined in the gauge, added to the length of the plugger required to reach the pulpal end of the wire in position, also measured on the gauge, will give the depth of penetration of the wire from the landmark and consequently the measurement to be set for washers on instruments designed to reach an equal penetration.

The gauge would seem to be adaptable to practically all root canal techniques and should increase their efficiency, since it visualizes relative penetration at all times and thereby imparts a sense of security and exactness during manipulations. It can be used for any system of measurement, serving equally well with metal holders, sliding metal guards, or disks. Metal guard holders have been found to impair a delicate sense of touch which the use of washers does not affect.

Kerr style bayonet pluggers have not proved to be satisfactory for use with measuring devices because their working points are too short. Considerable length is sacrificed to curves, and the smaller sizes increase too rapidly in diameter from the point toward the shaft. The requirement for a suitable style of plugger has been met by bending Kerr style straight pluggers to correspond roughly to the shape of the bayonet pluggers, leaving the working points about an inch in length and making definite angles instead

of curves. Pluggers should be left without further alteration after they have been once bent, as definite angles facilitate accurate measurements and firm packing. Twentieth Century and Caulk pluggers which were bent in this manner have given satisfactory service in fine canals.

For those who are partial to seating canal points in hardening pastes, such as the combination of zinc oxide and eugenol, or in cements, the following is suggested: A test of 12 different-sized pluggers is made from a like number of Kerr style straight pluggers, leaving six of them as purchased and reducing the diameters of the others down to intermediate gauge numbers. In addition to the six consecutive numbers as purchased, two No. 3, two No. 4, and two No. 5 pluggers can be disked down until they conform to Brown & Sharpe gauge Nos. 25, 24, 21, 20, 18, and 17. After having been reduced in size, all of them are bent to bayonet shape and equipped with washers. They are then available in the double capacity of root canal pluggers for posterior canals and foramen diameter gauges for straight canals having accessible foramina.

After having enlarged the canal, the insertion of successively smaller pluggers will result in finding one which will just penetrate to the depth of the washer with a feeling of snugness. The approximate diameter of the apical opening may be determined in this manner. The diameter of the plugger which has been selected is measured in a wire gauge plate and a suitable gutta-percha point is inserted as far as it will go in the same number in the wire-gauge plate. The point is then severed close to the plate with a safety razor blade. This furnishes a cone of the same approximate end diameter as the canal opening.

The length of the canal having been obtained previously with a hook broach or by some other means, the length of the cone to be used may be determined by inserting in the pulp chamber a plugger larger than the pulpal opening of the canal and adjusting the washer so that the plugger will not quite reach the orifice of the canal when the landmark is touched with the washer. The distance between the end of the plugger and the washer measured on the gauge and substracted from the distance between the landmark and the apex of the tooth will give that required for the cone. The cone may be cut to exactly this length by setting the gauge to the distance and inserting the cut end of the cone to rest against the opposite plate, severing on the outer side of the perforated plate. This gives a cone which, when inserted in the canal ahead of the plugger, should reach the apical foramen as the washer on the plugger touches the landmark.

For fine canals, points of iridio-platinum, gold, or gutta-percha reinforced with silver wire may be used to insure stiffness. The

inside of the canal and the surface of the point having been thinly coated with the cementing substance, the final filling is made. If desired, radiographs may be taken with a preliminary insertion of the points, without the cementing substance.

Filling canals after the method advocated by Doctor Abraham[1] may be facilitated with the gauge. The penetration of the pluggers may be measured accurately and noted and those which go to or nearly to the apex may be used to cause a slight extrusion of the filling material.

For pulpotomy and the treatment of teeth with recently extirpated vital pulps, the gauge will serve as a check against going further into a canal than is desired. In these cases, washers one-eighth of an inch in thickness may be employed if fear is felt of exerting pressure on the remaining portion of vital tissue. Washers of this thickness can be moved on the long axis of the instruments only with considerable force and will not bend.

The filling of multiple canals presents a problem as yet unsolved and the use of the gauge represents merely an effort to lighten the labor in routine root canal treatment and to give to it, perhaps, an exactness which seems lacking in most of the techniques employed.

The B. F. Goodrich Co., of Akron, Ohio, was kind enough to furnish samples of pure bandage gum with which experiments were undertaken to determine the most suitable thickness for this work.

Good quality rubber has proper resiliency and should serve for many operations without perceptible deterioration incident to repeated sterilizations by boiling or autoclaving. A routine is established of having all files and broaches, equipped with washers, sterilized and in test tubes ready for immediate use, as shown in Figure 3. They are removed as required from the test tubes and set in one ounce, salt mouth, cork-stoppered bottles containing alcohol, from which they are used and returned during the operation. At the conclusion of the operation they are sterilized with the other instruments, dried, and returned to their respective test tubes. They may be autoclaved in the test tubes if sufficient vacuum is made to dry them thoroughly.

For the convenience of the operator and the sterilizing assistant, all file and broach handles are marked with rings made with thin separating disks, the number of rings on any instrument corresponding to the number of the test tube in which it belongs and the bottle from which it is used. For instance, test tube No. 1 will contain the three finer sizes of Kerr files marked with one ring, while tube No. 4 will contain the three finer sizes which have been bent to

[1] Abraham, Samuel, Ph. C., D. D. S., "The Conservative Treatment of Pulpless Teeth," Dental Items of Interest, Volume XLV.

55 degrees for posterior treatment and which are encircled with four rings. Individual instruments are marked one step further so the operator may see at a glance the relative sizes in each bottle. The finest has the end of its handle ground to cone shape, the medium is flattened to a tent shape by grinding two sides and the coarse is left as purchased. Test tubes and bottles are numbered by grinding the numbers on them with a small mounted disk stone and rubbing into this roughened surface a blue pencil such as is used by bacteriologists for marking glass.

In handling an absorbent point, the gauge is set for the canal and the point is grasped with the pliers at the proper distance from the end, as shown by holding over the gauge and inserting to the depth where grasped. This determines whether or not the point penetrates the length of the canal and likewise discloses the presence or absence of moisture in the canal proper. This fact is not readily ascertainable if the point is permitted to project into the tissues beyond the apical opening.

Additional uses for the gauge may be established.

NOTE.—The washers used in the successful experiments were marked 20 gauge by the manufacturers, but measured 19 gauge in a Brown & Sharpe wire gauge plate, having a thickness of 0.03589 inch. This is a little greater than one thirty-second of an inch. Washers of exactly 20 gauge are considered to be a little too thin.

THE DENTAL DEPARTMENT, UNITED STATES NAVAL HOSPITAL, PHILADELPHIA, PA.

By E. H. TENNENT, Lieutenant Commander, Dental Corps, United States Navy

Three years ago, a dental officer was assigned to duty at League Island Hospital, Philadelphia, and, as is the general rule, at first all of his time was devoted to caring for the relief of pain and the insertion of fillings. However, with a closer association with disease, it was soon realized that a greater service lay in working out the connection or influence of dental conditions to general disease.

Just how to serve the demand for what may be termed "general" dentistry and yet function in that not yet understood field that forms the "no man's land" between medicine and dentistry, became quite a problem; especially so since there was no definite procedure or routine for dental officers in naval hospitals. Under such circumstances, one must depend upon his own initiative and ingenuity, hence this writing with the hope that a seed may be planted from which some standard may be developed, that the dental officer and the hospital staff will know just what is to be expected of the dental department.

At the present time, only about 50 per cent of what may be regarded as the maximum service is obtained from the dental department. The other 50 per cent is not yet provided for, either in equipment or personnel. This article therefore may be divided into two parts, viz., the 50 per cent that now functions and the remainder which, it is hoped, also will become the standard of every naval hospital.

In order to clarify the functioning of the dental department, it is necessary to explain the organization of the hospital and the correlation of one activity with another. At a glance, the accompanying diagram (Fig. 1) readily shows three main divisions, namely, Administration, Surgery, and General Medicine and their subdivisions, i. e., the specialties. From this, one can make quickly a mental picture of how one department operates in conjunction with another, although a casual reader may not understand just what information is desired from these various departments.

Of course, the dental department is here under consideration and the blanket term "dental focal infection" is the main thought. Even this subject may be without interest to the reader unless there is a better understanding of dental foci and of the classes of diseases and injuries that may be influenced by such infections. To give one a fair idea of how attention has been directed to this work, a few of the diseases in which the dental department is of assistance in determining etiology and treatment will be mentioned, while at the same time an attempt will be made to explain the relation of the respective divisions.

To follow the chart, administration comes first. It is to be noted that the dental department bears the same relation to the executive and commanding officers as any other department.

Such matters as material, civilian employees, and routine necessary to the maintenance of a large hospital will not be touched upon here, but the routine which applies to the handling of the sick must necessarily be shown. A patient is received and sent to the indicated service, either surgical or medical, where his case is taken up for study and confirmation of diagnosis. At this time, all of the specialties in the hospital, including the laboratory, genito-urinary, X-ray, nose and throat, eye and ear, and dental departments are called upon to examine in their particular fields and to furnish written reports of their findings. The several reports are made a part of the clinical record and become the subject of study and discussion. The more obscure and interesting cases are discussed by the entire staff in the presence of the commanding officer.

When we speak of the dental examination, we are not concerned with simple cavities, but rather with areas of dental disease which may influence the body. The patient is sent for the examination

with a prescribed form on which are written the general symptoms and diagnosis of the condition with which he is admitted. Certain

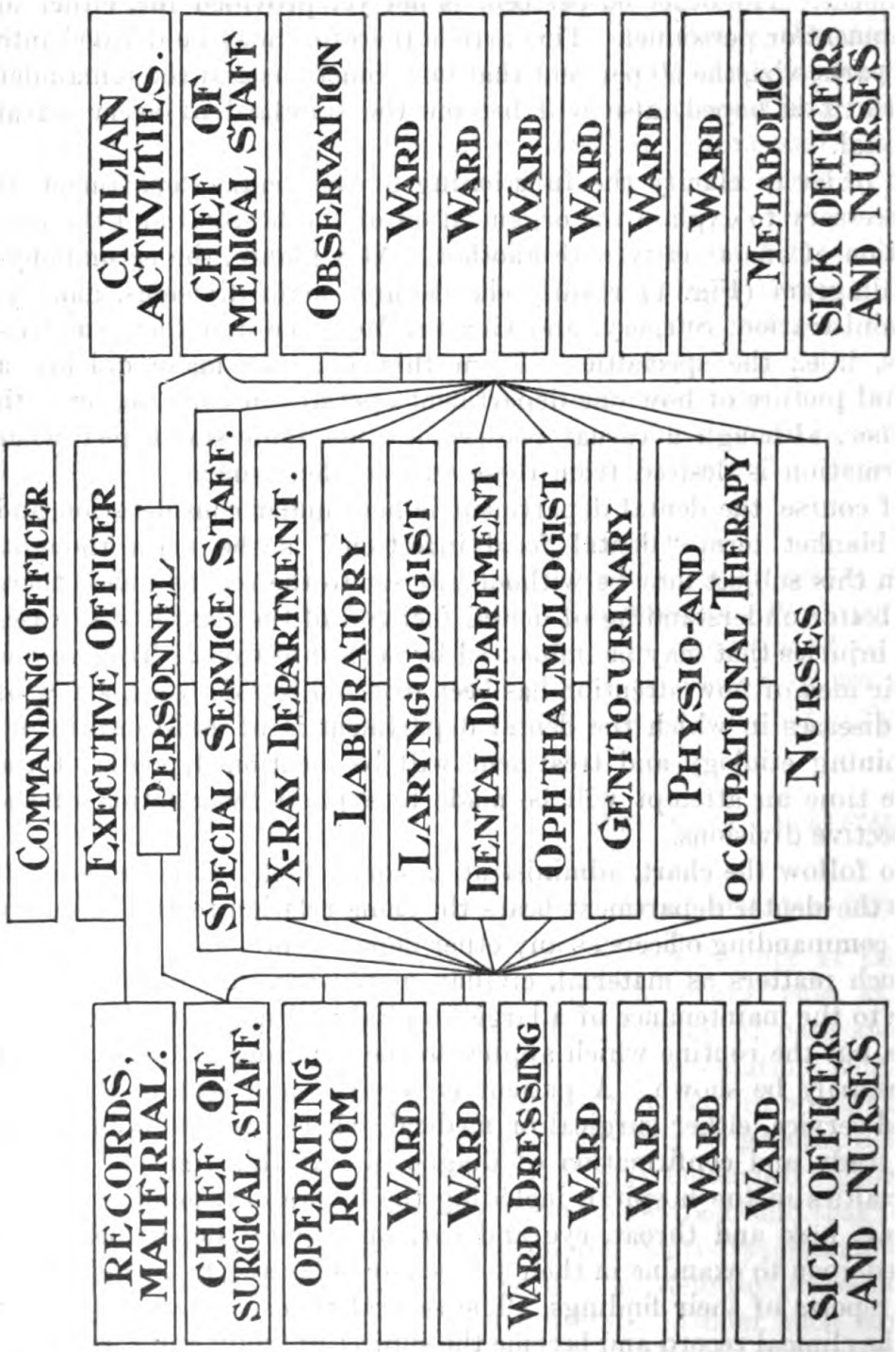

FIG. 1.—Chart illustrating hospital organization

dental diseases seem to produce specific systematic symptoms, hence the importance of a correct diagnosis.

The patient is seated in the dental chair and the mouth is studied to determine the following points which are essential to a complete

examination: Does it look healthy? The color of the mucous membrane is then studied. Is the interdental papilla hypertrophied or hyperemic? Are the gums flabby or firm? Are there any fistulae or scars? Test each tooth to determine its firmness. Apply the percussion test to each tooth. Study the color of each tooth and the conditions of old fillings, noting their size and considering the possibility of encroachment upon the pulp. Note the extent of caries in each tooth involved. Each suspicious tooth should be tested thermally. Note the occlusion of the teeth. Draw an instrument along the morsal surface and incisal edge of the teeth and watch the palpebral muscle for a possible sign. Obtain the history of all extracted teeth. Make a note of type of calculus, if any. Explore for pockets around the roots of the teeth. Are there any enamel fractures? Palpate for symmetry of alveolar border. Select and enumerate the teeth or areas to be X-rayed. Take the patient into a dark room and transilluminate the maxillary sinuses and the alveoli of both jaws. Make notes of all findings and return the patient to his ward while waiting for X-rays. Upon the return of the dental films, study them in a suitable light and make a report of the findings to the medical officer having the patient in charge.

The study of focal infections in relation to conditions which demand surgical interference has taught us that it is quite possible that a dental focus may be a potent influence in the cause of disease and in the retardation of repair. This has been especially true in such conditions as synovitis, pes planus, enlarged glands, abscesses, obscure pelvic and vertebral tenderness, operative gastric ulcers, cholecystitis, symptoms of kidney stones and gall stones, slow healing fractures, appendicitis, osteomyelitis, furunculosis, intestinal obstruction, etc. Some of these may be questioned, but how can the body be a perfect resistive machine when one or more parts of it are broken down and loaded with some destructive agency which disseminates poison into the surrounding tissues. In addition to the thought that dental conditions may be the cause of, or greatly influence disturbances in other parts of the body, there is the ever increasing demand for oral prophylactic treatment. It is desirable that such treatment be given preoperative cases, especially when ether anesthesia is to be administered and the mouth of the patient is found to be loaded with putrescent or pussy material.

In considering the importance of dental treatment to patients who are under the cognizance of the general medical service, it is possible that any given case may be influenced by dental infection, and there are many systemic diseases of which dental infections are undoubtedly the cause. Conditions in connection with which dental

infections seem to be ever present, include gastric disturbances, rheumatic fever, septic headache, acute and chronic cardiac disease, nephritis, diabetes, duodenal ulcer, sclerosis, arthritis, paralysis, epilepsy, septic goiter, and all skin diseases. No case should be treated without giving due consideration to dental focal infection which the writer believes to be equal in importance to tonsillar infection.

Turning to the special services, the subject of dental infection has been found to be of special interest to the eye department and such cases as optic atrophy, iritis, cyclitis, paralysis of optic muscles, keratitis, etc., have been referred for dental treatment. With no treatment by the ophthalmologist many such cases have shown marked improvement and permanent repair often has resulted.

The nose and throat department has a still closer relation; so close in fact, that it is hard to tell just where the rhino-laryngologist and the oral surgeon should stop, lest one encroach upon the field of the other. Abscessed areas and necrotic channels of the anterior teeth often extend into the floor of the nares, and a developing abscess at the apex of a bicuspid or molar tooth frequently pushes its way on through the thin bony floor of the antrum.

There are times when the invading bacteria from infected teeth seem to have waited until they have passed through the floor of the antrum before starting the destruction of tissue and the formation of pus. The process rips up the muco-periosteal membrane lining the floor and stimulates the condition that we have when pus, seeking the road of least resistance, finds its way through the alveolar bone and bulges out the gum tissue. Picture a similar condition on the floor of the antrum and consider who should handle or treat such a situation. The antrum may be punctured and washed until "Doomsday," but there will be no signs of pus and the invading bacteria will not be reached or destroyed.

Only a real surgical interference will help such a situation and the dental surgeon must enter the antrum, possibly best through the socket of the offending tooth, and render such treatment as the condition may demand. So then, we have two specialists interested in the same field. A solution of the problem may be found in a custom which prevails at this hospital. When a maxillary sinusitis comes under the care of the rhinologist, the dental surgeon is called upon to verify or rule out dental infection and to give subsequent treatment if necessary. This does not mean that the nose and throat department drops the case or loses interest in it when a dental cause is found, but merely marks time while observing the result of the dental procedure. While this is a division of the field in one sense, it is also a display of cooperation between the two specialists.

Passing on, we have the X-ray department. Here, the cooperation between two departments can not be overestimated, for there is no doubt that many times the X-ray officer feels that too many pictures are requested and that too many retakes are wanted. Nevertheless, his effort to furnish the best possible service to the dental department is an important asset. The dental department is available for the interpretation of dental films and we may in this connection digress to say a word or two regarding the interpretation of dental films.

The film itself is insignificant looking and to the person who is not versed in dental anatomy, histology, and pathology, it should mean nothing. Forty-nine times out of fifty, such is the case. Any one can recognize what appears to be an abscess at a root apex, but it is believed that there are few of us who are qualified to identify the many pathological conditions that show up in the hard and soft tissues peculiar to teeth. If that which you have just read hurts your pride a little, just ask yourself, "What did I look for on the last dental film that I held up to the light?" I dare say that the question of an abscess was the only thing in your mind, hence you looked only for the characteristic radiolucent area at the root apex. If present, were you able to tell whether or not the condition was an old subdormant abscess or an active dental focus?

There may be some question of danger in the first type; but in the second great danger to the patient's health undoubtedly exists. Granting that there was no radiolucent area, did you study the peridental membrane to determine continuity, thickness, or signs of inflammation? Did you study the bone lamina of the socket to determine whether or not abnormal stress had been brought to bear? Did you study carefully the structure adjacent to the tooth root for any bone changes? Did you determine that the bone was normal and free from any signs of edema or that an absorptive process was going on? Did you take note of any undue calcification and note the cause of it? Did you see any so-called black spots? What information did you gain concerning the regularity of the canal walls? Were any nodules present? Were there any pulp stones present either in the canal or pulp chamber? Was there any difference as to density of the tooth crown, and, if a multirooted tooth, was the penetration sufficient and the angle correct so that all roots could be studied alike? Did you look for a protrusion of a filling at the gum margin, or ascertain whether or not a filling encroached upon a horn of the pulp? Did all of the above come into your mind? It could not have unless you are thoroughly versed in the subject under study. It takes a trained eye and experience in habitual reading of films and you must first know that such things exist.

Last, but not by any means least, there is the bacteriological laboratory, which functions with the dental department in making bacterial and microscopical findings from active or suspicious areas about the mouth and root apices, assists in the study of the behavior of leucocytes in the several dental infections, and is of a great help in the charting of haemoglobin index in cases of active absorption.

In the foregoing it is not intended to sing the praises of anyone, but to show how the dental department serves this hospital.

Looking ahead a little and from the above, it may be seen readily that such services could be much improved. Let us take, for example, the need of dental prophylactic treatment in this hospital. All surgical cases should receive this treatment, to say nothing about other bed patients. This prophylaxis should include not only the scaling of teeth, but also treatment of the gums and the removal of diseased roots which are unquestionably useless.

In the next place, we should not be lagging behind civilian hospitals in the subject of dental diagnosis and oral surgery. Civilian hospitals throughout the United States have qualified oral surgeons and dental diagnosticians. In fact, they go so far as to have wards that are especially designated and equipped for the care of dental patients, of whom there are many nowadays. When we refer to dental patients we have in mind those who are hospitalized for dental conditions alone plus those patients whose subsequent diagnosis turns out to be a dental condition.

Such cases as Vincent's infection of the gums, pyorrhea (suppurative periodontitis), surgical removal of teeth, fracture of the maxilla, necrosis of the jaw, abscess of the jaw with external fistula, root resections, apicoectomy, chronic gingivitis, pericementitis, cellulitis due to impacted or erupting third molars and abscesses of the antrum associated with teeth are constantly under treatment in the hospital.

It is true that some of these conditions can be treated at the patient's regular station or duty, but will it be denied that the ideal treatment would be hospitalization?

The question of X-ray comes next in mind. Just how can any dental surgeon know when he has completely and perfectly filled a root canal, unless there is a picture as a check on each step? And this means two to four pictures. There are two ways of taking dental pictures, a good and a poor way. The value of clear detail in dental films is well known, but the average X-ray establishment often fails to appreciate this fact. Of course, we get films that show roots, teeth, and bone, but the fine detail often is missing. With no apology for his frankness, the writer wishes to say that it is perfectly absurd to expect an X-ray operator to obtain pic-

tures which will show all that should be shown when he is unfamiliar with the subject at hand. Consider the time saved to the dental surgeon and the patient. This hospital should be equipped with a dental X-ray machine, the services of which would be available for the whole naval district.

If we are to arrive anywhere in the study of dental focal infection, there must be provisions made for a strict record of all diseases in which such infection seems to be a factor. The diseases must be classified and the nature of the dental infection noted. Such changes in the course of the disease as may occur following elimination of the dental disease must also be noted and the final behavior of the general and local conditions should be watched closely.

While the volume of work at this hospital does not permit the keeping of any definite data, yet it has been noted that patients with such disease as inflammatory conditions of the eye, rheumatism, cardiac lesions, synovitis, bronchitis, anemia, and diabetes often have aggravating dental infective areas. This is true especially in inflammatory diseases of the eye and the several cardiac lesions. In the former class of conditions it is found that a large percentage of cases improve as a result of dental treatment.

It is true, possibly, that one or more phases of the system urged in this article are already in operation in other naval hospitals. But, are we getting maximum service? Would it not be well to standardize the equipment for hospitals and then to outline the functioning of the dental department? The accomplishment of such measures undoubtedly would help to increase the value of dental service and bring closer the interests of the medical and dental services.

COOPERATION BETWEEN THE SURGEON AND THE DENTAL SURGEON

By L. W. JOHNSON, Lieutenant Commander, Medical Corps, United States Navy

During the past 15 years, the subject of oral health has occupied so large a place in medical literature that its importance is now realized by the internist as well as by the dental surgeon. But the surgeon frequently fails to avail himself of the special knowledge and skill possessed by his professional colleague in the treatment of diseases and injuries about the mouth.

In the Medical Corps of the Navy, we are fortunate in having closely associated with us the Dental Corps, composed of carefully selected men who keep in touch with the latest advances in the theory and practice of dental surgery, to cooperate with us in treating patients whose oral condition is important. The surgical

service of a naval hospital receives many cases in which the surgeon and the dentist, working together as a team, can produce results greatly superior to those which either could accomplish alone. The latter has special knowledge of the anatomy and pathology of the oral cavity and is more competent in diagnosis of its surgical lesions, while the former has the special training which enables him to perform major surgical operations in the same field. Gillies says that the facial surgeon has the advantage of the orthopedist in that his instrument maker is a professional colleague who has for his goal the provision of the best masticatory result.

Fractures of the mandible make up a large part of the cases in which such team work is essential. Here the special skill of the dental surgeon is valuable in diagnosis, in determining the amount of damage done, and providing fixation of the fragments. If extensive infection or faulty union follows and requires major surgery, then the surgeon is called upon to aid his colleague. There are few exceptions to the rule that simple fractures of the mandible are more successfully handled by the dental than by the medical profession; but when complications ensue, both must work together.

Chronic arthritic or myalgic conditions of obscure etiology lead us to suspect focal infection and here we are glad to lean heavily on the dental surgeon because the most common seat of such infection lies within his field. Leukoplakia, especially in the early stages before malignant change is evident, requires the removal of all sources of irritation, whether mechanical or chemical, and for most of this we must seek dental cooperation. The writer has seen three such cases recently. Severe facial wounds involving the mouth require, during the period of primary healing, careful attention to mouth hygiene and the responsibility for this should be placed with the dental profession. When doing facial surgery, we frequently need special appliances, splints or other devices which are best made by the skilled prosthodontist.

Several cases have appeared recently in the surgical service of the United States Naval Hospital, Washington, D. C., which illustrate the point and in which the able assistance of Lieutenant Commanders Darnall and Chandler of the Navy Dental School has been invaluable. The following cases will make this clear:

Case 724.—Luetic perforation of the hard palate. There is a hole 1 inch long and averaging one-quarter of an inch wide, through which the secretions of the nose continually pass into the mouth. During the stage of active treatment of the disease, this hole was closed by a plate made at the dental school. When the condition became quiescent, repair was made by swinging a flap from the margin of the opening to provide mucous membrane lining of the nasal cavity and sliding a flap of adjacent mucous membrane as

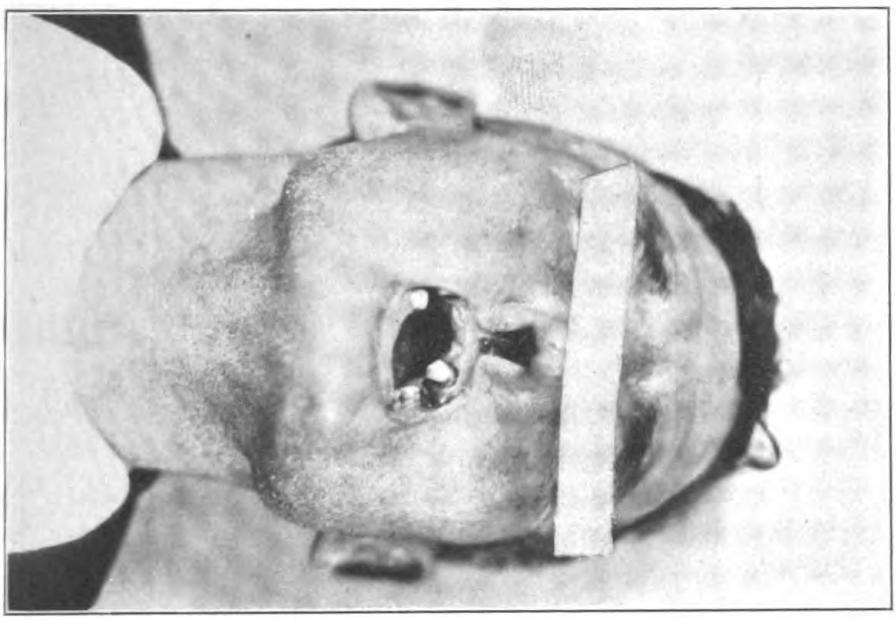

Fig. 1.— Microstoma following ulceration with loss of lips and columnella

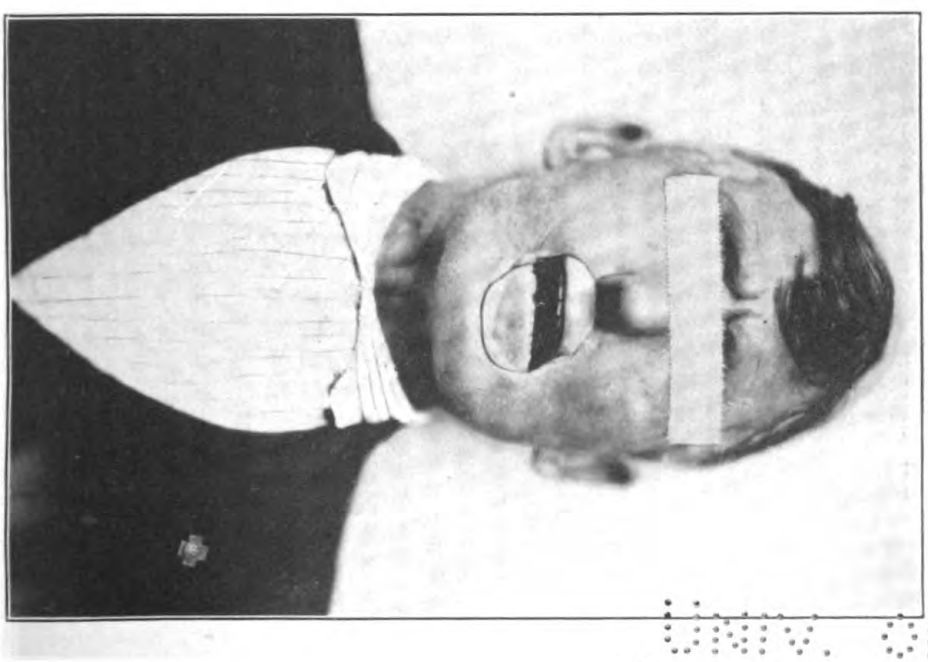

Fig. 2.- After first operation to enlarge mouth

Fig. 3.—False mustache on upper plate

Fig. 4.—Fixation by wiring upper and lower teeth

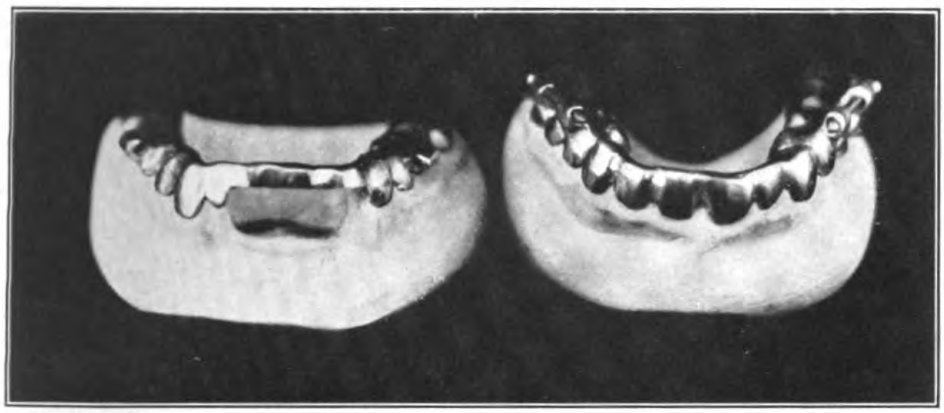

Fig. 5.—Models of jaws with position of mandibles corrected. Cast metal splints with locking device

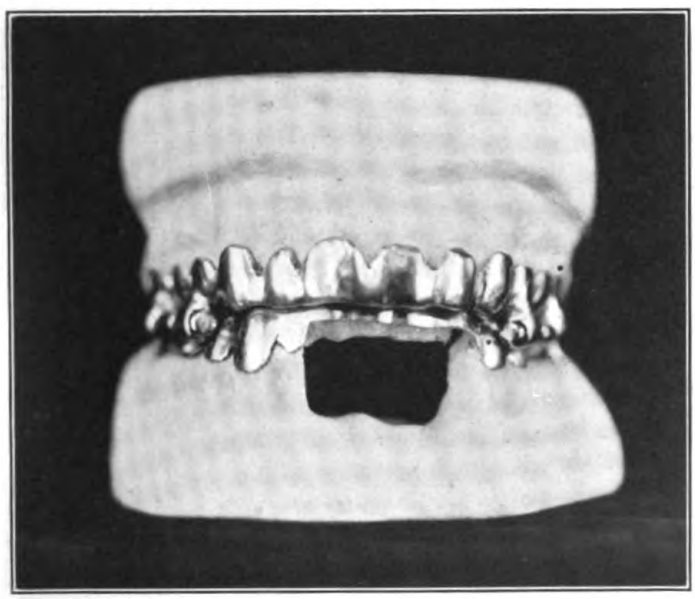

Fig. 6.—Cast metal splints with locking pins in place

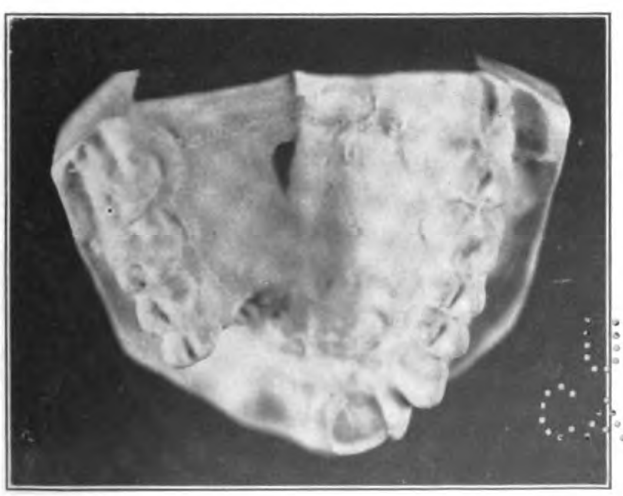

Fig. 7.—Model showing loss of teeth and opening in palate

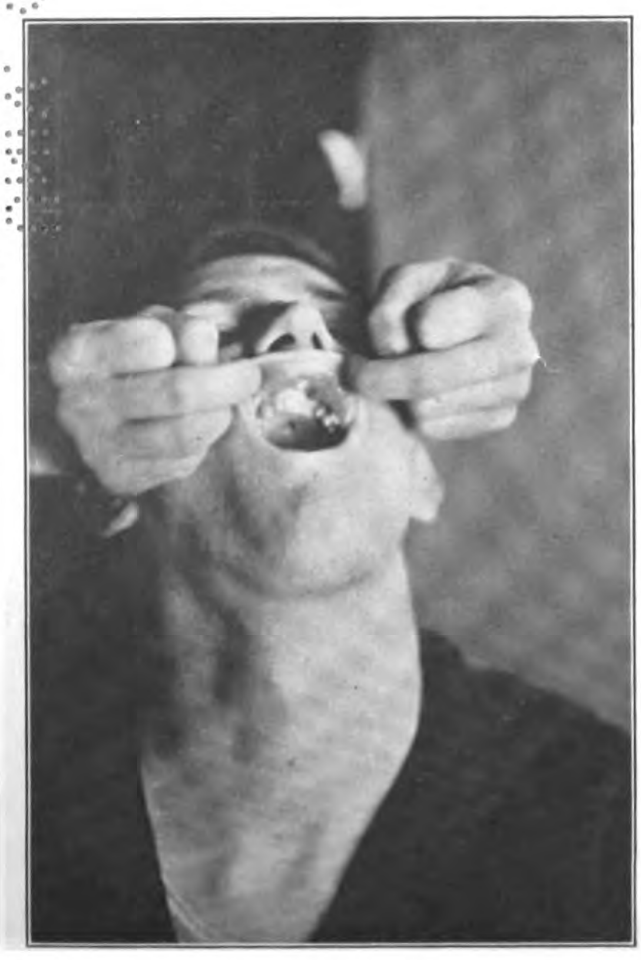

Fig. 9. - Condition of tissues after primary healing

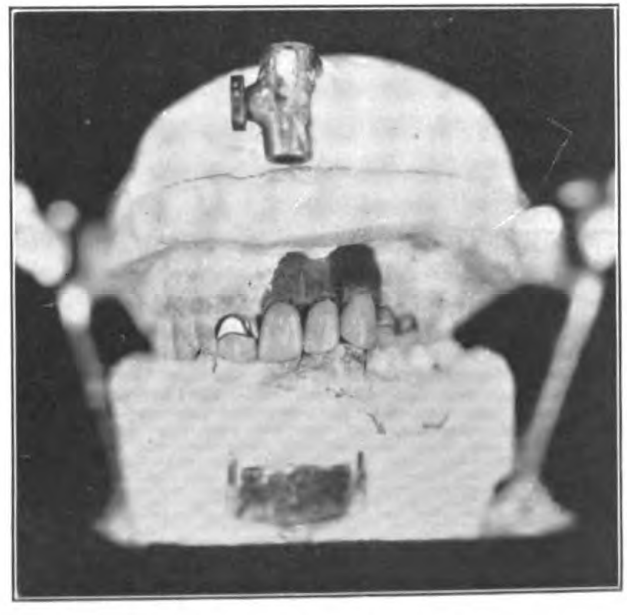

Fig. 10. Plate to replace broken teeth and cover opening in palate

a lining for the oral side. The plate was used to maintain the necessary pressure during healing and the maintenance of postoperative cleanliness was left to the dental surgeon.

Case 753.—Loss of lips and columella by a chronic ulcerative process. The plastic work in this case is still in the early stages, four operations having been done so far to provide the foundation for the more extensive repair which is to follow.

As the ulcers healed, the contraction of the scar greatly reduced the size of the stoma and allowed only one-fourth of an inch opening (fig. 1). The first operation was to enlarge the stoma by incisions three-quarters of an inch long on each side, skin being sewed to mucous membrane to maintain the opening. After healing, the patient was able to open his mouth wide enough so that impressions could be taken and plates made (fig. 2). As some time will be required to form the upper and lower sulci on each side before new lips can be made, a false mustache was placed on the upper plate to make the disfigurement less apparent (fig. 3). During the formation of the sulci for the lower lip, the plate was used to hold the stent with the epithelial graft in place. After this was formed and grafted, an extension was added to the plate to fill and maintain the sulcus. There will be further prosthetic problems to be solved as the work in this case progresses.

Case 790.—Fracture of mandible near ramus, followed by prolonged suppuration and many sequestra, with union in poor position. Under ether anesthesia, an incision was made below the mandible and the fragments were exposed and separated. The fracture was very oblique and it was possible to hold the fragments in good position with a single silver wire ligature after the surfaces were freshened (fig. 4). Repair of fractures of the jaw by nonabsorbable foreign bodies is seldom desirable, but in this particular case it was the simplest efficient method. Following the operation, the upper and lower teeth were wired together for fixation. Later, a cast metal splint was made and applied.

Case 802.—Fracture of mandible at symphysis with union in faulty position. A model was made by the dental surgeon, the position corrected, and a cast splint made (figs. 5 and 6). Under novocaine nerve-block anesthesia, working within the mouth, the jaw was refractured, the position corrected, and the splint applied. Later, under general anesthesia, an incision was made below the chin, the fractured surfaces exposed and freshened, and an osteoperiosteal graft from the tibia applied.

Case 828.—Gunshot wound of face and mouth. The bullet from a 0.38 revolver entered the left side of the upper lip; passed through the alveolus, breaking off the left central and lateral incisors and canine and being deflected by them: passed through the hard and

soft palate, producing a laceration which extended nearly to the uvula; struck the posterior pharyngeal wall and fell loose in the mouth (figs. 7 and 8).

The patient was placed in the hands of the dental officer until primary healing should be complete, which stage has now been reached (fig. 9). An appliance was made which replaced the missing teeth and covered the opening in the palate so as to facilitate speech and swallowing (fig. 10). An opening now remains at the junction of the hard and soft palate which will soon be repaired by a plastic operation.

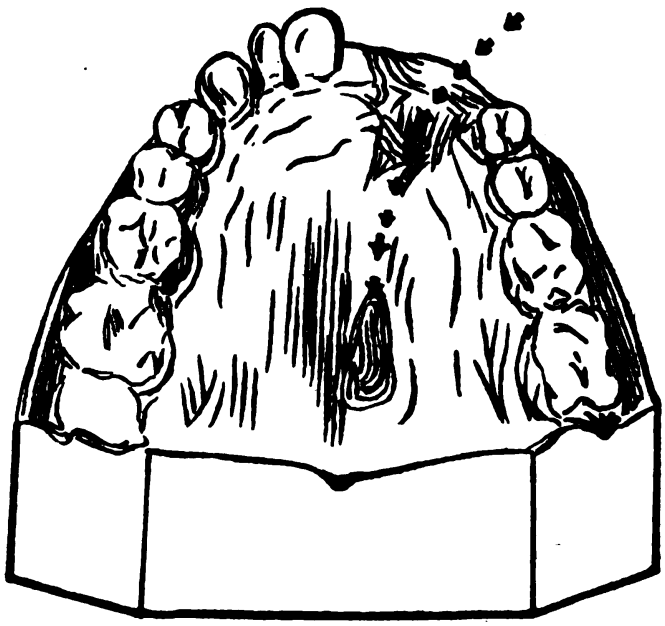

FIG. 8.—Diagram showing path of bullet

CONCLUSION

There are many border-line cases in which the dental surgeon and surgeon, working together as a team, can produce better results than either one, working alone, could produce.

THE DENTAL RECORD SHEET AS A MEANS OF IDENTIFICATION

By R. R. CREES, Lieutenant (Junior Grade), Dental Corps, United States Navy

Considerable discussion and comment is accorded the many phases of dental practice, but it is very seldom that the subject of dental record keeping is brought before the profession. While not in itself a specialty of dental practice, the keeping of the dental record is of great importance and is worthy of consideration.

To the civilian practitioner of dentistry the matter of record keeping is intimately associated with his auditing system. There

are, no doubt, a few who render their monthly statements after having made an examination of the mouth to determine what type of service has been rendered to the patient, but they are among the minority.

While the financial aspect of record keeping does not concern the military or naval dental surgeon, the importance of the dental record as a component part of the health records of individuals in the military and naval services is not in the least diminished. The case history of an illness is indispensable to the physician, and a record of treatments and service performed is likewise of great value to the practitioner of dentistry.

There are probably as many different systems of dental record keeping as there are individuals practicing the profession in civil life. The civilian practitioner renders service to his individual clientele and his record is therefore adequate if it provides a means of accounting which will enable him to render a satisfactory statement before a court of law of service performed for a patient. A written record is the best protection against the designs of the unscrupulous patient and the unprincipled lawyer. Such records usually are accepted by a court without question and go on record as service performed and treatment rendered.

The military or naval dental surgeon deals with an enormous practice and a constantly changing personnel. In view of this fact, it is of the utmost importance that the method of keeping records which is followed in the services be standardized in every detail.

In formulating systems of dental record keeping, there is usually a tendency to make the forms too complex and the diagrams too technical in character. As a result of this tendency, the systems which are evolved are often unwieldy and are very often little employed. In spite of the efforts which have been made to insure that complete records of treatment will be kept, examination of the records of men who claim to have had dental treatment rendered at former stations frequently fails to show that the dental surgeons who rendered such service have recorded the fact, either graphically or in writing.

While the dental records used in civil practice vary greatly in form, the "dental abstract" sheet which is inserted in the health record of every member of the naval personnel is a standardized form and definite instructions relative to its use are included in the Manual of the Medical Department of the Navy. A naval dental abstract sheet is prepared when an officer or enlisted man is first examined or treated by a dental officer and is inserted as the top sheet in his health record. Upon the arrival of an officer or man upon a ship or station, the dental sheet is detached from the health

record and sent to the dental officer, who keeps it on file. The abstract accompanies every patient who is sent to another ship or station for dental treatment and upon the completion of treatment it is returned to the medical officer who has the custody of the health record.

A very small amount of time is required to record the insertion of a filling and to chart its position upon the dental diagram in the health record. Notations of root canal treatments can also be entered with very little effort and such entries are of great value to the operator who may be called upon to render future service to the patient.

The professional value of properly kept records of treatment should be self-evident, but the dental record and diagram very often assume another rôle which is not directly related to the practice of dentistry, but which is important in itself. The post-mortem durability of the skeletal framework, including the teeth, is well known to all, and we still have the work of ancient practitioners of our profession preserved in the skulls of ancient peoples. Police investigators have recognized and made use of this fact for a considerable length of time.

No better means of post-mortem identification exists to-day than a well-kept dental record and diagram. Two cases of actual instances in which the dental record has played a prominent part in identification are quoted from police records and these will serve to illustrate the importance of the dental record in criminal investigation.

The body of a woman was found on Pikes Peak, in the State of Colorado, and from the fact that all of the clothing had been removed and destroyed and the additional fact that the head and a great part of the trunk had been destroyed by fire, it was apparent to the investigators that great difficulty would be encountered in the identification of the remains. However, the police officials called to their assistance a dental practitioner, who made a complete diagram of the teeth found in the skull of the remains. This diagram was published in the various dental journals throughout the United States.

Subsequently, a dental surgeon in the State of California recognized that the chart, as published in the journals, bore a resemblance to a diagram which he had made while engaged in the treatment of a former patient, a Miss B. There was no question in his mind regarding the identification and later investigations proved it to be correct.

As a consequence of this identification, certain clues were established which enabled the police to determine the identity of the murderer, who was trailed over the entire United States, but finally

succeeded in escaping to Australia. He subsequently returned to the United States and, after having attempted to commit another murder in the city of Berkeley, was trapped in his room in San Francisco.

A number of charred bones and a few human teeth were found among the ruins of a consulate in one of the Central American Republics. The consulate had been destroyed by fire, evidently for the purpose of concealing a crime. An employee of the consulate could not be located, and since the funds of the consul were missing, it was assumed that this employee had murdered the consul, burned the consulate, and escaped with the funds.

Subsequently, a local dental surgeon identified restorations in the teeth which had been recovered from the ruins as services rendered by him to the employee of the consulate. This changed the aspect of the case by indicating that the employee had been murdered. Further investigation proved that the consul had perpetrated the crime and had absconded with the funds of the consulate.

In the recent Argonaut Mine Disaster at Jackson, Calif., the value of the dental record as a means of post-mortem identification was again very well demonstrated. The condition of the remains of the 47 victims of this disaster was such as to render physical identification impossible.

A rule of the Argonaut Mining Co. compelled each man to carry a metal identification tag with him when going below the surface. This regulation had been ignored by the shift which went below on the night of the fatal fire, for their tags were all found among their effects at the top of the shaft.

Identification by any known means was possible in only a very few cases, but the dental records of local practitioners proved to be of value in two instances. In one of these, a body was identified by the mine foreman as that of William Fessel, but others were not so positive concerning the correctness of this identification. A dental surgeon who had treated Fessel was called in and after having examined the skull was able to state unhesitatingly that the body was not that of Fessel.

Forty-six bodies were recovered at the time of the disaster but it was known that 47 had lost their lives. During the month of September, 1923, a skeleton was found by a clearing crew in one of the lower levels of the mine. There was apparently absolutely nothing by which an identification could be made, but the dental surgeon who had treated Fessel was again called in by the coroner and was able to state positively, after comparison of the teeth of the skeleton with his office records, that the skeleton was that of William Fessel.

Some police departments have incorporated a dental diagram in their record of Bertillon measurements.

During the World War, and for some time after its conclusion, the value of the dental record sheet was demonstrated in a great number of identifications which were made through the Graves Registration Service.[1] Many of these identifications were made upon the disinterment of the bodies of soldiers, marines, and sailors who had been buried several years before, when their identities could not be determined owing to the fact that records were not available. The identification of many who had fallen on the field of battle and who had been listed as "missing" and the return of the remains to relatives in the United States was thus made possible.

The names of soldiers, sailors, and marines who had been reported as "missing" and the bodies which were disinterred for purposes of identification were classified as "unlocated" and "unknown," respectively. Attempts to identify individuals were based on the following points, arranged in their order of importance:

1. The dental chart. Such charts were made at the time of disinterment and reinterment and their accuracy in minute details constituted the most important contribution to data upon which identification could be based.

2. Articles found on the body, such as clothing, battle records, tags, insignia of the service to which the individual belonged and of his rank, badges, and equipment.

3. Original grave location, based upon the casualty cable reporting death and burial and upon the first disinterment of the body for sectional burial by the American Graves Registration Service.

4. Wounds, war fractures, and operations.

5. Old fractures or other peculiarities of the skeleton which had existed prior to the casualty.

The identification of "unknowns" was far from an easy task and every available item of information, no matter how insignificant it appeared to be, was seized upon as the possible deciding factor in the establishment of identity. If all dental charts, which had existed prior to the deaths of the men for whom they had been made, had been correct in every detail and available to the Graves Registration Service, many identifications would have been an easy matter.

However, practically every dental chart which was available was found to antedate the death of its owner by a year or more. Despite this fact, the charts permitted the elimination of many doubtful cases and enabled the searchers to settle many identifications upon small groups from which the identity of individuals could often be determined by other data, such as the habit of wearing a certain ring or locket or of carrying a certain article, such as a pocket

[1] Report of Lieutenant Commander L. W. McGrath (M. C.), United States Navy, officer in charge of the Navy and Marine Corps Graves Registration Service in France.

Bible. These latter data were added to the possible points of identification through the advices of relatives and friends.

A large percentage of bodies were listed with "lower jaw missing," and at the same time, as a result of the various operations in the cemeteries, there was accumulated a fairly large collection of lower jaws and other bones which had been found in or near empty graves. These bones were familiarly known to the searchers as "spare parts," and each one was tagged to show the exact locality in which it had been found. It was found to be possible to articulate a considerable number of these mandibles with the skulls of bodies which had been listed with "lower jaw missing" and thereupon to compare the complete dentitions with the original charts.

Fortunately, it does not often happen that a dental practitioner is called upon to present his records for purposes of post-mortem identification. However, from the histories of the cases cited it may be seen that the dental record is sometimes called upon to play an important part in such identification.

A dental record should indicate the outstanding features of the mouth examined. Missing teeth, the positions and types of fillings found in the teeth, and the character and location of prosthetic restorations are the vital facts which should be recorded on each and every original diagram of the mouth. Notations of services rendered subsequently should under no circumstances be neglected.

The only feasible, scientific method of conducting a dental practice is to keep accurate records, for the failure of an operator to note services rendered to a patient greatly handicaps other operators who may be called upon later to render additional services to the same patient and results in the loss of a valuable means of personal identification.

THE NAVAL DENTAL TECHNICIAN

By the Faculty of the Navy Dental School

The dental technician has established himself firmly as a valuable assistant to the dental surgeon in the practice of preventive and restorative dentistry. His advent into the naval service has been especially welcome, for the naval dental surgeon has heretofore been obliged to depend for assistance upon the services of hospital corpsmen trained for general medical duties and has been able in many instances to retain the services of such individuals for brief periods only.

The trend of modern dental practice has been constantly toward higher specialization and the need of a trained assistant who could assume many of the simpler duties of the dental surgeon has been

long realized. For many years dental practitioners have employed laboratory assistants to carry on the mechanical procedures incidental to prosthetic dental treatment and nurses to assist directly in the treatment of patients in the dental operating room.

Within the last decade, the duties of the dental nurse have become so augmented and specialized that we have seen the recognition of the dental hygienist, while the work of the laboratory assistant has become so technical that many schools of so-called mechanical dentistry have been established in our cities.

The general duties of the naval dental technician include both those of the oral hygienist and those of the dental mechanic. His most important clinical duty is the rendition of dental prophylaxis and his efforts are therefore directed toward the furtherance of the cause of preventive dentistry rather than toward the accomplishment of reparative dental treatment. His training in the mechanical phases of prosthetic denture construction, inlay casting and other laboratory procedures enables him to relieve the dental surgeon to a large extent of this class of work.

While not engaged in rendering prophylactic treatment in the clinic, the technician is an expert operative assistant to the dental officer acting as nurse, anesthetist or in whatever other capacity he may be required. He is trained to handle directly the sterilization and care of the instruments and materials employed in dental operations, to develop and prepare for examination radiographic films and plates and to handle the records and appointments of patients.

The training of the dental technician is, as has been stated, along lines which will enable him to relieve the dental surgeon of certain work which is incidental to the treatment of patients, but it must not be inferred that the technician is trained to render general dental treatment. All of his duties, whether in the nature of treatment in the clinic or the construction of appliances in the laboratory, are under the direct supervision of a commissioned dental officer.

To be eligible to take the course for dental technicians at the Navy Dental School, applicants must be hospital corpsmen of the lower ratings who have had courses of instruction at hospital corps training schools. Candidates must be recommended by dental officers who have had opportunity to observe their qualifications. The maximum capacity of the class for dental technicians is at present 12 men. Three classes, with a total of 30 technicians, have been graduated and a class of 10 hospital corpsmen is now under instruction.

The course is of 16 weeks average duration and includes instruction in anatomy, physiology, metallurgy, dental radiology, dental prosthesis, oral prophylaxis, operative assistance, first aid, operative technics, military drill, clerical duties, and a general review of the

hospital corps handbook. The instruction in most of these subjects is both didactic and clinical.

The course is, to be sure, of short duration and the student is required to become familiar with a considerable number of subjects, but it must be remembered that the technician has already undergone a general basic training during his attendance at the hospital corps training school and has had considerable practical experience during his service in the naval medical department. The majority of the student technicians have had special training as assistants to dental officers and are therefore more or less familiar with certain of the subjects included in the course.

Dental prosthesis is taught by lectures in the classroom and by practical instruction in the prosthetic dental laboratory of the Navy Dental School. The practical instruction includes taking and boxing-up impressions, preparing models, vulcanizing, polishing and finishing cases, and casting inlays and metal dentures.

An attempt is made to familiarize the student technicians with all phases of laboratory technique and men who show exceptional ability are given special advanced training. During the earlier part of the course the students are engaged in the preparation of specimen cases, but after they have attained a certain degree of proficiency they are permitted to assist in the preparation of practical cases for patients in the clinic.

The methods by which oral prophylaxis is taught have been applied from those originated in the Fones Clinic at Bridgeport, in the Forsyth Infirmary at Boston, and in the Eastman Clinic at Rochester. Dr. Fones' "Mouth Hygiene" is used as the textbook for theoretical and practical instruction.

Preliminary instruction in oral prophylaxis is given on the "Dentech," a mechanical device which simulates the mouth, jaws, and teeth. The teeth of the "Dentech" are coated with a mixture of plaster of Paris and sandarac varnish to represent deposits of calculus and these deposits are removed by the student technicians. While engaged in scaling the teeth of the "Dentech," the students are taught the proper manner in which instruments should be held and applied. Following the removal of artificial deposits, the teeth are stained to resemble conditions found in the mouths of patients and the students are taught to remove this stain with porte-polishers and engine instruments.

Modern experience in oral prophylaxis has shown that the porte-polisher is a much more valuable instrument for the treatment of stained and roughened surfaces of teeth than the instruments designed for use in the dental engine handpiece and this fact is emphasized by the instructors. A complete equipment of the instru-

ments and accessories employed in oral prophylactic treatment is maintained in the clinic and each student technician is taught the use of this equipment.

The importance of effective methods of sterilization in dental practice is stressed throughout the course and every student technician is taught to carry out the measures by which the incidence of cross-infections is reduced to the minimum. Special attention is given to the preparation of sterile packets of cotton pellets, cotton rolls, dental napkins, and the several other accessories to dental operations.

Handpieces for the dental engine are sterilized before and after use by the flame method advocated by Harvey.[1] This method of treating infected appliances which can not be boiled without injury to their mechanisms has been adopted as a routine procedure in the clinic of the Navy Dental School. In addition, the technicians are taught to handle aseptic cotton pellets and other materials, which are placed on the bracket table of the dental operating unit, by a technique which was evolved at the school. All of these methods have been carefully checked by bacteriological tests and have been found to be effective and convenient. Since they are taught in the clinic under actual operating conditions, each technician obtains a thorough working knowledge of practical sterilization and aseptic technique.

The arrangement of the equipment and materials used in the clinic of the Navy Dental School is standardized and the student technician goes forth trained to maintain the arrangement of the instruments and accessories of the dental operating room to which he is assigned in an orderly and shipshape manner. Attention to such details on board ship and at shore activities results in increased operating efficiency.

Instruction in dental radiology is given by lecture and by actual practice in the clinic. Each technician is taught to assemble and operate the X-ray machine and to develop and mount radiographic films and plates for examination by the dental officer. Special attention is given to the technique of radiographing fractured maxillae and the root apices of teeth.

Dental first aid is taught in the clinic of the school, with supplementary lectures and demonstrations in the classroom. The students are taught the differential diagnosis of the conditions causing odontalgia and the rendition of first-aid treatment by instrumentation and medication. The reduction of fractures and dislocations of the jaws is studied and each technician learns to apply the Barton bandage and modifications of the Barton bandage. The prepara-

[1] Harvey, H. E., "Methods of Sterilization in Dentistry"— UNITED STATES NAVAL MEDICAL BULLETIN, April, 1921.

tion of liquid and soft diets and the instruction of the patient in methods of taking such diets with the jaws splinted or bandaged is taught in this connection.

The student technicians learn to prepare dental abstract sheets from the mouths of patients and to make proper notations on the abstracts of treatment performed by the dental surgeon. In addition, they are taught to prepare requisitions for dental supplies and reports of operations and treatments. The preparation of the dental abstract sheet is considered to be very important, inasmuch as this sheet is inserted as the first page in the health records of all officers and men and is, in the absence of other evidence, a valuable means of identifying individuals. A well-made dental abstract has proved its value, especially in post-mortem identification of persons whose other personal characteristics have been obliterated.

The weekly schedule of the course for dental technicians is as follows:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9–10	*9–10*	*9–10*	*9–10*	*9–10*	*9–9.30*
Lecture.	Quiz.	Lecture.	Quiz.	Drill.	Inspection.
10–12	*10–12*	*10–12*	*10–12*	*10–12*	*10–11*
Group No. 1.—Dental prosthesis.	Group No. 1.—Prophylactic clinic.	Groups Nos. 1 and 2.—Prophylactic clinic.	Group No. 1.—Dental prosthesis.	Group No. 1.—Prophylactic clinic.	Dental radiology.
					11–12
Group No. 2.—Prophylactic clinic.	Group No. 2.—Dental prosthesis.		Group No. 2.—Prophylactic clinic.	Group No. 2.—Dental prosthesis.	Instructions, hospital corps handy book.
NOON HOUR, 12.15–1.15. LUNCHEON					
1.15–4.30	*1.15–2.30*	*1.15–2.30*	*1.15–2*	*1.15–3*	*1.15–4.30*
Group No. 1.—Operative assistance.	Lecture or quiz.	Lecture.	Lecture.	Group No. 1.—Operative assistance.	Operative assistance.
	2.30–4.30	*2.30–4.30*	*2.15–4.30*		
Group No. 2.—Dental prosthesis.	Group No. 1.—Dental prosthesis.	Groups Nos. 1 and 2.—Prophylactic clinic.	Group No. 1.—Operative assistance.	Group No. 2.—Dental prosthesis.	
				3–4.30	
	Group No. 2.—Operative assistance.		Group No. 2.—Dental prosthesis.	Field day.	

The number and variety of the subjects which are presented to the dental technicians during the brief period of instruction permit them to acquire a good working knowledge of these subjects and it is expected that dental officers in the field will make every effort to continue the instruction of the technicians over whom they have cognizance.

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A greater number of men can be interested in oral hygiene and in the care of their teeth through the dental technician than through any other medium, for there is no surer way to awaken a man's appreciation of a clean mouth than to restore his mouth to a healthy condition. The beneficial effect of a clean mouth on a man who has habitually neglected oral hygiene is often reflected by improved outward appearance, increased efficiency in the performance of his duties, and a heightened self-respect which gives him a new outlook on life.

While the dental technician is a newcomer in our midst, he already occupies an important place in the field of preventive dentistry. His special training has made him an invaluable assistant to the naval dental officer and his individual efforts as an oral hygienist will go far to spread the doctrine of the value of a clean mouth in maintaining a healthy body.

PREVENTIVE DENTISTRY IN THE NAVY

By H. R. Delaney, Lieutenant, Dental Corps, United States Navy

With the advancement during recent years of the theory and practice of preventive medicine we have heard much of preventive dentistry. The realization of the importance of a healthy denture to systemic health has become universal, but much remains to be done to systematize treatment with the view to prevent dental disease.

When Dr. William Hunter denounced "American" dentistry he sounded a warning which awakened the medical profession to the fact that dental disease is something really worthy of study. His denunciation, provoked by observation of septic dental restorations, did not go beyond the unhealthful possibilities of a mouth which harbors food catching and gum irritating appliances. He failed to consider the fact that the teeth themselves and their infected root apices in particular are the predisposing causes of secondary disturbances, but his declaration was, nevertheless, the forerunner of the focal infection theory.

Since Hunter's arraignment of the crown and the bridge, we have read many reports of the eradication or alleviation by tooth extraction of rheumatic fever, neuritis, arthritis, valvular cardiac lesions, and nearly everything experienced by the lame, the halt, and the blind. We all know that many a good tooth has been extracted just because its owner happened to have one of the ailments which throw suspicion on the teeth. We have removed thousands of our neighbors' teeth and have lost a few of our own, but it has all been in the good cause.

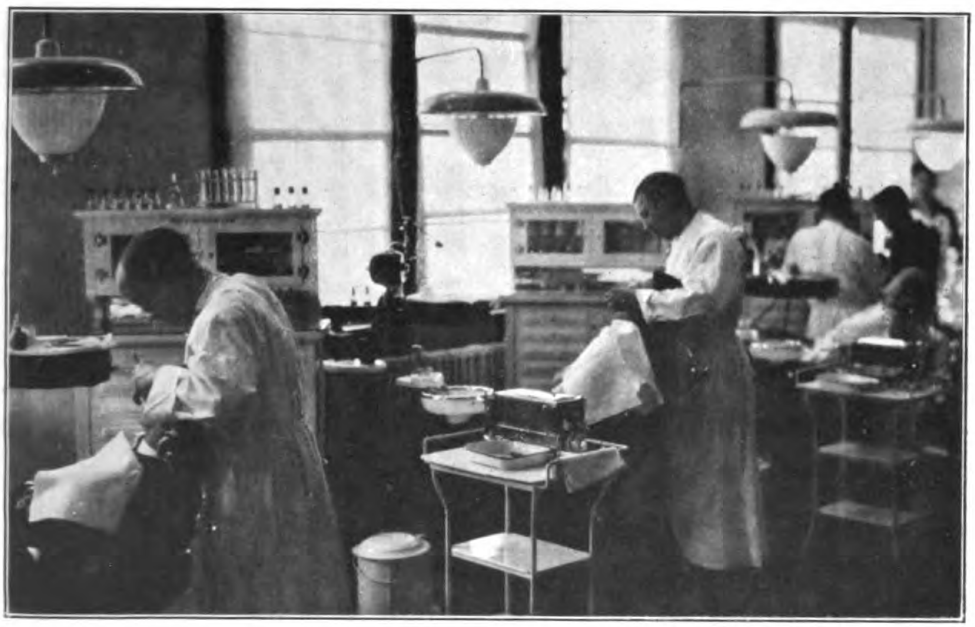

Fig. 1.—The prophylactic clinic

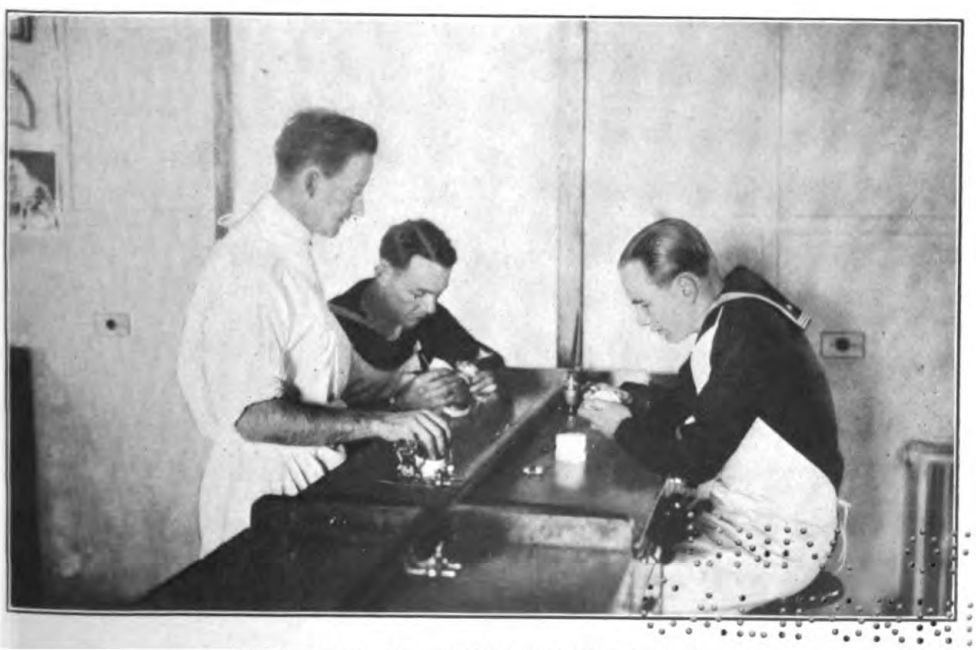

Fig. 2.—Instruction in the prosthetic laboratory

Fig. 3.—Vulcanizing and polishing dentures

Fig. 4.—Instruction on the Dentech

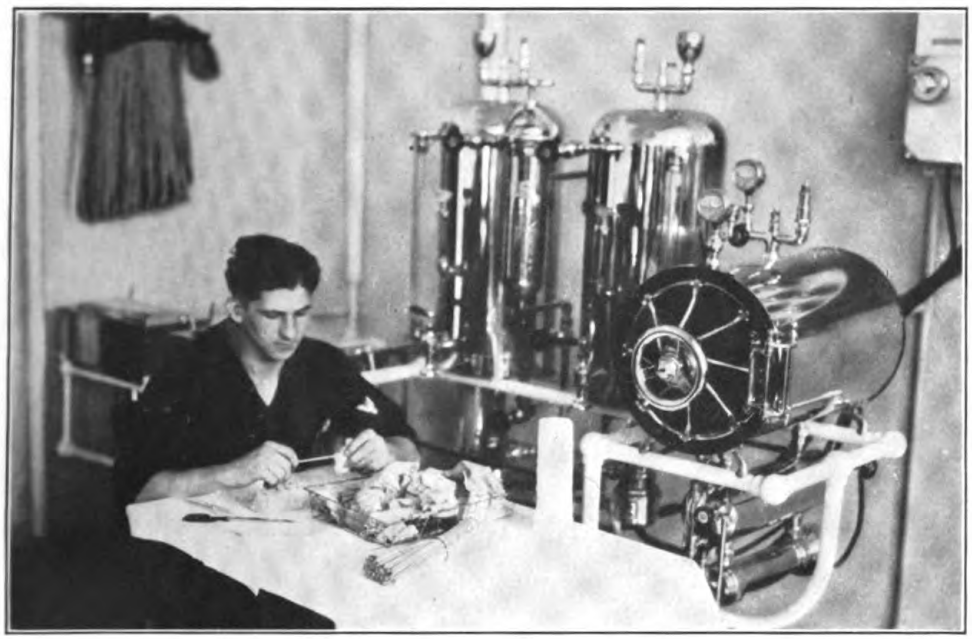

Fig. 5.—Preparing packets for sterilization

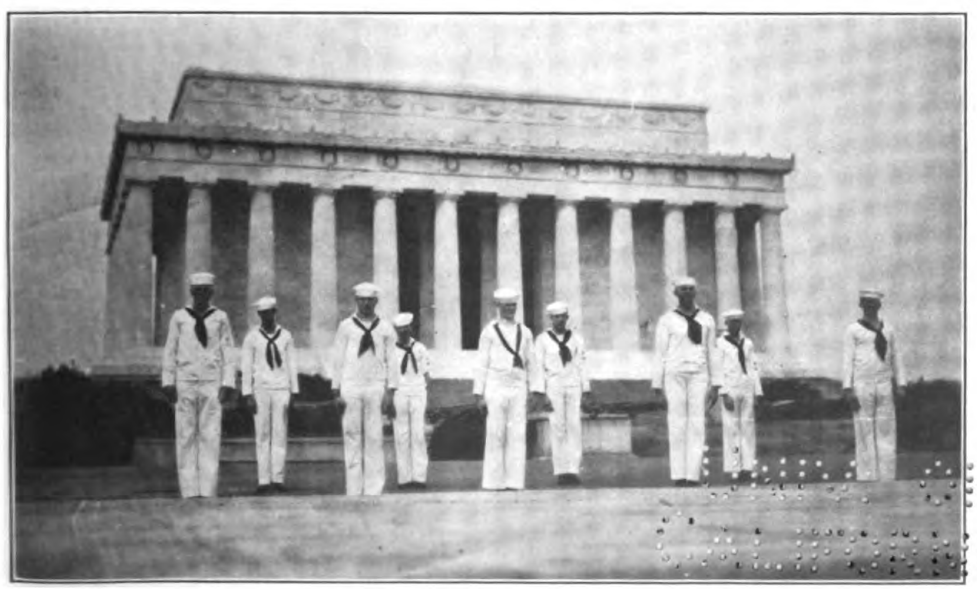

Fig. 6.—Litter drill

The writer has his own little notebook containing the names of many sufferers whose health and happiness returned after some of their infected teeth had departed. Some of them had lost a bit of their youthful vim and vigor, some had lost their ability to get about without the help of a cane and some had lost their reason. They all lost teeth before Mother Nature overcame their disabilities.

The moral of all this lies in the realization that the condition of the teeth had not aroused very serious thought until some ostensibly more grievous injury to the health had occurred. It is true that many teeth which are the centers of advanced destructive infections show little in the way of subjective symptoms. So long as the resistance of the individual permits toleration of the local or secondary disease process, he loses little sleep over the matter. The average individual knows little or nothing of preventive dentistry.

Responsibility rests, then, squarely on the dental profession. This responsibility has been shifted from the physician to the dental surgeon and perhaps back to the physician again, but it is primarily, at least, a dental problem and should be considered as such.

The knowledge that dental treatment is helping to solve some of the problems of preventive medicine has given more prominence to dentistry in the last 10 years than was ever experienced before. In the search for the etiology of obscure infections, suspicion usually falls on the teeth even before other commonly infected areas have been eliminated and this suspicion is often confirmed by later developments. The condition of the teeth as a factor in the causation of disease processes in other parts of the body has come to overshadow their importance as functioning organs.

In seeking to advance the cause of preventive dentistry, we must consider its value to preventive medicine indirectly. Our first objective, the prevention of dental disease, will naturally have its influence on the prevention of systemic disease. Many of us have been too much inclined to overlook the great amount of good that can be accomplished by the simple operations which we are trained to do.

Is not a simple filling which preserves the health of a tooth of greater value than would be surgical removal of the same tooth or amputation of its root apices years later to arrest some systemic disease process? The filling of the tooth is a less heroic measure but it nevertheless constitutes a more important contribution to the health and comfort of the patient.

Black found that the mouths of more than 75 per cent. of a large number of persons examined harbored chronic dental infections. Dental conditions within the naval service are very little if at all better, for, but a small proportion of rejected recruits are turned away on account of defective teeth. Many of these chronic local

infections result in more extensive injury and their early eradication must constitute a very important improvement in service health conditions.

From the removal of an infected tooth and the attainment of the desired curative effect we trace back the uncertain paths by which bacterial toxins travel and establish to our own satisfaction the existence of a focal infection. We hold a sort of post-mortem celebration over the late offending tooth or teeth. We can not by an inverse speculative process anticipate the probable pathology that will result from the retention or neglect of an infected tooth, but we can prevent the infected tooth. Nearly all dental disease is preventable and all dental disease can be arrested by treatment.

We have been shown by statistics that the number of persons in the profession is inadequate to deal with the problem in an ideal way. In the Navy we are, perhaps, not handicapped in this respect in a much greater degree than is the case in civil life. Our standards of physical fitness are, however, higher. If the naval dental officer is required to extend the scope of his work to that offered in civil life the problem becomes more difficult of solution. Only a substantial increase in dental officer personnel can provide the care that should be given.

The technique of dental operations and treatment is so specialized that very little can be accomplished in a supervisory way. By working seven or eight hours a day we can barely keep up with demands for the most necessary treatment. The writer has spent nine hours in the dental operating room and has been aroused during the same night to treat emergency cases. The dental officer afloat can do very little in the way of systematic examination and treatment that will tend eventually to place the teeth of the men on his ships in fair general condition. Dental treatment afloat is essentially an effort to promote efficiency of personnel by keeping the men free from pain.

During the first month after arrival in southern waters for the 1924 maneuvers the writer gave 292 sittings and 327 treatments. Among these, permanent restorations were inserted for only 57 visitors. The remainder consisted of extractions, pulp extirpations, various treatments, and insertion of abstract sheets in health records lacking the form now in use. Less than one-half of the personnel entitled to dental treatment on the hospital ship was present during most of this period.

The above figures show that only 20 per cent. of visits during the month permitted permanent dental repair. It might be assumed that the number of emergencies would decrease sufficiently to allow a gradual accomplishment of dental repair in general. That this is hardly the case is shown by records for the month of April, 1924.

During this month, the last spent in southern waters with the fleet, 462 sittings were given. One hundred and twenty-five of these visits resulted in the insertion of permanent fillings, or about 27 per cent.

Statistics for the latter period naturally favor a larger ratio of completed treatment to the total, as much unfinished treatment can be completed after months of contact. In addition, the present complements of the ships include drafts of men very young in the service. The condition of the teeth of these recent recruits is below the average.

The special inconveniences and disadvantages of treatment afloat require that naval personnel be made as fit as possible while attached to shore establishments. This has always been the case in the past and will probably continue to be in the future. Especially in these days of limited personnel, the services of every officer and man in the fleet must be available in the maximum degree.

If the above is a true presentation of conditions afloat it must appear that very little can be accomplished in the cause of preventive dentistry on board ship. The problem must be handled ashore and the training stations are the establishments of election. With a sufficient concentration of dental-officer personnel at the larger stations, an attempt can be made to generalize the methods of examination and treatment in use at the Naval Academy. The writer is not acquainted with the exact methods pursued at the academy, but has noted the presence of well-made dental charts in the health records of the majority of young line officers and the excellent condition of officers' teeth as compared with those of the enlisted personnel.

A minimum apportionment of three dental officers to every thousand men should obtain. With only 2,500 apprentices undergoing training for a period of two months the assignment of but one hour per man for dental treatment would require seven dental officers to work about eight hours a day. Very few men are received at training stations who require less than two hours of treatment and some attention must be given the permanent personnel of the stations. Instruction of recruits in mouth hygiene should be an important feature of the dental officer's duty. Each incoming group should be taught to use the toothbrush efficiently and warned of the dangers of dental neglect. By such measures many men would be induced to apply for treatment before being driven to the dental dispensary by pain.

One dental officer should be detailed at each training station to examine and treat incoming recruits. His mornings would be occupied in examining and making abstract sheets for men received on

the preceding day. Upon the completion of examinations and the delivery of a short lecture on the care of the teeth, preliminary treatment would be undertaken among the men examined the day before. Every tooth beyond repair and every useless root should be extracted and after notation of this treatment the abstract sheets would be delivered to the main dental infirmary. There, appointments would be made for the men soon after their release from the detention camp and as much reparative treatment as possible performed during their training period.

A thorough examination is the first step in the practice of preventive dentistry and the earlier the examination the better. However, the examination itself is but a notation of the condition existing, preparatory to treatment. A dental examination which results in the insertion of a chart in the health record and which is not followed by whatever treatment may be necessary has accomplished nothing beyond the addition of a possible means of personal identification.

A dental examination should be, whenever possible, a part of every physical examination. Such an examination is especially indicated in the annual physical examination of officers and in examinations seeking to establish the etiology of diseases falling within the focal infection group. Careful notation of the condition of the teeth would detect abnormal conditions which might otherwise escape attention until more serious disease followed.

Early treatment following the first examination is not only desirable from the standpoint of tooth preservation but also means a definite economy in hours of treatment. This economy includes a greater amount of benefit for a greater number of men and an increase of personnel efficiency by curtailing absence from duty.

To illustrate this economy, it is only necessary to cite the case of a man recently treated by the writer. This man was examined about two years ago while in training at one of the larger stations. His teeth were charted and a small area of caries noted on one of his molars. The man had taken excellent care of his teeth, as shown by their general condition, but his sea duty had been such that he had been afforded very little opportunity to apply for dental treatment. The pulp of the tooth, which had been exposed by caries, was extirpated, the root canals filled, and an amalgam filling inserted. This treatment required nearly three hours and kept the man away from duty on his ship considerably longer, due to ordinary inconvenience of transportation. He now has a nonvital tooth, the condition of which should be henceforth periodically noted. If a small amalgam or cement filling had been inserted two years ago a gain of at least two fillings to other men would have resulted and the services of the man on board ship would not have been lost at all.

We know that bodily health and comfort are paramount factors affecting the efficiency of the average individual. The treatment which gives a man relief from pain restores his efficiency only from that time on and the hours of suffering before relief is obtained have greatly decreased his energy in the performance of duty. The urgent need of dental treatment by a large number of men can be compared in effect to the total loss of services of a certain smaller number, viz., if the duty efficiency per man concerned is reduced 10 per cent, the reduction in personnel efficiency is in effect the total loss of services of 10 per cent of the number of men involved. Dental treatment covering one-half hour for each patient usually means at least two hours lost to his ship. If 16 patients are treated during the day, 32 duty hours will be lost, equivalent to total loss of the services of four men working an eight-hour day.

Since the great majority of cases are emergencies, it is possible to arrange the treatment of only a small fraction of the total by appointment. This fact is the natural accompaniment of the meager dental officer personnel available. The writer had under his care the complements of 13 craft, aggregating about 2,500 persons and the vast majority of them have carious teeth which can have little attention until emergencies arise. Dental examination and treatment should be carried on for the personnel of the ships while the vessels are docked for annual overhaul. The prophylactic treatment accomplished at such times would save many teeth and prevent many secondary infections which keep men from duty in the fleet.

The training of dental technicians chosen from the ranks of the hospital corps to furnish dental prophylaxis is a distinct contribution to the cause of preventive dentistry in the service. The removal of calcareous deposits from the teeth and other treatments to be undertaken by the technicians will remove the cause of many cases of gingival disease and will stimulate the interest of the men in the care of the teeth.

Preventive dentistry, through its influence on general health, is bound to be an important factor in promoting the efficiency of the men in the naval service, and when the numerical inadequacy of dental officer personnel has been removed, preventive dentistry in the Navy will come into its own.

NEW DENTAL WARD, NAVAL HOSPITAL, NORFOLK, VA.

By P. G. White, Lieutenant Commander, Dental Corps, United States Navy

An important portion of the practice of the dental surgeon comes to-day from the medical practitioner who refers his patients for consultation with a view of obtaining an opinion on the relationship

of the mouth to systemic disease, or to enlist aid in the treatment of some condition. The fact is recognized that local infections play an important rôle in systemic disease and that such foci are often found in the mouth.

For some years our leading civilian hospitals have recognized and carried on a system of group medical practice in which the dental surgeon has played an important rôle, through his cooperation with the medical and surgical specialists, in diagnosis and treatment. The importance of the dental surgeon's part in the cure, control, and prevention of disease has been demonstrated, and it is extremely gratifying to know that the Surgeon General[1] is of the opinion that the Navy should not offer less to its sick than is accorded patients elsewhere.

The first step in the improvement of the dental service was the consolidation of all dental activities of the larger stations into one central clinic with an experienced dental officer in charge. In all cases this has resulted in a considerable saving of supplies and equipment and in a more efficient service.

The next move must be the assignment of an adequate number of dental surgeons to the various naval hospitals for the purpose of properly carrying on the important development of group practice.

The naval hospital at Norfolk, Va., which is situated at the very base of all naval activities on the Atlantic coast and has usually a large number of patients under treatment, was considered to be an excellent location for the establishment of special facilities by means of which a closer correlation of medical and dental practice could be effected. Plans have been approved by the commanding officer of this naval hospital and by the Bureau of Medicine and Surgery for the establishment of a dental and oral surgical ward in connection with the new dental quarters of the hospital.

These dental quarters will be located in a separate building within the hospital grounds and will include a large waiting room for out-patients, a fully equipped oral surgery, a dental operating room, a prophylactic room, a transilluminating room, a ceramic laboratory, a prosthetic laboratory, a record office, and a store room. In addition, there will be a 12 to 16 bed oral surgical, or dental ward, which will have its own diet kitchen, laboratory, and bath.

One of the greatest difficulties with which we have had to contend in the past has been the dental surgeon's inability to maintain contact with his patients. Obscure and interesting cases were perhaps seen and perhaps not. Upon the transfer of a man to a

[1] Annual report of the Surgeon General of the Navy, 1924.

hospital for treatment, all knowledge of the case was lost to the dental officer.

With the establishment of a dental ward in the hospital, such conditions will be remedied. All fracture and surgical pyrrhoea cases and patients admitted with such conditions as cellulitis, abscesses, impactions, alveolectomies and apicoectomies, etc., will be entered in the dental ward. Their health records, containing their medical histories, and so forth, will be at hand and the patients available at all times for necessary treatment. This is especially true of cases sent to the hospital for prosthetic treatment during the course of which numerous try-ins and adjustments are necessary. The dental officer will profit by such contact with his patients and his interest in their welfare will increase. Incidentally, the patient's treatment and discharge to duty will be expedited. The great number of strictly dental patients always present in this hospital assures a full ward at all times and it must be borne in mind that assigning such cases to a dental ward, as other special diseases are assigned to certain other wards, releases beds in the regular wards, which are often filled to capacity.

With the inauguration of group medical practice, including a thorough examination of the patient's oral cavity and with a consideration of the relationship of oral infections to systemic diseases, many which are not now considered strictly dental should show marked improvement under proper treatment.

The relation of the oral prophylactodontist to preoperative cases can not be questioned. A patient whose mouth is laden with putrescent or pussy material is seldom a fit subject for ether anaesthesia. Proper oral prophylaxis in many other cases will improve the general resistance and recuperative power of the patient. We have often found, in cases being treated for syphilis and where treatment had to be stopped on account of salivation, that with prophylaxis the patients were able to take their regular courses of treatment. A great many cases in medical practice may be influenced by proper dental treatment and there are many in which a dental condition may be the cause of the disease.

The cooperation and correlation of diagnosis in the special services, such as the nose and throat, eye and ear, surgical and X-ray should be a wonderful help to all concerned and especially to the patient.

The hospitalization of dental patients, plus those whose subsequent diagnoses prove to be dental conditions, will prove a stimulus to the dental department, an interesting aid to the medical department, and will bring about a more thorough and better treatment for the patient.

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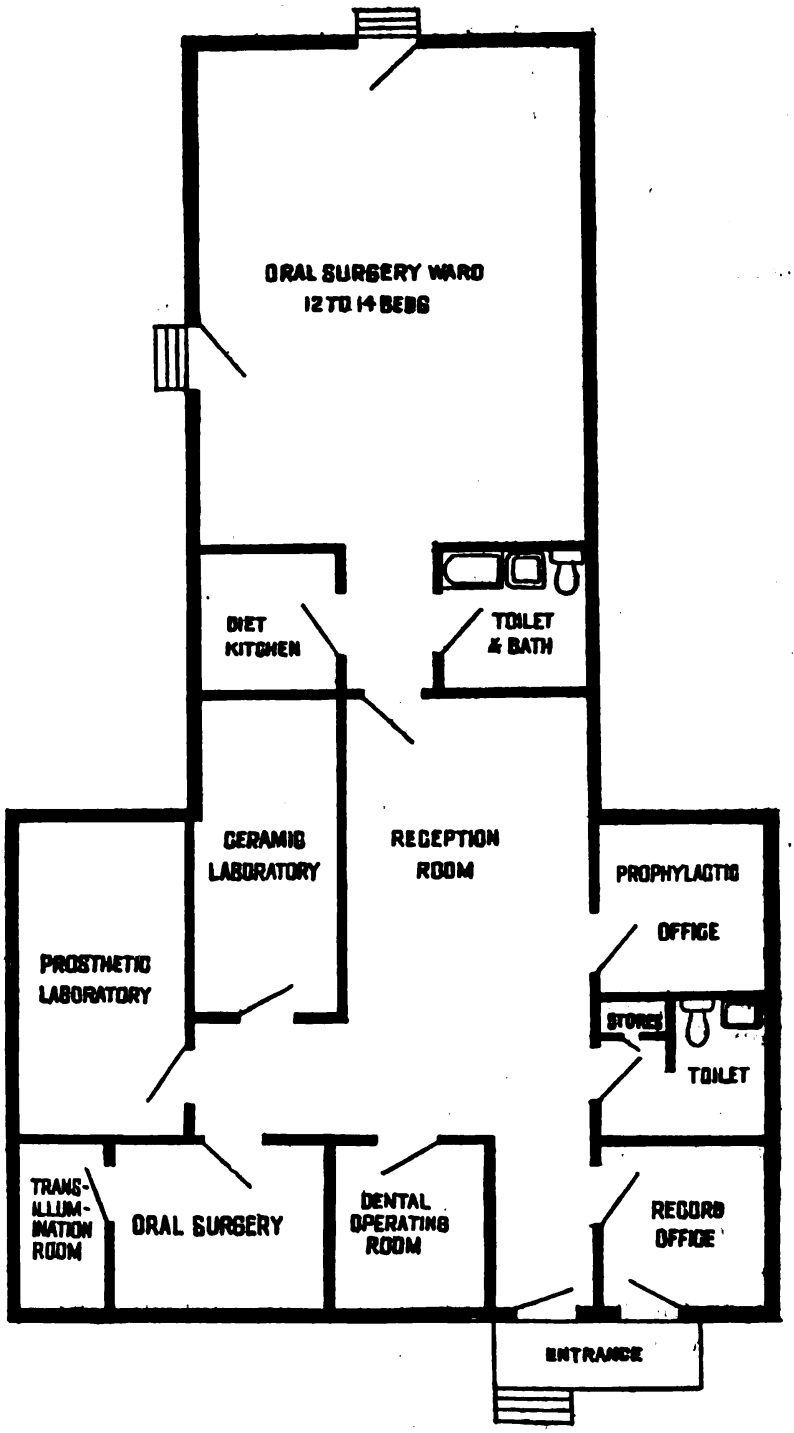

FIG. 1.—Diagram of new dental ward, Naval Hospital, Norfolk

BETEL NUT CHEWING AND ITS EFFECTS

By C. R. Wells, Lieutenant, Dental Corps, United States Navy

The natives of many tropical islands, and especially the inhabitants of the island of Guam, are widely addicted to the habit commonly known as betel nut chewing. This habit is usually begun in early childhood and often works havoc with the soft tissues of the oral cavity before adult life is reached.

The betel nut, or areca nut, is a small orange-colored, drupelike fruit, which is inclosed in a fibrous husk. It is really the seed of the fruit which grows on the *areca catechu*, a tree which has a slender, ringed trunk and a pretty foliage of pinnated leaves.

The nut is chewed in combination with a piece of lime and a bit of the leaf of the betel palm. These are rolled together in the form of a pellet, which is inserted in the mouth. This little pellet is hot and acrid, due, no doubt, to the fact that the betel tree is a variety of the pepper species. In spite of the peppery taste, however, the pellet is apparently enjoyed.

The betel nut has aromatic and astringent properties and imparts to the teeth a reddish tinge which eventually becomes a dense black deposit. The properties mentioned are due to the presence of catechu, gallic acid, tannin, liginim, various saline substances, fixed and volatile oils, and a red coloring matter.

One can nearly guess the age of a native from the amount of the deposits on his teeth. The Chamorro is far from reluctant to display his share of black concretions and the ability to exhibit a row of dirty-looking black teeth seems to be regarded as a mark of real accomplishment. The sight of a proud native of the Malay race with a broad grin baring a mouthful of coal-black teeth is one to remember. The repulsiveness of this sight is enhanced by the drooling and frequent expectorating which result from stimulation of the salivary glands.

Observation and examination of the mouths of betel nut chewers would lead one to believe that dental caries is to a great extent prevented by the habit, for but few confirmed betel nut chewers will be found with carious teeth. The writer was privileged to study jaws and teeth of past generations of the natives of Guam through the courtesy of Commander J. C. Thompson of the Naval Medical Corps and found but few decayed teeth, although the black betel nut concretions were present.

It is probable that the absence of caries among past generations of natives was due in some measure to the character of their diet, although examination of the teeth of the present generation of betel nut chewers reveals a very rare incidence of caries despite the fact that they have accepted American foods with avidity and have dis-

carded, in so far as possible, the coarse foods of their ancestors. Extensive caries has been in evidence among some of the school children who do not habitually chew the betel nut. From these facts it would seem to be possible that betel nut chewing or its effects may prevent dental decay.

An effort has been made to discourage the masticatory use of the peppery pellet since naval dental officers began to devote considerable time to the treatment of native school children and oral hygiene has been substituted as a much more desirable means of preventing dental decay.

The school children of the island are taught to care for their teeth and have been made to see that betel nut chewing is a disgusting habit which will eventually impair their health and good looks. Through these little school children and through their native school teachers information concerning oral hygiene and the bad effects of betel nut chewing are carried to many who could not be reached in any other way.

Many school children who have discontinued betel nut chewing through the efforts of the dental officer have desired to have the black stains removed from their teeth. This has been done in many cases, with the result that other members of their families have desired to have the stains removed from their teeth, too. The dental officer and his assistant have removed these stains in as many cases as could be handled during the hours devoted to the treatment of natives.

The stains on the teeth of confirmed betel nut chewers of mature years are so difficult to remove that the usual method of dislodging calculus with scalers is not effective. Enamel chisels are used with the thumb grasp, but so much time would be consumed by a complete scaling that only four teeth at a time can be scaled. These deposits resemble somewhat serumal calculus although they are darker in color, are more closely adherent to the teeth, and are much more difficult to remove. They are, no doubt, the result of a chemical reaction between the substance contained in the pellet chewed and the fluids of the mouth. While the deposits are difficult to remove, the result of a thorough scaling is certainly gratifying to the patient and to the dental officer. The sight of the true outlines of the natural teeth, brought to light after perhaps years of hiding, is adequate compensation for the labor involved in the treatment.

The soft tissues of the oral cavity and especially the gingivae, are the parts adversely affected by betel nut chewing, for marked, serious, and chronic changes in these tissues result from the habit. These changes involve at first a slight gingivitis, followed by the accumulation of heavy deposits of salivary calculus. Some pain is experienced with the early gingivitis, but this subsides without

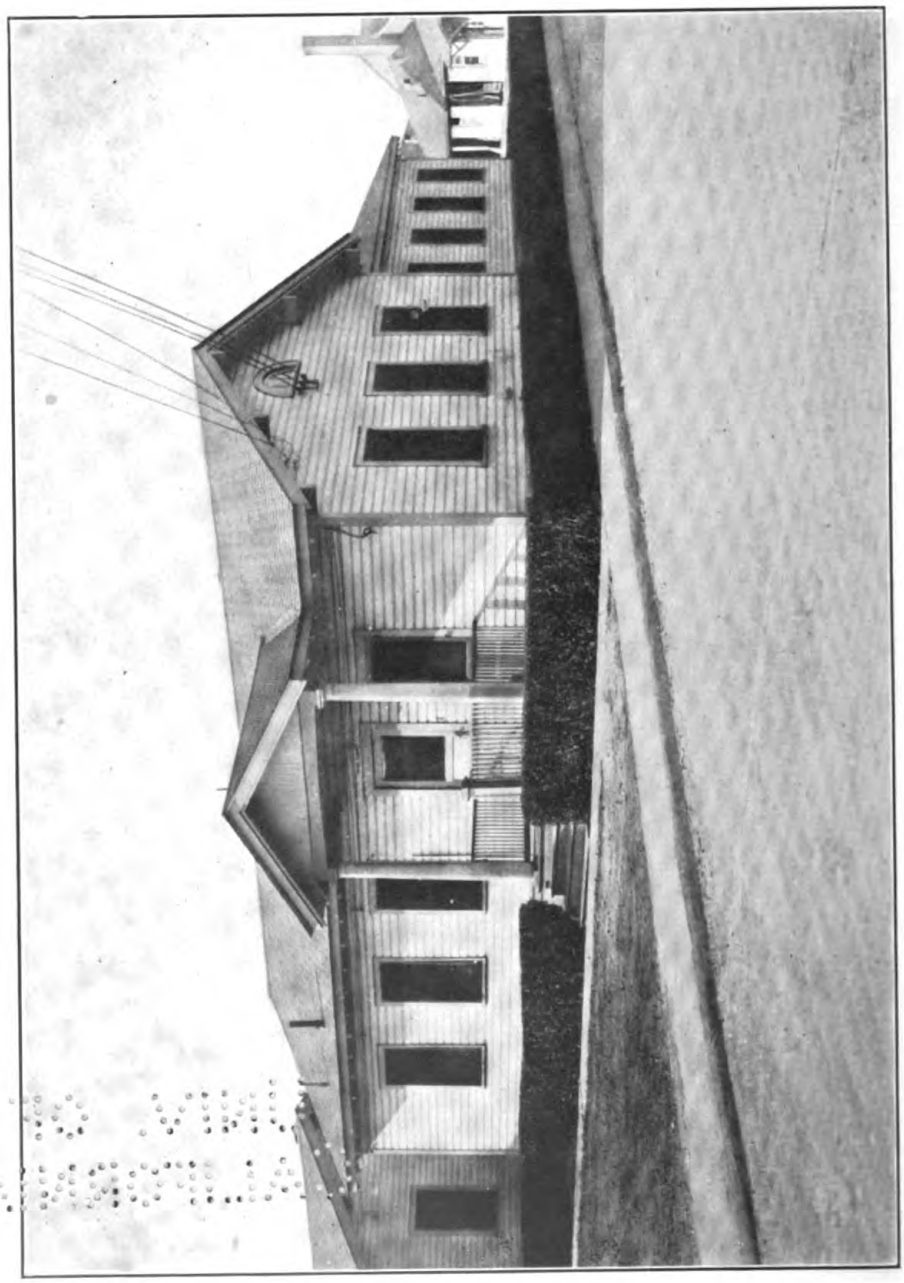

Fig. 2.— New dental ward, Naval Hospital, Norfolk

treatment and a chronic gingivitis follows. There is a gradual recession of the gingivae, with the formation of pockets, and the deposition of serumal calculus beneath the free margin of the gums and of black concretions from the betel nut on the necks of the teeth. The gums become soft and spongy, bulging about the teeth and bleeding easily. The alveolar process soon becomes affected and breaks down, leaving ragged spicules which constantly irritate the tissues. The teeth loosen, appear to be elongated, and are sore while in use. At about this time, true pericementitis develops and the native begins to appreciate his dental troubles. However, he does not realize that his teeth or his oral tissues require any special care, so he suffers on without seeking the aid of the dental officers near at hand. Finally, his pain becomes unbearable and he seeks the hospital. His teeth are now candidates for the forceps and his oral tissues require careful attention, since nearly all of the alveolar process and the peridental membrane have been destroyed.

Many natives have presented themselves for examination with septal, lateral, and alveolar abscesses before extreme destruction has taken place. These conditions have been due, it is believed, directly to betel-nut chewing.

The writer has never observed, in the hundreds of betel-nut chewers who have been treated, any evidence of tumors or cancers of the mouth or jaws. It would therefore seem to be true that while betel-nut chewing works havoc with the teeth and their supporting structures, it is rarely if ever the cause of malignant growths.

In conclusion, it may be said that much good can be accomplished by dental officers on duty in tropical islands where betel-nut chewing is practiced, through the education of their native patients along the lines of oral hygiene and by bringing to their attention the disastrous effects of the habit. Many true cases of periodontoclasia result from betel-nut chewing among natives and it has been noted that this condition progresses much more rapidly than is the case among people who do not use the betel nut. In addition, septal and lateral abscesses appear to be more common among betel-nut chewers than among people who are not addicted to the habit.

The absence of caries among betel-nut chewers may be attributable to the fact that the teeth of these people are coated with heavy concretions which mechanically prevent the attack of decalcifying acids and the ingress of infectious organisms, or it may be the result of the alkaline reaction of the saliva which is commonly noted in the presence of chronic gingival infections. However, the fact that generations of betel-nut chewers have lived and died with their teeth free of decay can not be looked upon as an argument in favor of the habit when the serious destructive effect on the other tissues of the mouth and jaws is considered.

AN EFFECTIVE TREATMENT FOR VINCENT'S INFECTION[1]

By S. M. AKERSTROM, Lieutenant, Dental Corps, United States Navy

The element of time is a factor which must be taken into consideration with reference to the naval dental officer's professional services to the personnel under his care. Especially is this true on certain types of ships and at certain shore stations, where the patient is most liable to be a transient. For example, mother ships for destroyers, navy yards, and receiving ships offer illustrations of places where the sailor is here to-day and gone to-morrow.

Vincent's infection is a condition which may be present among great numbers at such stations and because of the probable short stay of the patients, it behooves the dental officer to adopt some treatment which will afford prompt relief and promote permanent rapid improvement. The treatment submitted herewith apparently fulfills these requirements, and although each individual treatment consumes more time at a given sitting, yet the subsequent appointments necessary are so greatly reduced numerically that the use of chromic acid *per se* warrants its adoption to combat the lesions which usually accompany Vincent's infection.

During the current year a great many cases have presented themselves at the naval training station, Hampton Roads, for relief from this malady. The treatments employed by the several dental officers on duty here consisted of applications of silver nitrate solution (5 to 25 per cent), potassium permanganate, liquor potassii arsenitis and hydrogen peroxide, used either in combinations or singly, together with whatever instrumentation was necessary and permissible. In conjunction with these applications, various mouth washes were prescribed. It is believed that none of these treatments, however patiently and conscientiously given, has effected the rapid improvement or established the permanent alleviation produced by chromic acid.

There is but one minor deterrent feature in connection with the use of this agent and this is the fact that the drug is not carried on the supply table. However, it is believed that such a difficulty, if it may be so termed, can be circumvented very readily. When a man is in such pain that he may not enjoy any sort of food, his gums bleed upon the slightest provocation, and the fetid odor of his breath renders him obnoxious not only to his shipmates but also to himself, and, as the condition spreads very rapidly in congested places like ships, the acquisition of any agent which will give relief from and eradicate the disease is obviously for the welfare of the crew.

[1] Name suggested by the Committee on Dental Nomenclature at the Cleveland meeting of the American Dental Association, September 10–14, 1923.

Hospitals, dispensaries, and training stations may obtain small quantities through the medical officers from the financial allowance authorized to them by the Bureau of Medicine and Surgery to cover such exigencies. Incidentally, the price of the drug is very nominal.

The etiology, diagnosis, symptoms, and differentiations between Vincent's infection and other lesions of the gingivæ more or less commonly seen in the mouth and the use of chromic acid as a treatment have been given recently by Rattner (1) and by Bonney (2).

The equipment prerequisite to the treatment of the disease by the chromic acid method is as follows: Alcohol lamp, chip blower, cotton pliers, water syringe, cotton rolls, applicators, tongue depressors, and three dental medicine glasses. The medicinal agents needed are alcohol, chromic acid solution (5 per cent.), distilled water, potassium permanganate solution (2 per cent.), and compound tincture of benzoin.

Preliminary preparations.—Render the metal points of the chip blower, cotton pliers, and the water syringe aseptic by dipping them several times in alcohol, carrying to the flame of the lamp and allowing the alcohol to burn.

Cotton rolls.—Select three rolls of a suitable size for the particular mouth under treatment. It is suggested that the entire roll as it comes from the box be used for the isolation of the teeth. This will obviate the necessity of adjusting a cotton roll holder several times. In addition to the rolls, use one-third of a large-sized sterile cotton roll to furnish an ample supply of cotton for the operation.

Applicators.—Sharpen to a fine point a sufficient number of applicators for at least one operation and about these points wrap small wisps of cotton. The number of applicators necessary will depend upon the severity of the case, but the use of only one or two throughout the operation should be avoided. The purpose of these cotton-wrapped applicators is to convey the drugs not only to the gums but also into the interproximal spaces and any pockets that may be present. Therefore, to gain access to these places very little cotton is necessary on the applicator.

Tongue depressors.—Use the tongue depressors in lieu of mouth mirrors to press back the cheeks, thus giving a clear view of the field of operation.

Medicine glasses, dental.—The medicine glasses serve as containers for the solutions of chromic acid, potassium permanganate, and compound tincture of benzoin, respectively.

The technique of the treatment is as follows: Instruct the patient to massage his gums about each tooth as firmly and thoroughly as possible with the forefinger. This massage is to be given buccally, lingually, and palatally, the object being to force out stagnant

blood, detritus, and pus. Then rinse the mouth with distilled water. Adjust the selected cotton rolls buccally and lingually to the teeth, thus preventing the chromic acid, which is somewhat caustic, from injuring healthy tissue and apply the acid with the cotton-wrapped applicators to all infected areas about the necks of the teeth, beneath the free margin of the gums, and into the interproximal spaces and any pockets that may be present.

To gain access to the lingual surfaces of the inferior incisors, break one or two applicators near the point after the manner of a greenstick fracture and use them to carry the drug. To assist the agent to more or less inaccessible places, follow up the application with a gentle stream of warm air. Allow the acid to remain unmolested for at least five minutes, after which the cotton rolls may be removed and the mouth washed thoroughly with distilled water. With pledgets of cotton, remove gently as much necrotic tissue as possible. Using an ordinary sized swab, apply the potassium permanganate solution freely to all parts previously treated with acid.

Care must be observed to neutralize the chromic acid in the interproximal spaces and pockets. To assure success in this, the permanganate solution may be diluted and given as a mouth wash, instructing the patient to force it vigorously between his teeth. Immediately thereafter apply the compound tincture of bezoin liberally by means of a swab. It will be seen that the benzoin runs quickly over the tissues and promptly forms a protective coating, much the same as flexible collodion. No mouth wash is needed to follow up this treatment.

Treatments are given daily in the initial stages, but, as the condition clears up, treatment may become less frequent.

The writer wishes to state that he lays no claim to the originality of the treatment described and probably commits plagiarism of the subject. Nevertheless, the justification for the presentation of the treatment seems warranted for the reasons that it probably is not employed to any extensive degree in the naval service and that it has effected excellent results in a remarkably short space of time. Furthermore, this article is intended, primarily, to give the technique of the treatment and the observations upon the results actually obtained.

In conclusion, the writer wishes to express his thanks to Lieut. Edwin N. Cochran, Dental Corps, United States Navy, for his assistance in giving his findings and suggestions on the subject and to the other dental officers of this station who have furnished reports of the results obtained by this method of treating Vincent's infection.

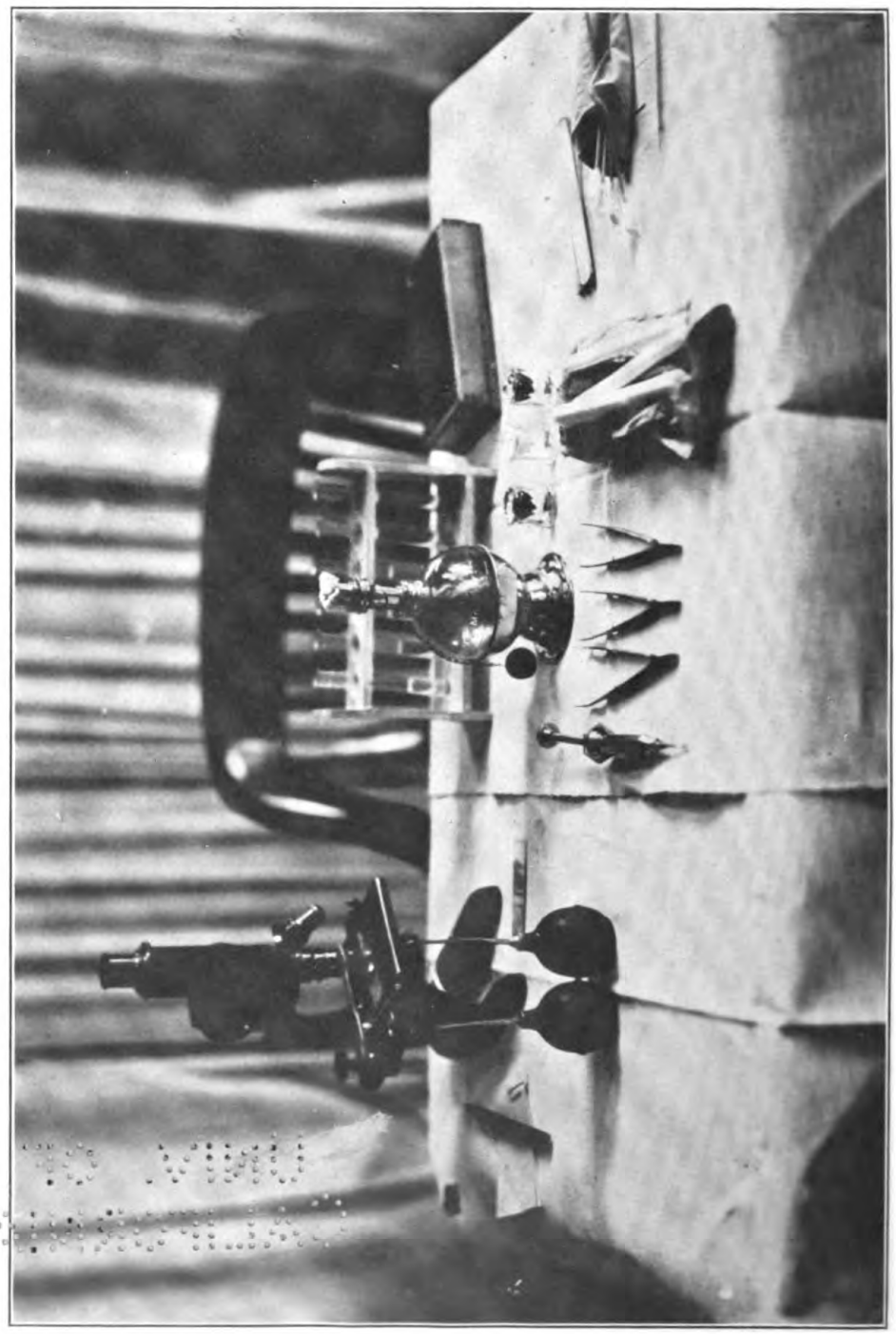

Fig. 1.—Appliances and instruments used in the treatment of Vincent's infection

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A PROTEST AGAINST THE RUTHLESS EXTRACTION OF TEETH

By P. G. White, Lieutenant Commander, Dental Corps, United States Navy

Before the recent advent of prosthetic dentistry into the naval service, many officers and enlisted men were obliged to seek the services of our civilian colleagues for treatment. During the last 10 years, the writer has been more or less in touch with civilian practitioners in many so-called "Navy towns." From observation, he has sensed the idea that possibly our brother practitioners in civil life are asking "Are the members of the naval dental corps extracting too many teeth, and if so, can this ruthless extraction be prevented?"

To answer the above question in the affirmative may be taken by some as a confession of guilt; to deny would not prove our innocence. The writer assumes to answer in the affirmative and attempts to explain why such conditions exist and how they may be prevented.

The root canal problem, which is one of the greatest complexity, is perhaps the perfect nightmare to the dental surgeon. Many of our leading scientists have devoted the major portions of their lives to the study of this problem and are now divided into two groups—the "conservatives" and the "radicals." Each group has found its followers.

With the advent of the focal infection doctrine, especially in its consideration of tonsils and teeth, has come a group of men who would attribute to these organs all of our ills. Granted that the extraction of one, two, or perhaps all of the teeth from the mouth of one patient has resulted in a miraculous cure, does it necessarily follow that the same procedure in another patient would effect a similar cure? Is such a procedure ever justifiable? In return for a toothless mouth what have we to offer? We must remember that there are other atria of infection and that the removal of a diseased gall-bladder or appendix or the free incision of an abscess often results in a marked improvement of the patient. If we suspect the presence of pus, we must make an effort to find it.

Since the teeth are perhaps the organs most frequently infected, they should be examined both clinically and roentgenologically and must be considered possible sources of systemic infections until we

are certain of their innocence. In cases of extensive necrosis, of pyorrhea involving teeth already pulpless and devitalized by large abscesses, and in other cases where conservative treatment appears to be hopeless, there is no solution but extraction. If, however, a small abscess exists upon only one root of a molar while the other roots remain healthy, the tooth should be given a chance and apicoectomy must be considered. If the peridental membrane is intact and the gingivae are in good condition, the dentine may continue to receive nourishment. In short, all of the operative possibilities for cure must be considered. We must remember that it is the infection and not the teeth which we desire to eliminate and also that the operation of removing a diseased tooth may not be complete until the apical granulomata or other pathological appendages have been removed.

Let us ask ourselves repeatedly, "What have we to offer for a toothless mouth?" and let us remember that no matter how clever the dental surgeon may be, he can not supply artificial teeth which will restore fully the function of those provided by nature.

In the light of present knowledge, we know that if a focus of infection be found in the mouth or at the apex of a tooth, it must be eliminated; but first we must give the tooth a chance. The attempt to save the tooth may fail, but by having made an honest though unsuccessful effort to preserve its usefulness, we are no worse off. We must consider the patient, our patients. If the infected teeth are strong and serviceable, if the areas of rarefaction are small and questionable and particularly if restoration by bridges will be impossible, we must be fair to the patient and give him and his teeth a fighting chance.

The period has passed when 100 per cent extraction is indicated, and it is the opinion of the writer that the officers of the naval dental corps are extracting too many teeth. In justice to the naval dental surgeon, however, it is believed that many extractions are necessary because of the following reasons:

1. It has been proved beyond all shadow of doubt that if a dental surgeon in civil life has 250 patients a year and is busy eight hours a day, excluding Saturday afternoons and Sundays, he has more than he can handle properly. The naval dental surgeon is required to furnish treatment to a much larger clientele.

2. In the Navy our ratio is but one dental officer to every 1,000 men, consequently the policy of "the greatest good to the greatest number" works to the detriment of the individual patient.

3. The dental officer seldom has sufficient time to perform properly the most difficult operation which he has to perform. That is to say, the fact that a large proportion of the many patients who visit

the naval dental dispensary are in need of root canal treatment results in such a great demand for this class of treatment that it can not be met.

The obvious solution to the many problems which confront the naval dental surgeon in his attempt to meet the demands for treatment made upon him would seem to be a considerable increase in the size of the dental corps, for despite the improvements in efficiency which have followed centralization of dental activities and systematization of routine, the number of dental officers in the Navy has been found to be far below service requirements.

The old proverb, "Do unto others as you would have others do unto you," may be applied to dental practice. The application of the Golden Rule to naval dental practice is often difficult, but we must by all means try to treat our patients as we would ourselves be treated.

CLINICAL NOTES

THE IMPORTANCE OF ORAL HYGIENE TO SUBMARINE PERSONNEL

By R. C. Green, Lieutenant Commander, Dental Corps, United States Navy

The dental officer serving on board a submarine tender must be constantly on the lookout for Vincent's infection and other forms of gingivitis. Should one of these diseases become established among the crew of a submarine, its eradication is a serious problem due to the difficulty of isolating the patient and properly sterilizing mess gear. On long cruises of seven days or more, the supply of fresh water usually runs low and this causes the men to neglect personal hygiene. If there happens to be an incipient case of Vincent's infection about, the chances are that many of the men will become infected before they can again be seen by a dental officer.

The writer makes it a point to warn all commanding officers of the dangers of this disease and to suggest that they personally supervise and instruct their crews concerning the necessity of proper mouth hygiene. They are advised also to insist that the cooks do their utmost to boil all knives, forks, and spoons.

All men attached to submarines should be examined within a few days of their departure for an extended cruise and if any suspicious cases are found, treatment should be instituted immediately. With these precautions followed, the writer is able to report but one epidemic on board a submarine. This occurred during a trip to Honolulu, when 7 men of a crew of 30 became infected, due to the presence among them of a man who had been on leave and who reported just in time to sail. This man subsequently was found to have the disease in the most virulent form.

Just a word concerning the writer's treatment of Vincent's infection. After the disease has been identified by laboratory findings, a routine cleansing of the mouth is performed. All of the interproximal spaces are sprayed with a saturated solution of potassium chlorate and this is followed by the liberal application of 7 per cent chromic acid to the mucous membrane of the mouth. Tincture of benzoin is applied finally. The patient is dismissed with instructions to return four times a day for a mouth wash of the saturated solution of potassium chlorate. This routine is followed until a

negative laboratory report has been received, which occurs usually in from 3 to 10 days, depending on the virulence of the infection.

It has been found that the commanding officers of the submarines are, as a rule, more than willing to cooperate with the dental officer, since they realize that the oral health of their crews is of paramount importance. The writer believes that in no other branch of the service is the opportunity so great for the practice of preventive dentistry.

CASE REPORTS

By A. Knox, Lieutenant, Dental Corps, United States Navy

The following case reports may be of general interest, inasmuch as they represent types of cases which are frequently referred for treatment to dental officers attached to hospital ships of the Navy.

The case of G., seaman, first class, United States Navy, emphasizes the kindness of nature in her endeavor to heal and the efficiency of her resistance to infection. After having been struck on the jaw during a fistic encounter, G. noticed a moderate swelling in front of and below the ear, but experienced very little discomfort.

Examination showed only a small area of discoloration over the angle of the mandible. There was very little displacement, but considerable tenderness when pressure was applied in the region of the lower third molar. A radiogram disclosed a simple fracture at the angle of the mandible, with a partially developed third molar lying in the line of fracture. (Fig. 1.)

The mandibular nerve on the affected side was anesthetized by a procaine injection, an incision was made in the gum tissue overlying the unerupted molar and the tooth was removed without difficulty. After the wound had been thoroughly irrigated with 1 per cent dichloramin-T solution, the first molars and bicuspids of both sides of the lower jaw were secured by ligature wires to their maxillary opponents. Routine treatment consisted of spraying the mouth thoroughly three times daily.

The patient was kept in bed for a period of six days, after which he was allowed to be up and about, assisting in the ward. On the twentieth day, the wires were removed and the patient was discharged to duty, well.

The second case reported came to the hospital ship as the result of an accident which occurred during the administration of a local anesthetic on one of the battleships of the fleet. R. S. C., seaman, first class, United States Navy, was admitted with the history of a broken conductive anesthesia needle imbedded in the soft tissues posterior to the left retro-molar fossa.

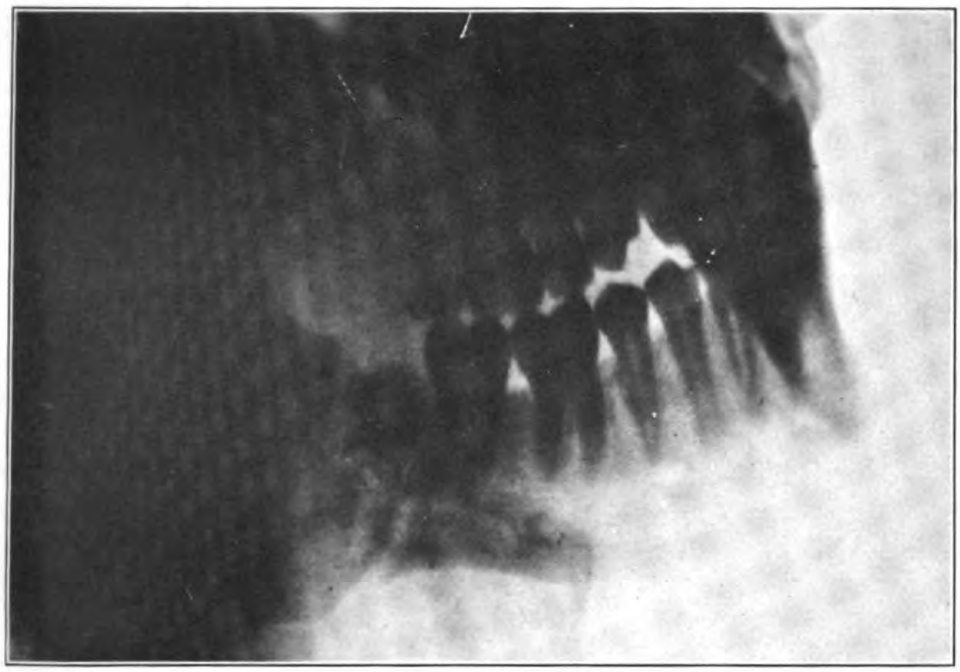


Fig. 1.—Fracture of mandible with third molar in line of fracture

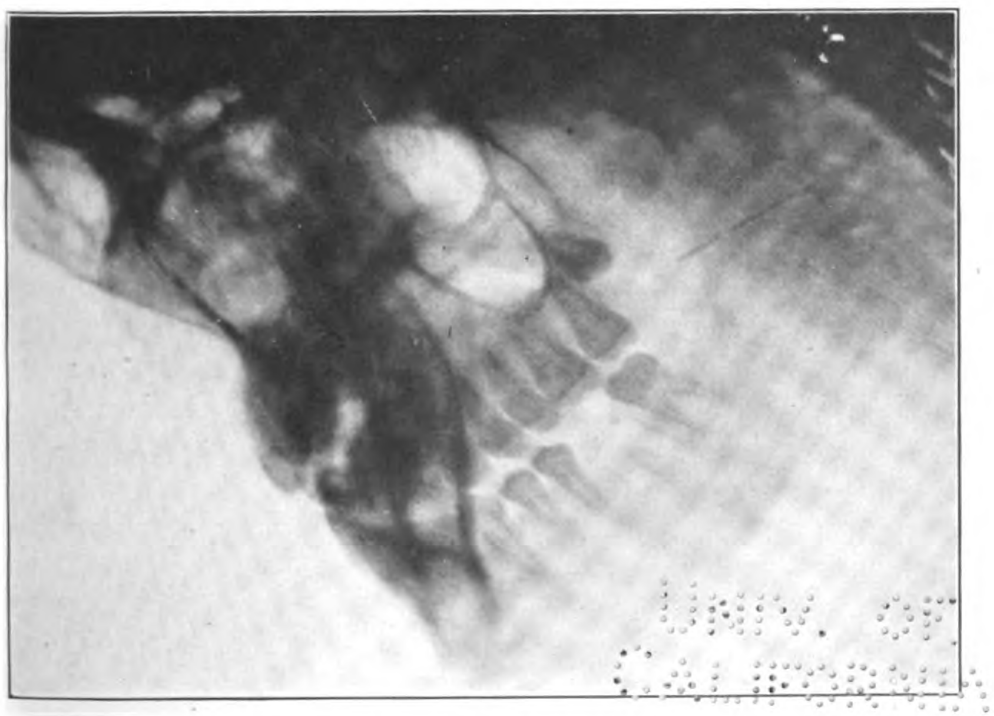
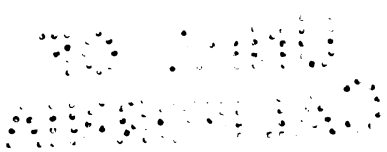


Fig. 2.—Broken conduction anesthesia needle



Examination showed a slight swelling over and posterior to the angle of the jaw, with edema of the soft tissues in that region. Trismus was present, but the jaw was forced open far enough to discover a small sloughed perforation marking the entrance point of the needle, about one centimeter above the occlusal plane of the molars. The laboratory report of the blood count which was requested showed a marked leukocytosis (24,500 white cells). This demonstrated a rather severe reaction in relation to the size of the traumatized area. A radiograph taken immediately after admission of the patient disclosed the needle, about 1½ inches in length, buried in the soft tissues near the inner surface of the ramus of the mandible. (Fig. 2.)

The parts were anesthetized and a vertical incision was made through the point where the needle had entered. The tissues were retracted and the needle was grasped and withdrawn in two segments. The wound was sutured and the patient ordered to bed for several days. Convalescence was uneventful and the patient was discharged to duty after 11 days.

CONSIDERATIONS AND OCCURRENCES INCIDENT TO INFILTRATION AND NERVE BLOCKING TECHNIC

By F. R. Hittinger, Lieutenant (Junior Grade), Dental Corps, United States Navy

From the time of the earliest recorded activities of the human race, many individuals have taken a special interest in solving the question of relieving pain. Prior to the discovery of the anesthetic properties of cocain, attempts to induce local anesthesia had been abortive and a painless operation under local anesthesia had not been heard of. In novocain, we now have an agent which is universally satisfactory and with which dental operations may be performed without pain.

The technic of any hypodermic injection can be improved materially by a painless insertion of the needle and attention to this apparently minor detail will go far to insure the cooperation of the patient during the remainder of the administration of the anesthetic and also during the operation. The injection of the anesthetic solution should consume from three to five minutes, whether it be for nerve blocking or local infiltration. If an injection of the latter type is followed by a gentle massage with the finger tips over the injected area, anesthesia will be obtained more quickly.

The superior maxilla may be completely anesthetized for any dental operation by the infiltration method, and for this reason blocking the second division of the fifth nerve is usually unnecessary. Serious ill effects rarely follow the administration of novocain-

suprarenin solution hypodermically, although suprarenal extract may accelerate the heart action. This effect may lead to a psychic disturbance, but it usually is of short duration.

Care should be taken to make the injection slowly and without undue force, in order that the tissues through which the needle passes and in which the anesthetic solution is deposited will not be injured. A hasty injection or one made with unnecessary force produces an untoward impression on the nervous system and causes trauma, with consequent postoperative pain.

Local ulceration may be due to improper disinfection of the tissue at the site of injection, to neglect of aseptic precautions, or to mechanical trauma. Injection into inflamed or infected areas should be avoided. Syringes which are constructed entirely of glass are preferred by the writer, as the parts can be separated easily and sterilized by boiling.

The development of symptoms of partial facial paralysis after anesthesia has passed usually is the result of injury to the mandibular branch of the fifth nerve or to injection of some of the alcohol used to disinfect the syringe. The proper technique should include sterilization of all instruments by boiling, prior to each operation.

Trismus is usually caused by passage of the needle through muscular tissue.

VINCENT'S INFECTION

By. T. L. SAMPSELL, Lieutenant Commander, Dental Corps, United States Navy

During the past two years many cases of Vincent's infection have been treated by the writer. So many cases have presented themselves, in fact, that for a time the situation appeared to be serious enough to demand a search of all stations under this command to discover the carriers.

The etiology and clinical symptoms of this infection are well known, but the fact that it is distributed by carriers perhaps has not been given sufficient recognition. This has seemed to be especially important to the writer in view of the fact that he has been able to trace many of his cases to carriers. The contention that the majority of Vincent's infection cases can be traced to carriers seems to be supported by the fact that only a small portion of patients who have been treated for this malady have had the disease completely eradicated. Many have been discharged when they apparently were cured, only to suffer a recurrence later. During the interim, when the disease was subacute and therefore hardly noticeable, they have unwittingly been passing it on to their shipmates.

One case which recently came under the care of the writer was of the low grade, subacute type, showing both Spirochaetae Vincenti

and Bacilli fusiformis under the microscope. The patient was a member of the station baseball team and played regularly in all games. Three days after he came under treatment another member of the team reported with the same type of infection. This led to an inspection of the other players and resulted in the discovery of two more cases. All were placed under treatment simultaneously and no more infections occurred among members of the team. The carrying vehicle in this case seemed to have been a water bucket, as the team carried no drinking cups, and each man, when thirsty, hoisted the bucket to his lips in regular approved sailorman fashion.

In like manner, the origin of cases presenting from other stations has been traced to pretreated cases or to new cases. Each patient under treatment was instructed to send any of his shipmates who appeared to have a similar condition to the dental dispensary. Needless to say, most of them were very successful in their search and it was not long before a considerable portion of the dental officer's time was spent in the treatment of Vincent's infection.

There is a striking dissimilarity in the clinical symptoms of individual cases and the use of the microscope is recommended in attempting to establish the diagnosis. Many simple gingivitis cases will be shown to be more malignant than would be supposed from their clinical appearance.

Three distinct clinical types of the disease have come under observation, viz, the typical case with all the cardinal symptoms; the subacute case with an occasional active lesion and slight fetor; and the pretreated or chronic case which can be determined only by diligent search and microscopic examination.

Each type differs in its response to treatment, the typical, acute cases responding most readily from a clinical standpoint while the chronic, pretreated cases are slow to react to treatment. All types will respond to treatment with arsenicals, but it should be remembered that the subsidence of all objective clinical symptoms does not constitute a cure and that the patient should be instructed to report from time to time thereafter for observation.

The majority of drugs which have been reported to be efficacious in the treatment of this disease have been used by the writer. A mouthwash consisting of one part of Fowler's solution to three parts of hydrogen peroxide and a dentifrice consisting of 0.6 gram neoarsphenamine to 20 grams of prepared chalk, with a sufficient quantity of tincture of green soap to make a paste, have been prescribed by the writer. In many cases, these agents failed to effect a complete cure and trichloracetic acid ranging from 10 per cent to full strength was used to accomplish the desired result.

Recently, routine treatment has consisted of the topical application of a fresh solution of neoarsphenamine in mercurochrome–

220 and results have been rapid and gratifying. In preparing this medicament, no attempt has been made to determine exact proportions, since the solution is made fresh for each application and only a very small amount is required. A small quantity of neoarsphenamine is placed in a medicine glass and dissolved in 10 per cent mercurochrome. Only a few drops of the liquid need be used and the solution is completed by stirring with a glass rod. This solution is worked into all crevices with a flat-sided probe and the excess applied to the gums generally. The response is rapid and an absolute cure often can be pronounced in three or four days.

A case is considered to be cured when negative smears are obtained and only when there has been a complete subsidence of all clinical symptoms and no sign of recurrence for a period of two weeks after treatment has been discontinued.

A CASE OF FOCAL INFECTION

By P. H. MacInnis, Lieutenant, Dental Corps, United States Navy

The following case report may serve to accentuate the importance of cooperation between the medical officer and the dental officer in the treatment of many conditions which are not strictly dental in their clinical manifestations.

The patient was 31 years of age and gave a history of impaired vision. His annual physical examination, which was held in January, 1923, disclosed the fact that the vision of his left eye had been reduced to 17/20 and there was a constant lacrimal flow which could not definitely be accounted for. Vision of the right eye was normal.

A radiograph taken during July, 1923 (Fig. 1), revealed a large area of rarefaction about the apex of the superior left lateral incisor. Clinical examination brought out the additional fact that the pulp of the left central incisor was nonvital. The lateral incisor was extracted at once and the necrotic bone area removed by curettage. The root canal of the central incisor was treated and filled.

During January, 1924, when the patient appeared for his annual physical examination, the vision of both eyes was found to be 20/20. The tendency to tear formation had disappeared and the comfort of the patient had been greatly improved. A radiograph of the upper left incisors showed regeneration of bone in the area involved (Fig. 2).

In view of the fact that the teeth and eyes derive mutual innervation from the fifth cranial nerve, and that the pathological condition of the eye disappeared soon after the removal of the dental infection, it is concluded that the dental infection was a contributory cause to the impaired vision.

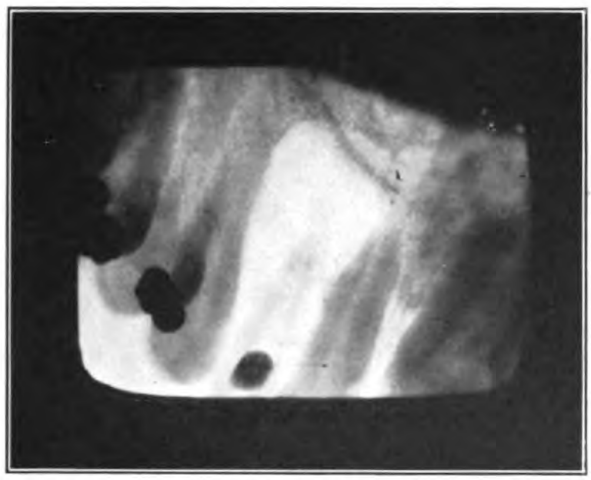


Fig. 1.—Focal infection

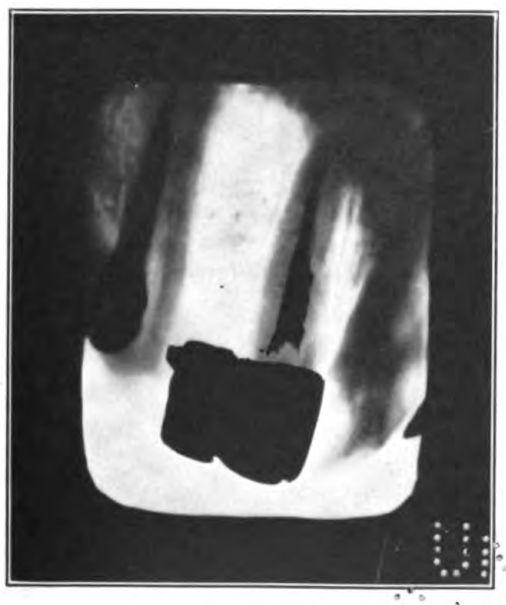


Fig. 2.—Focal infection

DENTAL ACTIVITIES AT THE NAVAL TRAINING STATION, SAN DIEGO, CALIF.

By F. L. Morey, Lieutenant Commander, Dental Corps, United States Navy

Dental activities at a naval training station differ in many respects from those which accompany the duties of the dental officer at other stations.

The majority of patients who come to the dental officer at a training station have habitually neglected their mouths and it is found that the soft tissues, as well as the teeth, need much attention. Many have no toothbrushes and some probably have never had them. In some cases, it is impracticable to attempt any extractions or filling until the condition of the mouth has been improved by the thorough removal of calculus and the reduction of inflammation in the membranes.

The recruits are sent first to the detention camp, where they are examined physically. At this station the dental officer examines and charts the teeth of all recruits and extracts abscessed teeth or useless roots at the time of the examination. The recruits are instructed at this time in the care of their mouths and in the brushing of the teeth.

After the recruits are outfitted they are kept in the detention camp for three weeks. During this time it has been the aim to complete all dental treatment for the men. They are concentrated in this small camp and their duties are generally such that it is easy to summon them to the dental infirmary. It is regretted that the inadequacy of dental officer personnel has made impossible the assignment of a sufficient number of dental officers to this station to send one complete company from the detention camp dentally fit.

This station was commissioned June 1, 1923, and on June 16, the first recruits were received. The average complement of dental officers from the opening of the station to the end of the calendar year was three. If one dental officer for each 1,000 personnel could have been assigned, there would have been an average of 8.6 for the year. Considering the short period of time spent by recruits at this station, it would be necessary to increase this complement to give proper attention to the constantly shifting personnel.

Following the three weeks detention period, the recruits are transferred to the main unit, where they remain for about five weeks. The monthly complement has been approximately 2,000, of whom 460 are attached to the station force and trade schools. From July 1, 1923, to December 31, 1923, 4,337 recruits were examined and charted.

The table following shows the amount of dental treatment accomplished at this station for the six months' period, July 1, 1923, to December 31, 1923.

CONDITIONS AND TREATMENTS AT FIRST DENTAL EXAMINATIONS

Number of recruits examined and charted	4,337
Number in need of treatment	3,016
Number of extractions performed	1,246
Number of cavities found	6,314
Number of cases of heavy calculus and Vincent's infection	736

These examinations showed that about 70 per cent. of the recruits required treatment.

TREATMENT ACCOMPLISHED FOR THE SIX MONTHS' PERIOD

Patients treated	1,723
Sittings	4,420
Completed cases	407
Fillings (amalgam, cement)	1,040
Extractions	1,523
Anesthesia given	1,402

It may be noted that among the recruits received and charted, 6,314 cavities were found but only 1,040 fillings were inserted. A large amount of treatment was accomplished, but the result is far short of our goal. Many more dental officers will be required if all men are to be sent to the fleet dentally fit. There were left 5,274 cavities to be filled by dental officers on board ships, where drills and other routine duties interfere with keeping appointments. On board ship, it is impossible for the dental officer to complete the cases of all of the men.

If there were a sufficient number of dental officers at the training stations to care for all of the dental needs of the recruits and to send all men to sea dentally fit, the dental officer at sea could periodically examine all of the crew. He could give prophylaxis to those who need it and fill all cavities as found, thus preventing in many cases the formation of abscesses and resultant focal infections. The loss of time in hospitals and medical surveys from the service, as the final results of dental conditions which could have been corrected, involve the loss of many dollars to the Government.

COLORS FOR FINISHING DENTAL OPERATING ROOMS

By J. R. Barber, Lieutenant Commander, Dental Corps, United States Navy

An attempt was made recently to ascertain the present-day opinion regarding the effect on eyesight or nerve strain of operating rooms finished in glazed white, as compared with rooms done in a color or a combination of colors. After having consulted literature which contained various conflicting statements, a number of New York hospitals were visited and the opinions of surgeons, superintendents, and nurses were obtained.

While definite scientific data seem to be lacking, there is, in general, the opinion that the white, glazed finish room is trying to the eyes and increases nervous fatigue because of the glare and reflected light. Surgeons who perform but one or two operations a day feel the effects the least; but operating room nurses, who are on duty all day, are much affected by nerve strain. At the Post Graduate Hospital nurses reported less fatigue following a day in a gray operating room than in one finished in white tile.

The newer hospitals, and older ones which are having additions built or changes made, show a marked tendency to get away from white and glittering finishes. The Fifth Avenue Hospital's extensive use of a satin finish gray tile and gray-enameled furniture gives a quiet effect without being depressing. At the Post Graduate Hospital some operating rooms have been painted gray and a very light gray paint has been used in the wards and corridors, all with satisfactory results. In a new wing at the Roosevelt Hospital a satin finished lilac-tinted tile is used. This appears to be gray, except when viewed directly, when the slight lilac tint gives it a warmer look than plain gray. An operating room in glazed jade green tile at the Central West Hospital does not seem to be much easier on the senses than plain white. In an operating room where large slabs of tile are used instead of small pieces there is noticeably less glitter. One hospital is using white operating rooms with green sheets and other operating room linen.

From the opinions of those interviewed and from observations it was concluded that:

1. The dental surgeon, operating continuously all day long, is more greatly concerned with the factors affecting vision and nerve strain than is the surgeon.
2. A glare of reflected light causes a contraction of the pupils and hinders vision.
3. Many reflected light rays increase nerve strain.
4. Strong colors on walls or furniture make themselves felt on the consciousness of the operator.
5. The desired effect is more negative than positive—the least possible effect on the retina.

To accomplish a result in keeping with the above conclusions, a gray with a slight trace of red was decided upon, with an "egg-shell" glaze finish. Paints and pigments vary considerably and the following formula is about as exact as it is possible to state for 1 gallon of paint:

White lead	14 pounds.
Lampblack	1 ounce.
Turpentine	3 pints.
Raw oil	1 pint.
Dryer	1 gill.
Venetian red	Trace.

This paint was used in finishing two dental operating rooms, the walls being stippled to further the plan of a semidull finish. The amount of red used is scarcely perceptible, but gives a pleasing tone. Too much red gives a lavender tint which is undesirable. The ceiling, which is high, and the walls down to the picture molding are finished in white. Window frames and accessory furniture (other than dental equipment) are painted the same color as the walls. Contrasts are thus avoided and bulky objects blend into the walls, rather than obtrude on the vision. In comparison with two adjoining dental operating rooms, which are finished in white enamel, the results are very satisfactory.

A DISINFECTING AND LUBRICATING SOLUTION FOR THE DENTAL ENGINE HANDPIECE

By C. R. Morris, Lieutenant, Dental Corps, United States Navy

Disinfection of the dental engine handpiece without injury to its mechanism can be accomplished by the following simple method, which cleans, prevents the formation of gummy deposits of oil, and leaves the working parts thoroughly lubricated.

Fisher, in his work on anæsthesia, says that alcohol of 70 per cent has been found to be more strongly bactericidal than absolute alcohol. The alcoholic strength of the alcohol-glycerin solution recommended for disinfecting the dental hypodermic syringe is about 70 per cent.

To make a disinfecting and lubricating solution for the dental engine handpiece, use two parts of absolute alcohol and one part of castor oil. This solution may be kept in a wide-mouthed bottle of such depth as will permit the immersion of the handpiece and the covering of the interior working parts. Dental engine handpieces may be kept in this solution without injury and will be found to be ready for use when required. During the day the handpiece may be removed from the engine and immersed in the solution for the interval between operations. The alcohol in the solution quickly evaporates and leaves the handpiece thoroughly lubricated. An examination of the handpiece, after immersion for a few minutes, will show that the inner mechanism is clean and bright and that the solution has penetrated to every part. It is unnecessary to remove the outside case for effective action.

It may be thought that castor oil is too heavy a lubricant for the dental engine handpiece, but the writer can say, after several months' experience, that such is not the case. A trial will be convincing.

This solution can also be effectively used for disinfecting and lubricating broach holders, separators, screw mandrels, disk holders, and various other threaded and jointed contrivances.

NOTES AND COMMENTS

THE ANNUAL REPORT OF THE SURGEON GENERAL

In his recently published report to the Secretary of the Navy the Surgeon General has included an interesting résumé of the progress and development of naval dental activities during the four-year period preceding the date of the report, in which are outlined the steps which led to the adoption of the policies under which the Dental Corps now functions.

The outstanding results which were accomplished under these policies include the establishment of the Dental Division of the Bureau of Medicine and Surgery and of the Navy Dental School, the inauguration of a system of inspection by dental officers, and the revision of the dental supply table.

The inadequacy of dental officer personnel is of paramount interest among the problems to be considered in relation to the affairs of the Dental Corps. On this subject the report includes the following comment:

"One of the urgent needs of the medical department is an increase in the personnel of the Dental Corps. The apportionment of 1 dental officer to every 1,000 officers and men of the Navy and Marine Corps, which was arbitrarily determined several years ago, when the Dental Corps was first established, has been found to be totally inadequate to furnish satisfactory and complete dental service to the personnel. At the time this apportionment of 1 to 1,000 was proposed the real value of dentistry in the naval establishment was not yet known, nor was the importance of dentistry in its relation to general health fully understood. One of the important advances made in medicine during recent years has been the development and recognition of the dental surgeon's part in the cure, control, and prevention of disease.

"With the present numerical strength of the Dental Corps, it has been found impossible to assign an adequate number of dental surgeons to the various naval hospitals for the purpose of properly carrying on the important development of group practice. This cooperative system of treatment, which has the excellent effect of correlating the medical, dental, and surgical specialists for purposes of diagnosis and treatment, has been recognized as a necessity and is

practiced in the leading civil hospitals of this country. With this exception, the professional facilities of our hospitals compare favorably with those of the leading hospitals of the country and it would seem that the Navy should not offer less to its sick than is accorded patients elsewhere.

"This serious personnel situation which confronts the bureau is constantly emphasized by the receipt of insistent requests for the assignment of dental officers who can not be supplied, and by the receipt of reports from the various ships and stations of the Navy on the unsatisfactory state of the present dental service. Additional dental officers are needed in the destroyer, mine, and special-service squadrons, in the train and light cruiser divisions, at the several Marine Corps bases, naval air stations, and at various navy yards, training stations, and hospitals.

"The clearly demonstrated inadequacy of the Dental Corps to cope with the situation, together with the general recognition of the importance of dentistry in maintaining general health, would seem to indicate that some action should be taken in the near future to increase the strength of the Dental Corps to a number which will insure health and comfort and assist in preserving the physical fitness of the personnel.

"There are no reliable data or statistics of assistance in estimating the number of dental officers needed to provide adequate dental service, but it is generally considered by officers who have made a study of the subject that 1 dental officer to every 500 officers and men would be none too many. The bureau is of the opinion that an apportionment of less than 2 dental officers to every 1,000 officers and men would prove to be insufficient and recommends that steps be taken to obtain a new apportionment of 1 to 500. It is realized that legislative action requires considerable time and that immediate relief can not be obtained from this source. It is therefore strongly recommended that authority be granted to fill the Dental Corps to its authorized strength of 189. This would make the services of a dental officer available for every 615 officers and men and would relieve to a considerable extent the serious situation now existing.

"The conditions under which the apportionment of 1 to 1,000 was fixed have changed radically. To-day it is generally recognized that dental service is an important factor in the conservation of bodily health and that the physical and mental well-being of an individual are in a decidedly large degree dependent upon a healthy condition of the mouth."

SYSTEMATIZATION OF DENTAL TREATMENT AT THE NAVY YARD, NEW YORK

Lieut. Commander J. R. Barber, Dental Corps, United States Navy, who is on duty at the navy yard, New York, has evolved a system of handling dental patients from ships which do not carry dental officers. This system has operated so successfully that the matter has been made the subject of several favorable reports to the Bureau of Medicine and Surgery from the commanding officers of vessels overhauling at the navy yard, New York.

As a result of the receipt of these reports by the Bureau of Medicine and Surgery, Lieut. Commander Barber was requested to submit a complete report of his system for the information of the bureau. Extracts from this report are quoted as follows:

"For some years it has been believed that dental treatment of naval personnel could and should be as universal, complete, and systematic as are antityphoid inoculation, serving of rations, and disbursing of pay. The question of practical application calls for a scheme for each general type of ship or station. A year ago it was decided to try in practice at this navy yard certain personal theories about the function of such a shore station in affording dental treatment for the personnel of visiting ships. Anything accomplished would serve as a demonstration of what could be done on a larger scale.

"The situation is that several hundred officers and men are on shore duty in the immediate vicinity. The continuous shifting of individuals causes a turnover which must be considered in estimating the number of dental patients. A few small craft are present most of the time. Then there are the ships which come to the navy yard or the vicinity for a stay of from a few days to several months. Counting destroyers, it was found during the past 12 months there was no length of time when no ships were present. On ships not carrying dental officers and on ships during the absence or illness of the dental officer it is expected that dental treatment shall be obtained in the navy yard.

"Of these sources, this report has particularly to do with caring for patients from ships not carrying dental officers. In the past, men desiring dental treatment have applied for permission to go to the yard dental surgeon and the ship's officers have permitted the men to go at such times and in such numbers as was possible. The dental officer of the yard gave appointments to men for such times as suited him. There was no coordination of interests and the results were a great influx of patients for the dental surgeon at some times and a very few at others, and on the ship men were presenting

notices of appointments for dental treatment when they could least easily be spared from the ship's work. Further than this, the men in greatest need of treatment frequently were the least likely to apply for it. Men would postpone asking for treatment until too late; then, when the ship had left port, would complain of dental troubles and it would be necessary to send them by boat for dental treatment when there was an opportunity.

"In place of such haphazard methods the following plan is used: The dental officer of the yard after arrangement with the commanding officer goes aboard ship, makes a cursory examination of each man's mouth, makes out dental abstracts for those lacking them and indicates conditions not shown on previous abstracts. The entire lot of abstracts is taken ashore and kept during the period of treatment of that crew. Appointments are made a day in advance by the selective list system. Each day at noon, the ship is furnished with a statement as to how many patients are wanted on the following day and the hours they are to arrive. Following is a list of three to four times as many names as the number of patients requested. The administrative office of the ship chooses from the list the men who can best be spared, assigns a time to each and notifies the men. The carbon copy received with the original is forwarded to the dental officer the following morning, the men selected being indicated by merely setting down the hour of appointment opposite the man's name. The dental officer's clerk then sorts out the abstracts and makes up a new list for the succeeding day. Men not selected one day have their names appear on the list for the following day and this continues until the time when they can conveniently be spared from ship's duties. Thus, automatically, everyone is taken care of.

"For the dental officer it means a steady flow of patients all day every day, so that his time can be used effectively. For the patients it means a fair division of the dental surgeons' time so that all stand an equal chance of being treated. The enlisted man's entire attitude toward dental treatment is changed. Instead of a bugaboo to be dreaded and postponed, treatment is brought to him in a matter of course way. It becomes one of the many things he falls in line for and gets without exertion of initiative. The first period of treatment convinces him that it is not so bad as he expected and he accepts it appreciatively. To the ship's officers it means dental care for the crew with little or no inconveninece. Best of all, it results in diseased conditions being arrested in their early stages and to that extent is preventive dental surgery.

"The simplicity of the arrangement facilitated its functioning and the ship's officers have taken to the plan with enthusiasm. The

year's work, accomplished in spite of various handicaps, has thoroughly proven the practicability and its economic worth. With increased facilities it should be possible for all ships to leave the yard with their entire crews in dental health.

"Correlated with this system of receiving patients, and essential to get results, is the thorough internal organization of the dental dispensary. Dental operating rooms are standardized as to arrangement of equipment and instruments, definite ways of caring for patients are established, a division is set between the duties of dental surgeons and enlisted dental assistants, concise regular methods of instructing new men in their duties are arranged for, and a simple system of property accountability instituted."

THE ANNUAL DENTAL EXAMINATION

The importance of a thorough, periodical inspection of the condition of the teeth and their supporting structures has been emphasized by the institution of a dental examination as a part of the annual physical examination of naval officers.

Dental disease, in its relation to systemic disturbances, has been discussed widely in medical literature and many prominent internists have placed focal infections of dental origin high on the list of factors which predispose to degenerative changes in the tissues and organs of the body. It has been proved beyond a doubt that the elimination of low-grade infections of the teeth and adjacent tissues, which have appeared to be of small local consequence, has resulted in marked improvement or interruption of other more extensive conditions of indefinite origin.

Some writers are of the opinion that the small, circumscribed area of rarefaction about the apex of a tooth usually harbors a more virulent nidus than the area of infection which involves a comparatively large amount of tissue. The formation of granulomata, fistulae, etc., are held to be favorable local reactions.

With these considerations in mind, it is realized that the examination of the teeth must be conducted as carefully as the examination of any of the other organs and tissues of the body. A careful dental examination which employs every known aid to diagnosis completes what would be, in the exclusion of attention to the mouth, a survey of the body with the exception of the most fertile field of infection known.

The nonvital tooth is the center of interest in the study of dental disease and the best known means to diagnosis can determine only the probable absence of infection. The virulence of any infection

may be entirely out of proportion to its apparent importance and an attempt should be made to determine the identity of the organisms involved. Rosenow's theory of elective localization has been borne out by the results of experiments conducted by other research workers.

An effort has been made to insure that this special examination will be as complete as the facilities will permit and wherever practicable, an officer of the dental corps has been assigned to duty as a member of the examining board.

The dental examination, as described by Kerr[1] "should determine the condition of every tooth present in the mouth. Notations of all conditions found should be made on the dental chart in the examination form, with such abbreviated remarks as are deemed necessary to make clear their meanings. The record thus obtained will serve to indicate, at regular intervals of one year, the need of performing dental operations for the officer concerned. This periodical correction of the dental abstract sheet will insure its maximum value for the purpose of identification."

In discussing the incidence of abnormal urinalysis in connection with the annual physical examination of officers, Kerr expresses the opinion that dental infections are of first importance among the acute or chronic infections which are concerned in the etiology of albuminuria.

Interesting comments relative to the purposes and importance of the annual physical examinations of officers have been incorporated in the recently published annual reports of the Surgeon General of the Army and the Surgeon General of the Navy.

THE ROYAL NAVAL DENTAL SERVICE

The need of a dental service in the British Navy was given official recognition during the World War by the appointment of dental surgeons for service in a temporary status. This introduction of the benefits of dental treatment to the personnel of the Royal Navy proved to be so successful on board ships of the Grand Fleet and at the shore establishments to which dental surgeons were assigned that the nucleus of a permanent dental service was formed after the armistice.

The Admiralty has published regulations for admission to the royal naval dental service and particulars of the service as follows:

[1] Kerr, W. M., Lieutenant Commander, Medical Corps, United States Navy, "The Annual Physical Examination," UNITED STATES NAVAL MEDICAL BULLETIN, Volume 21, No. 3.

"QUALIFICATIONS

"1. Every candidate for admission into the dental service of the Royal Navy must be not under 21 nor over 28 years of age on the day of the commencement of the competitive examination. He must produce an extract from the register of the date of his birth, or, in default, a declaration made before a magistrate, from one of his parents or other near relative, stating the date of birth.

"2. He must declare—

1. His age and date and place of birth:
2. That he is of pure European descent and the son of either natural-born or naturalized British subjects:
3. That he labors under no mental or constitutional disease or weakness nor any other imperfection or disability which may interfere with the most efficient discharge of the duties of a dental officer in any climate;
4. That he is ready to engage for general service at home or abroad, as required;
5. Whether he holds, or has held, any commission or appointment in the public services;
6. That he is registered under the dental act, giving the date of his registration as a dental student or of his beginning professional study:
7. Whether he has previously been examined for entry in the naval service, and, if so, when.

"3. The certificates of registration and birth must accompany the declaration, which is to be filled up and returned as soon as possible, addressed to the director general, medical department, Admiralty, S. W. 1, to permit of reference to the candidate's dental school.

"4. The dean or other responsible authority of such school will be requested by the medical director general to render a confidential report as to the candidate's character, conduct, professional ability, and fitness to hold a commission in the Royal Navy.

"5. The candidate will then be interviewed by the medical director general, and his physical fitness will be determined by a board of naval medical officers. The medical director general will then decide whether he may be allowed to compete.

"6. If accepted, he will be eligible to present himself at the entrance examination, which will be held twice a year.

"7. The appointments announced for competition will be filled from the list of qualified candidates arranged in order of merit; but should it at any time be considered expedient to grant commissions beyond those periodically competed for, the Admiralty have power to admit annually not more than two candidates, according to requirements, specially recommended by the governing bodies of such dominion or colonial dental schools as may be selected and whose qualifications are recognized by the general medical council.

"Candidates so proposed are to be approved by the director general of the medical department of the Navy.

"They will have to pass a physical examination before a board of naval medical officers in their dominion or colony, and will be required to register their qualifications on arrival in England. They will be allowed, if they wish it, to compete at the next examination for entrance, and take their position according to the order of merit. Should they decide not to compete, they will be placed at the bottom of the list. It will, however, be in any case necessary for them to pass a qualifying test at the time of the usual half-yearly examinations, when they will be required to obtain a minimum of 50 per cent of the total marks allowed in each subject. In case of failure in this test examination the Admiralty will not undertake to defray the cost of the return journey to the candidate's dominion or colony or other expenses thereby incurred.

"8. A fee of 1*l* will have to be paid by each candidate to enable him to take part in the competition.

"9. Candidates who have served in the officers' training corps, and who are in possession of the certificates laid down in the regulations for that corps, will be credited at the entrance examination with additional marks as follows: Candidates in possession of certificate A will receive 3 per cent, and those who possess certificates A and B, 6 per cent of the maximum number of marks allotted. Candidates who have served during the war in the Royal Navy, Army, or air force, either as officers or men, but who have not been members of the officers' training corps, will be accorded 3 per cent credit if their services are under one year, and 6 per cent if over that period.

"10. A candidate will not be allowed to compete at more than two examinations.

"REGULATIONS AS TO ACTING SURGEON LIEUTENANTS (D)

"A candidate successful at the entrance examination will be appointed as acting surgeon lieutenant (D) in the Royal Navy, and will be required to pass through such courses as the Admiralty may decide. (*See* under the heading Examinations.)

"At the end of the courses the acting surgeon lieutenant (D) will be examined, and, after he has passed, will be given a commission as surgeon lieutenant (D) in the Royal Navy. The commission will date from the day of passing the entrance examination. An acting surgeon lieutenant (D) who fails to qualify at the above examination, that is to say, who fails to obtain at least 50 per cent of the marks in each subject at the examination at the end of the Haslar course, will, if he so elects, be allowed a second trial at the next examination, and, should he qualify, will be placed at the bottom of his original list; but should he again fail, his appoint-

ment will not be confirmed, and he will be required to withdraw. During the period intervening between the two examinations he will be allowed no pay from naval funds, and the period will not be counted as service for either promotion, withdrawal with gratuity, or retirement.

"12. A gold medal will be awarded as a prize in connection with these examinations; and the gold medalist will have a distinguishing mark after his name in the navy list, provided he obtains at least 75 per cent of the aggregate maximum marks in the London and Haslar examinations combined.

"13. A candidate who at the time of passing the examination for entry into the dental branch of the Royal Navy holds, or is about to hold, an appointment as dental officer in a recognized civil hospital, may be allowed to serve in such civil appointment provided that the period of such service after the date of entry into the Royal Navy does not exceed six months. Pay from naval funds will be withheld from officers while thus serving, but the time concerned will reckon for increase of full and half pay while on the active list, and retired pay or gratuity on retirement or withdrawal, except that no officer will be allowed to retire on a gratuity until he has completed four years' service exclusive of the time spent as dental officer in a civil hospital. The eligibility of this appointment to count for time will be decided by the medical director general.

"14. Acting surgeon lieutenants (D) under training may, if they wish, provide themselves with those articles of uniform only, which are required for dresses No. 5 (undress) and No. 7 (mess undress) (*vide* quarterly navy list), omitting white trousers, sword, and belt. On receiving commissions as surgeon lieutenants (D) they must provide themselves with the complete outfit of uniform prescribed by the regulations.

"EXAMINATIONS AND PROFESSIONAL STUDY

"*Examination for entry*

"15. Candidates will be examined by the examining board in the following subjects:

"Dental surgery, including dental pathology therapeutics, oral hygiene, and oral prosthetics.

"The examination will be partly written and partly practical, marks will be allotted under the following scheme—

Operative surgery	400
Prosthetics (practical)	400
Paper	400
Oral	400
	1,600

"No candidate shall be considered eligible who obtains less than 50 per cent of the marks in each subject. The examination will be held in London and will occupy four days.

"COURSE OF STUDY AND EXAMINATION FOR ACTING SURGEON LIEUTENANTS (D)

"16. The course of instruction for acting surgeon lieutenants (D) will be one month in duration and will take place at R. N. Hospital, Haslar. A senior dental officer will be appointed on the staff of the surgeon rear admiral, Haslar, to superintend these studies and fill the post of lecturer. At the conclusion of the Haslar course an examination will be held as detailed in paragraph 11.

"The seniority of surgeon lieutenants (D) on entry will be determined by the sum total of the marks they obtain at the London examination and the examination at the conclusion of their probationary period as acting surgeon lieutenant (D). Their names will then be placed in the official Navy list. Candidates who hold, or are about to hold, a post as dental officer to a recognized civil hospital will retain the position in the list which they obtained on entry, and when their period of service as dental officers at such civil hospital is over, they will join the next 'acting surgeon lieutenants' (D) course,' and will be required to obtain qualifying marks. Surgeon lieutenants (D) entered without competition will take seniority next after the last surgeon lieutenant (D) entered at the same time by competition. (*See* clause 7 of regulations for entry.)

"17. A post graduate course of three months' duration will be allowed to surgeon lieutenant commanders (D) of over two years' seniority. The surgeon lieutenant commander (D) going through this course will be accommodated at the Royal Naval College, Greenwich, and will be under the general control of the president, and the dental assistant to the medical director general, Admiralty. This course is not compulsory, but is designed to afford senior officers the opportunity of refreshing their general knowledge of dentistry, and making themselves familiar with modern advances. There will not be any fixed syllabus of instruction or any examination, but a report will be made to the medical director general by the dental assistant to the director general at the end of the course.

"Under very special circumstances a dental officer taking this course may be allowed, by permission of the medical director general, to take three months' course at the dental hospital, outside London, at which he formerly studied. If this is approved, the dean of his dental hospital will be asked to forward to the medical director general, Admiralty, a confidential report on his abilities and particulars of his attendance during his course.

"18. A small dental library of a value not exceeding £6 is supplied to each ship or establishment in which a dental officer is borne.

"19. *Relative rank.*

	Military branch	Army rank
Surgeon Commander (D)	Commander	Lieutenant Colonel, but junior to that rank.
Surgeon Lieutenant Commander (D).	Lieutenant Commander.	Major.
Surgeon Lieutenant (D)	Lieutenant	Captain.

"*Pay and allowances.*

NOTE.—Twenty per cent of these rates of full pay, half-pay, and retired pay are considered as due to the present high cost of living, and are subject to change on or after July 1, 1924, and thereafter every three years, either upwards or downwards, according as the cost of living rises or falls.

"20. *Full pay.*

	Year of 365 days			One day		
	£	s.	d.	£	s.	d.
Surgeon Lieutenant (D):						
On entry	401	10	0	1	2	0
After three years	492	15	0	1	7	0
Surgeon Lieutenant Commander (D):						
On promotion	593	2	6	1	12	6
After 3 years seniority	629	12	6	1	14	6
After 6 years seniority	666	2	6	1	16	6
After 9 years seniority	730	0	0	2	0	0
Surgeon Commander (D):						
On promotion	775	12	6	2	2	6
After 3 years seniority	839	10	0	2	6	0
After 6 years seniority	912	10	0	2	10	0

"On first appointment to the service, dental officers will receive full pay from the date of appointment, but subject to the provisions of Article 1347 of the King's Regulations, 1913.

"21. *Allowances.*—Dental officers will be eligible for allowances on the same scale and under the same conditions as for medical officers of equivalent rank, except that 'flag allowances' and 'specialist allowances' will not apply.

"In the absence of service accommodation and victualing, lodging and provision allowances are payable under the conditions laid down and at the rates prescribed in the King's Regulations. The current rates are as follows:

	Provision		Lodging	
	Annual	Daily	Annual	Daily
	£	*Shillings*	£	*Shillings*
Lieutenant or Lieutenant Commander	80	5	80	8

"These rates are subject to revision from time to time.

"Payment of lodging and provisions allowances will be made in the first instance at the annual rate, but in cases where the period of payment does not exceed one month, the difference between the annual and daily rate will then be credited.

"22. The emoluments of the assistant to the director general are to be as follows:—

"Pay of rank plus lodging and provision allowances, and a special allowance.

"23. *Half pay.*—In the case of dental officers, a distinction is to be drawn between (*a*) officers awaiting employment, and (*b*) those who are permitted, for private reasons, which the Admiralty regard as satisfactory, to refuse an appointment or to have their appointment canceled, or who are unemployed at own request or in consequence of misconduct.

"In the former case (*a*) officers are to receive unemployed pay, as follows:

"For the first six calendar months, full pay of rank (without allowances).

"For the next six calendar months:

		s.	d.
Surgeon Lieutenants (D)	a day	17	0
Surgeon Lieutenant Commanders (D)	do	22	6
Surgeon Commanders (D)	do	27	6

"Thereafter half the full pay of their rank and seniority on the executive officers' scale, viz:

		s.	d.
Surgeon Lieutenants (D)	a day	8	6
Surgeon Lieutenants of 4 years' seniority	do	10	0
Surgeon Lieutenant Commanders (D)	do	15	0
Surgeon Lieutenant Commanders of 3 years' seniority	do	16	0
Surgeon Lieutenant Commanders (D) of 6 years' seniority	do	17	0
Surgeon Commanders (D)	do	20	0
Surgeon Commanders of 3 years' seniority	do	22	0
Surgeon Commanders of 6 years' seniority	do	24	0

"Unemployed pay will not, however, be granted in cases where an officer is undertaking continuous professional work for which payment is made.

"In the latter case, (*b*) officers may receive half the full pay of their rank and seniority on the executive officers' scale.

"Periods during which unemployed full pay or unemployed pay are received will only count as half-pay time.

"An officer who is permitted, for private reasons, to decline an appointment, or to have his appointment canceled will not be

entitled to any unemployed pay. In such cases, officers may be placed on half pay.

"24. *Retirement, and retired pay and gratuities.*—Service for retired pay, except where otherwise stated, is reckoned as follows:

Service on full pay	In full.
Service on half or unemployed pay	One-third.

"Civil employment under colonial or foreign governments or under other Government departments may, in certain cases, be allowed to count in full. (*See also* par. 13.)

(*a*) Compulsory retirement will be as follows:

Surgeon Commanders (D) retire at the age of 50; maximum retired pay, £600.

Surgeon Lieutenant Commanders (D) and Lieutenants (D) retire at the age of 45; maximum retired pay, £450.

"Subject to these maxima, the rates of retired pay for Surgeon Commanders (D), Surgeon Lieutenant Commanders (D) and Surgeon Lieutenants (D) are as follows:

Age on retirement	Retired pay	Period of service (years) counting towards retired pay	Addition for each full year's service in excess of that specified in column 3 or deduction for each full year wanting to complete that period of service, addition or deduction limited to five years in each case	
			Addition	Deduction
50	£675	22	£15	£15
49	637	21	15	15
48	600	21	15	15
47	562	20	15	15
46	525	20	15	15
45	487	19	15	15
44	450	19	15	15
43	412	18	15	15
42	375	18	15	15
41	337	17	15	15
40	300	17	15	15

(*a*) Officers over the age of 40 may retire on the half-pay applicable to their rank if more advantageous to them to do so.

(*b*) Surgeon commanders (D) under the age of 40, invalided, to receive the half pay of their rank.

(*b*) Voluntary retirement and withdrawal will be allowed as follows:

(i) An officer entered within the age limits prescribed in paragraph 1, who has reached the age of 40 years may, at the discretion of the Board of Admiralty, be permitted to retire with retired pay

upon the foregoing scale or upon the half pay of his rank, if to his advantage.

(ii) An officer entered below the age of 30 years after July 17, 1920, will be required to serve 12 years to qualify for retired pay according to scale or at the half-pay rate.

(iii) Such officers who retire voluntarily with less than the service stated, will be eligible for gratuities only on the scale set forth in paragraph 25(*a*) whatever their age.

(iii*a*) Officers entered exceptionally above the age of 30 years, will not be eligible for retired pay, but for gratuities only on the scale set forth in paragraph 25(*a*).

(iv) At the expiration of 4, 8, 12, or 16 years' full-pay service an officer will be permitted, subject to their Lordships' approval, to withdraw from the naval service, receiving a gratuity on the scale laid down in paragraph 25.

NOTE.—The four years' service is exclusive of time served as dental officer in a civil hospital (*see* par. 13) or of time served as a temporary officer.

The name of an officer so withdrawing will be removed from the lists of the navy, with which all connection will then be severed.

In order that arrangements may, as far as possible, be made for the relief of officers who may wish to withdraw on a gratuity, it is desirable that six months' notice of their wish should be forwarded for the consideration of their Lordships.

(v) Applications from officers to retire or withdraw, or to resign their commissions, will receive every consideration, but no officer will, as a rule, be permitted to resign within three years from the date of entry.

(vi) The Admiralty reserve to themselves power to remove any officer from the list for misconduct.

"25. (*a*) Gratuities will be awarded on retirement and withdrawal on the undermentioned scale.

Rank	Gratuity		
Surgeon Lieutenant (D), Surgeon Lieutenant Commander (D), and Surgeon Commander (D):	£.	*s.*	*d.*
After 4 years' full-pay service	500	0	0
After 8 years' full-pay service[1]	1,000	0	0
After 12 years' full-pay service[1]	1,500	0	0
After 16 years' full-pay service[1]	2,250	0	0

[1] Including service allowed by paragraph 13.

"Temporary Surgeon Lieutenants (D) who have transferred to the permanent dental service will only be allowed to withdraw with a gratuity after 4 years' full-pay service from the date of such transfer.

(*b*) The following is the scale of service pension for officers ineligible for retired pay under paragraph 24, other than Surgeon Commanders (D), if invalided:

(1) A Surgeon Lieutenant (D) to receive a minimum of £100 a year with an addition of £10 for each year's actual service in that rank.

(2) A Surgeon Lieutenant Commander (D) to receive a minimum of £180 a year, with an addition of £10 for each year's actual service in that rank.

"26. The power vested in their lordships of granting reduced rates of half pay and retired pay in cases of misconduct is extended to the award of gratuities on retirement, and the gratuity awarded will be reduced to such an amount as is thought fit.

"27. An officer compulsorily retired on reaching the age limit will be eligible, if recommended by the medical director-general for distinguished or meritorious service, to receive a step in rank on retirement, such step to be awarded at their lordships' discretion, and not to confer any claim to increase of retired pay or of widow's pension.

"28. All retired officers will be liable till the age of 55 to serve in time of declared national emergency in a rank not lower than that held on retirement.

"This liability will not exist in cases of withdrawal on the conditions specified in paragraph 24 (*b*) (iv).

"Retired officers called upon to serve will receive special consideration as regards appointments on shore, and will be, in all respects, entitled to the pay and emoluments of their corresponding ranks on the active list, their retired pay being suspended. Officers promoted on, or subsequently to retirement, will receive the rate of full pay of the higher rank, and those not so promoted the rate they were receiving when last in receipt of full pay, but unemployed time on the retired list does not count for increases of full pay governed by seniority.

"Officers on the retired, pension, or reserve lists of the Navy, when called out for service in time of war or emergency, will receive a bonus of 25 per cent for every pound of full pay of their rank earned by them, exclusive of allowances. The time served will not count for increase of retired pay or pension.

"If, however, an officer's retired pay exceeds the full pay of his corresponding rank on the active list, he will continue in receipt of his retired pay and will receive a bonus of 25 per cent for every pound of retired pay received during the period of reemployment, exclusive of allowances.

"In the case of officers who have commuted their retired pay or who received gratuities on discharge, deductions will be made from their full pay equal to the amount of retired pay commuted, or to the annual value of the gratuity.

"Officers called from the reserved, retired, or pension lists during war or emergency may be promoted irrespective of the regulations which are in force at the time for officers of the same class on the active list. It will carry with it during reemployment the emoluments of the higher rank.

"Dental officers on the reserved or retired lists, if employed in case of war or emergency, will receive an equipment allowance as follows:

Surgeon Commanders (D)	£18
Surgeon Lieutenant Commanders (D) and Surgeon Lieutenants (D)	15

"WIDOW'S PENSION

"29. Widow's pension and compassionate allowances for children are given under the conditions specified in Chapter LIV of the King's Regulations and Admiralty Instructions.

"When an officer retires on a gratuity or withdraws on a gratuity, his widow and children will have no claim to pension or compassionate allowance.

"The fact of an officer retiring *on pension* does not deprive the widow or children of any claim to pension if they are so entitled at the time of his retiring.

"Officers serving in the reserve, who during reemployment are injured on duty, or lose their lives from causes attributable to the service, come under the same regulations as regards compensation for themselves, or pension and compassionate allowances for their widows and children, as officers of the same rank on the permanent active list.

"PROMOTION

"30. To Surgeon Lieutenant Commander (D).

(*a*) Rank as Surgeon Lieutenant Commander (D) will be granted to Surgeon Lieutenants (D) at the expiration of six years from the date of entry, subject to their lordships' approval and to his being recommended for advancement by the medical director-general.

(*b*) Promotion to Surgeon Commander (D) will be made strictly by selection.

"DISTINCTIONS

"31. In addition to the possibilities of gaining war medals and other distinctions for active service or distinguished performance of

duty which dental officers share in common with the rest of the Navy, the following distinction is confined to the officers of the dental department: A gold medal is given at the end of the acting Surgeon Lieutenants' (D) course of instruction, as already detailed in paragraph 12.

"LEAVE OF ABSENCE

"32. Full pay leave of absence will be granted to dental officers under the conditions specified in the King's Regulations and Admiralty Instructions, articles 860 and 1398.

"SICK LEAVE

"33. Sick leave is granted to dental officers under the conditions laid down in the King's Regulations and Admiralty Instructions, articles 1396 and 1352.

"CABINS

"34. Dental officers will select their cabin (all ward room officers making such selection in order) according to their rank and seniority."

NOTES ON OFFICIAL CORRESPONDENCE[1]

Official correspondence in the naval service is written communication between officers of the Navy and the offices and bureaus of the Navy Department; commanders in chief; commandants; vessels of the Navy; and naval stations. The subject matter usually embraces information concerning the activities, duties, and policies of the Navy, recommendations, requests, reports, and knowledge of conditions which are of value in the transaction of public business. The forms employed in official correspondence are prescribed by Navy Regulations and are not subject to variation.

Use of prescribed form.—The forms prescribed for correspondence within the naval service should be used with such departments as may adopt a similar form of correspondence, but not with departments, officials, and persons by whom similar forms have not been adopted.

Essentials of correspondence.—Official correspondence should be courteous in tone and free from expressions of a personal nature, but courtesy should be indicated by the substance and feeling rather than by artificially polite phrases and formulas. The subject matter in a letter, endorsement, or report should be divided into paragraphs in logical sequence, each containing statements complete in them-

[1] From course in Naval Regulations, naval customs, and duties of dental officers, Navy Dental School, Washington, D. C.

selves but all relative and pertinent to the subject at hand. Separate letters should be written on separate subjects unless the subjects are of a like nature.

As a general rule, letters should be answered by letters and not by endorsements. All communications, except such as require neither action nor reply, should be acknowledged.

In adding to the clearness of a letter, the use of accompanying diagrams, tables, and sketches is permissible, but they should never be embodied in the letter.

Endorsements.—All endorsements, except those referred to in the next paragraph, should be placed in regular order, beginning on the last page of the letter, immediately below the signature, if there be room there; if not, additional full-sized sheets should be appended to the letter to accommodate them. Endorsements affecting pay, mileage, transportation, and traveling expenses should be placed on the face of the original order involving travel, if practicable; otherwise on the back of the order.

Transmittal of communications.—Communications from subordinates are sent to their superior officers for transmittal. If in proper form and language, the superior officer forwards them as soon after receipt as practicable, stating thereon in writing, by endorsement or otherwise, his opinion in relation to every part of the subject contained in the communication.

To such papers as are complete in themselves and do not require an expression of opinion from the office through which they are transmitted, the term "forwarded" is affixed and such papers transmitted under the endorsement of an officer of the staff, by direction of the commander in chief, the commandant, or the senior officer present.

No written communication is considered official which has not been forwarded through the prescribed channels and with the endorsements of the officers through whom it should have been forwarded.

Officers addressed—official titles used.—Communications generally are addressed to those who by regulation or law have cognizance of the subject presented or are authorized to take action thereon.

Official communications intended for officers holding positions with recognized titles are addressed to them by title and not by name, as "The Commandant," "The Commander in Chief,——— Fleet (or Squadron)," "The Commander, ——— Squadron (or Division)," "The Commanding Officer."

An officer left in temporary command of a station, fleet, squadron, or division, or in general, of any command, is addressed as if he

were the regular commanding officer, on the principle that it is the office and not the person that is addressed. The temporary incumbent transacts the business so that the necessary copies and records shall be preserved in the files of the absent superior officer's office, using stationery of that office when practicable.

Letters to Navy Department.—Official communications for the Navy Department or any of its bureaus or offices are addressed to the bureau or office which has cognizance over the subject matter. It is prohibited to address communications to "The Navy Department."

The following are examples of addresses:

The Secretary of the Navy.
The Chief of Naval Operations.
The President of the General Board.
The Chief of the Bureau of ———.
The Major General Commandant, Marine Corps.
The Judge Advocate General.
The Commanding Officer, U. S. S. ———.
The Dental Officer, Navy Yard, ———.
The Commandant, ———.
The Medical Officer, Naval Training Station, ———.

Abbreviations.—In the body of the letter, United States Navy should be abbreviated to U. S. N., United States Naval Reserve Force to U. S. N. R. F., United States Marine Corps to U. S. M. C., and United States Marine Corps Reserve to U. S. M. C. R. In the case of names of staff officers, the staff corps should be abbreviated as follows: Medical Corps to M. C., Supply Corps to S. C., Dental Corps to D. C., Construction Corps to C. C., Civil Engineer Corps to C. E. C., Chaplain Corps to Ch. C., Professors of Mathematics to Math.

Correspondence paper.—Letter paper habitually is used for official correspondence in the Navy, whether it be letters or endorsements. For the original or first copy it is white linen typewriter paper, 8 by 10½ inches in size, weighing approximately 4½ pounds per ream of 500 sheets of that size. For file copies a green tinted paper of the same size and weighing about 3 pounds per ream is used. Thin paper other than green is used for additional carbon copies.

Carbon copies.—Letters and endorsements should be typewritten, using noncopying ribbons. A sufficient number of carbon copies should be made for filing or other purposes. Carbon copies should show the office of origin, and the name of the signing officer should be typewritten or stamped on all copies. In preparing letters, endorsements, and reports which go through another officer or other

offices, the office preparing the original should make on thin white paper a copy for each office through which the correspondence is to pass before it reaches its final destination.

One side of sheet used—spacing.—Only one page of the sheet should be written upon and a margin of three-fourths inch should be left on each side and at the bottom of the sheet.

Letters and endorsements should be written single spaced, with one double space between paragraphs. A double space should be used before and after "Subject," "Reference," and "Enclosure."

Heading.—Letters and endorsements should begin with the ship or station, place, and date. The official designation of all vessels of the Navy should be the name of the vessel preceded by the letters "U. S. S." The word "flagship" should follow the name of the vessel in the heading of a communication from the office of a flag officer. The upper line of the heading should be at least 1½ inches from the top of the page. In the case of endorsements which start on a new page, or any letter or endorsement continued on a new page, there should also be left clear at least 1½ inches at the top for binding purposes.

Sub-letter heads.—Special sub-letter heads may be used at shore stations to designate the different offices of the station and by officers on detached duty ashore, but should not be used to designate the different heads of departments on board ship.

Letters written at sea.—In communications dated on board a vessel at sea, the latitude and longitude should be stated if exactness be necessary, otherwise the expression "Passage, to ———" should be used.

Origin.—Following the heading and date, with at least one double space intervening, either the official designation or the name and rank of the writer preceded by the word "From" should be written at the left side of the page as shown in accompanying specimen letters.

Addressee—channels numbered.—On the line below "From" and preceded by "To" at the left of the page, should appear the official designation of the office or official addressed; following this, the channels through which the communication is to pass; these offices to be designated by numerals indicating the sequence of routing.

The subject.—Following the address, the subject of the correspondence should be written across the page, preceded by "Subject."

The subject should be brief but complete, in about the same form and terms as would be used in indexing the communications in filing; for example,

"Subject: Unauthorized dental treatment; report of."

"Subject: Suggested changes in supply table."

Repetition of subject.—The subject should not be repeated at the beginning of an endorsement, except when required by the filing system of the writer's office to identify the file copy, or when the endorsement begins on a new sheet, in which case it should always be repeated.

References.—After the subject, the reference to previous correspondence on the subject, if any, should be briefly indicated, preceded by "Reference."

In acknowledging, answering, or referring to official communications, the file number (letters as well as figures), and date should be included in the "Reference." References should be lettered in small letters and may be referred to in the communication as "References: (*a*), (*b*), etc." Where there is but one reference, there need be no indicating letter.

Reference forwarded under separate cover.—When any article referred to in a communication is forwarded under separate cover, it should be tagged and plainly marked in the following manner: "From: The Dental Officer, U. S. S. ———, accompanying letter (or endorsement) No. ——, date ———." If possible, this should also appear on the box or package carrying the enclosure.

Enclosures.—Following "Reference," if any, the number of enclosures should be stated, preceded by "Enclosures" at the left of the page.

When necessary, the method of forwarding enclosures, whether enclosed under separate cover or by express, should be indicated.

The absence of "Reference" or "Enclosure" will indicate that no reference or enclosure accompanies the communication.

Paragraphs numbered—subparagraphs lettered.—Paragraphs in letters and endorsements or other officials papers should be numbered. Subparagraphs should be lettered thus: (*a*), (*b*), etc.

Ceremonial forms not used.—The body of the letter should begin and end without any ceremonial form or expression, such as "Sir," "I have the honor to report," "Very respectfully," etc., and the name of the signing officer should be typewritten without designation of rank, title, or office.

Arrangement and numbering of sheets.—The first sheet of a letter or a report should be placed on the bottom and additional sheets in regular order, so that the last sheet is on top. Inclosures, if any, should be placed on the bottom and the whole securely fastened together with paper fasteners, the ends of which should be on the top so that the upper sheet may be removed to place endorsements thereon or add additional sheets. Each page of letters and endorsements should be numbered consecutively throughout and the numbers

should be placed in the middle of the page about one-half inch from the bottom.

Files.—All officers are required to file and preserve all official documents received and copies of all official letters and endorsements sent.

Filing system.—Suitable files containing copies of all orders given and official letters written and the originals of all letters received on public service in all offices on board naval vessels and at shore stations should be kept and preserved. The system of filing should be such as to safeguard all official papers and to render them readily accessible to reference. A flat filing system should be used when practicable.

SPECIMEN LETTERS AND ENDORSEMENTS

Specimen I

Naval Air Station,
Camden, New Jersey,
10 July, 1924.

From: Lieutenant (jg) John J. Doe (DC), U. S. N.
To: The Commandant, Fourth Naval District.
VIA: The Commanding Officer.
Subject: Reporting for duty.
Reference: Orders Nav–717–NW 9969–43, dated 1 July, 1924.

1. In obedience to paragraph 2 of reference, I hereby report to the Commandant, Fourth Naval District, for duty at the Naval Air Station, Camden, N. J.

2. I reported to the Commanding Officer, Naval Air Station, Camden, N. J., at 10.00 A. M., this date.

John J. Doe.

Specimen II

U. S. S. WASHINGTON,
Navy Yard, Boston, Massachusetts,
1 August, 1924.

From: Lieutenant (jg) John J. Doe (DC), U. S. N.
To: The Chief of the Bureau of Navigation.
VIA: The Commanding Officer.
Subject: Commencement of leave, and address.
Reference: Letter Bunav 336–RB, 9999–10, dated 1 July, 1924.

1. In compliance with instructions, the Bureau of Navigation is

advised that the leave of absence granted by reference commenced this date.

2. My address while on leave of absence will be:

Army and Navy Club,
Washington, D. C.

John J. Doe.

Specimen III

U. S. S. KANAWAH,
Annapolis, Maryland,
5 January, 1925.

From: Lieutenant Commander John J. Doe (DC), U. S. N.
To: The Secretary of the Navy.
VIA: (1) The Commanding Officer.
(2) The Chief of the Bureau of Navigation.
Subject: Permission to leave the United States; request for.
References: (a) Article 1722, U. S. Navy Regulations, 1920.
(b) Bunav letter 335–RM, 9999–42, dated 19 December, 1924.

1. It is requested that I be granted authority to leave the continental limits of the United States with permission to visit Canada while on leave of absence authorized by reference (b).

John J. Doe.

Specimen IV

U. S. S. PATUXENT,
Passage, Puget Sound to San Pedro,
1 July, 1925.

From: Lieutenant (jg) John J. Doe (DC), U. S. N.
To: The Chief of the Bureau of Navigation.
VIA: The Commanding Officer.
Subject: Delay in reporting; request for.
Reference: Orders Nav–616–WN 9919–33, dated 15 June, 1925.

1. It is requested that I be authorized to delay for a period of ten (10) days in reporting to the Commanding Officer of the U. S. S. HOLLAND, in obedience to reference.

2. If this request is granted my address will be:

Hotel Copley-Plaza,
San Diego, California.

John J. Doe.

Specimen V

U. S. S. RAMAPO,
Passage, San Pedro to Monterey, California,
3 July, 1924.

From: The Dental Officer.
To: The Medical Officer.
Subject: Prosthetic dental treatment, case of SMITH, John D., Lieutenant, U. S. Navy (act of duty case).
Reference: Bureau of Medicine and Surgery circular letter serial No. 335–1924.
Enclosure: Copy of dental abstract in subject case.

1. Lieut. John D. Smith, U. S. N., reported to the dental officer on 15 May, 1924, with superior central incisors very loose and upper lateral incisors fractured below the gingival margin. It was necessary to extract all of the superior incisors.

2. The loss of teeth in this case was in the line of duty, not due to misconduct. The injury was sustained when a coal bag carried away and struck Lieutenant Smith while he was engaged in coaling ship, on 15 May, 1924.

3. Dental prosthesis is considered necessary to restore masticatory function as well as for esthetic reasons. The tissues are now nearly healed and the mouth will soon be ready for prosthetic treatment.

4. It is recommended that a report of this case be forwarded to the Bureau of Medicine and Surgery and that authority be requested to have the necessary prosthetic replacement made at the U. S. Naval Hospital, Santa Cruz, California, as soon as practicable after the arrival of this vessel at the Navy Yard, Santa Cruz, California, on or about 30 July, 1924.

John J. Doe.

1st Endorsement

U. S. S. RAMAPO,
Monterey, California,
5 July, 1924.

From: The Medical Officer.
To: The Chief of the Bureau of Medicine and Surgery.
VIA: The Commanding Officer.
Subject: Prosthetic dental treatment, case of SMITH, John D., Lieutenant, U. S. Navy.
Reference: Medicine and Surgery Circular Letter serial No. 335–1924.
Enclosure: Copy of dental abstract in subject case.

1. Forwarded.

2. It is requested that prosthetic dental treatment be authorized in the case of Lieut. John D. Smith, U. S. N., in accordance with the recommendation contained in paragraph 4 of basic letter.

John A. Johnson.

2nd Endorsement

U. S. S. RAMAPO,
Monterey, California,
6 July, 1924.

From: The Commanding Officer.
To: The Chief of the Bureau of Medicine and Surgery.

1. Forwarded, recommending approval.

2. This vessel is scheduled to be at the Navy Yard, Santa Cruz, California, during the entire month of August, 1924.

John P. Jones.

Specimen VI

U. S. S. PECOS,
Navy Yard, New Orleans, La.,
1 July, 1925.

From: The Medical Officer.
To: The Dental Officer,
Navy Yard,
New Orleans, La.
Subject: Prosthetic dental treatment, case of ROE, Richard James, Sea–1c, No. 123–45–67.
References: (a) Bureau of Medicine and Surgery circular letter Serial No. 335–1924.
(b) Manual of Medical Department, Paragraph 3168.

1. The above-named man is considered to be in need of prosthetic dental treatment as outlined in reference (a).

2. It is requested that an examination be made in this case and that a report of the oral condition and of the necessity for prosthesis be forwarded to this vessel as soon as practicable.

John A. Johnson.

1st Endorsement

Navy Yard, New Orleans, La.,
Dental Dispensary,
2 July, 1925.

From: The Dental Officer.
To: The Medical Officer, U. S. S. PECOS.
Subject: Prosthetic dental treatment, case of ROE, Richard James, Sea–1c, No. 123–45–67.
Enclosures: (A) Copy of dental abstract.
(B) X-ray negative in subject case.

1. Returned.

2. An examination in subject case reveals an edentulous superior maxilla and only two teeth remaining in lower arch—condition shown graphically by enclosure (A). The two remaining lower molars are in a diseased condition and should be extracted.

3. From the statement of the patient and from entries which appear on the dental abstract it is believed that the teeth were lost in the line of duty, not result of misconduct.

4. ROE is considered to be unfit for duty in his present condition and it is recommended that his case be reported to the Bureau of Medicine and Surgery with a view of bringing about his transfer to a naval hospital equipped to furnish prosthetic dental treatment.

John J. Doe.

2nd Endorsement

U. S. S. PECOS,
Navy Yard, New Orleans, La.,
July 3, 1924.

From: The Medical Officer.
To: The Chief of the Bureau of Medicine and Surgery.
VIA: The Commanding Officer.
Subject: Prosthetic dental treatment, case of ROE, Richard James, Sea–lc, No. 123–45–67.
Enclosures: (A) Copy of dental abstract.
(B) X-ray negative in subject case.

1. Forwarded.

2. In accordance with reference (a) of basic letter and in conformity with the recommendation contained in first indorsement. it is recommended that ROE, Richard James,, Sea–lc,, U. S. N., be transferred to a naval hospital for necessary prosthetic dental treatment.

3. An examination of the health record in this case shows that a number of teeth were extracted for therapeutic reasons while ROE was a patient at the U. S. Naval Hospital, San Francisco, California.

4. ROE has had 6½ years of continuous service. His current enlistment will expire in January, 1927.

John A. Johnson.

Specimen VII

Navy Yard, New Orleans, La.,
Dental Dispensary,
1 October, 1924.

From: The Dental Officer.
To: The Medical Officer.
Enclosure: Form B—Dental, in quintuplicate.
Subject: Semi-annual requisition for dental equipment and supplies.

1. The requisition forwarded herewith is submitted for the purpose of obtaining sufficient dental equipment and expendable supplies to meet the needs of the nine (9) dental officers attached to this station, for the next six months.

2. This requisition has been prepared with due regard to economy and the notes therein, which are correct as to the data on file at this station, have been made according to the instructions on the form, in the Supply Table, and in the Manual of the Medical Department.

3. Items marked "O" are non-expendable items which have recently been added to the Supply Table and are required to complete the standard units on charge at this yard.

4. The expendable items marked "X" have been requested in excess of the amounts laid down in the Supply Table for nine (9) standard dental units, but a review of the issue of these items during the past year indicates that the amounts required for will be needed during the next six months under similar conditions.

5. In view of the fact that certain expendable items have been requisitioned in excess of the amounts allowed in the Supply Table, it is requested that the inclosed Form B–Dental be forwarded to the Bureau of Medicine and Surgery with a recommendation for approval.

John J. Doe.

1st Endorsement

Navy Yard,
New Orleans, La.,
2 October, 1924.

From: The Medical Officer.
To: The Chief of the Bureau of Medicine and Surgery.
VIA: The Commandant.
Subject: Requisition SD No. 10–1926, Form B–Dental.
Enclosure: Subject requisition, in quadruplicate.

1. Forwarded, approval recommended.

2. The satisfactory manner in which the dental service at this yard is being carried on has been made the subject of a letter to the Bureau under even date.

John J. Smith.

2nd Endorsement

Navy Yard,
New Orleans, La.,
3 October, 1924.

From: The Commandant.
To: The Chief of the Bureau of Medicine and Surgery.

1. Forwarded, recommending approval.

John P. Jones.
By direction

Specimen VIII

U. S. Naval Station,
Island of Palmyra, T. H.,
31 July, 1924.

From: The Dental Officer.
To: The Chief of the Bureau of Medicine and Surgery.
VIA: (1) The Medical Officer.
(2) The Commandant.
Subject: Unauthorized dental treatment.
Reference: Bureau of Medicine and Surgery Circular Letter, Serial No. 339–1924.

1. Pursuant to the instructions contained in reference, the following report of unauthorized dental treatment is submitted for period ending 31 July, 1924:

JONES, John, son of Boatswain William Jones, U. S. N., lower right and lower left central incisors (deciduous) extracted, ethyl chloride spray anesthesia. These teeth were loose and the surrounding tissues inflamed.

JACKSON, Mrs. James, wife of Chief Shipfitter James Jackson, U. S. N., infected roots of lower right second bicuspid and first molar extracted.

SMITH, John, Electrical Engineer, Department of Public Works, Vincent's infection treated.

JONES, Mary, daughter of Chief Pay Clerk James Jones, U. S. N., lower left second molar, occlusal cement filling.

2. It was considered necessary to undertake the operations and treatments herein reported for humanitarian reasons, as reliable civilian dental service was not obtainable. The treatment rendered in each case was considered to be of an emergency character.

John J. Doe.

Specimen IX

U. S. S. VILLALOBOS,
Hampton Roads, Virginia,
1 January 1925.

From: Lieutenant John A. Doe (DC), U. S. N.
To: The Chief of the Bureau of Medicine and Surgery.
VIA: The Commanding Officer.
Subject: Case of dental anomaly.
Reference: Form K-Dental (new issue).
Enclosure: X-ray negative in subject case.

1. In conformity with the instructions accompanying reference, the following special letter report of a case of dental anomaly is submitted:

(a) SMITH, John James, Seaman, U. S. Navy, age 19 years, applied for dental treatment on 14 December, 1924. Smith requested that two "crooked teeth" on the right side of the lower jaw be extracted, stating that these teeth irritated his tongue and interfered with comfortable mastication.

(b) An examination disclosed the presence of two supernumerary teeth, resembling bicuspids, one imbedded between the cuspid and first bicuspid and one between the second biscuspid and first molar. Since they were of no value in mastication and were considered to be potential sources of chronic irritation, both teeth were extracted.

(c) Examination of the extracted teeth confirmed their resemblance to bicuspids. It is believed that the teeth were not deciduous molars.

2. It is considered that the case reported herein presents exceptional and interesting features and that it may be of sufficient interest to publish in a future dental number of the U. S. Naval Medical Bulletin.

John A. Doe.

NAVY DENTAL SCHOOL LIBRARY

The officer in charge of the Navy Dental School desires to complete the files of dental journals which are now in the possession of the school and will be glad to receive back numbers of any dental periodical. Numbers which appeared prior to 1920 are needed especially.

The establishment of a small museum in connection with the school library is planned and donations of old books, pictures and other objects of professional interest will be appreciated.

THE DIVISION OF PREVENTIVE MEDICINE

Notes on Preventive Medicine for Medical Officers, United States Navy

Lieut. Commander J. R. PHELPS, Medical Corps, United States Navy, in charge

MORBIDITY REPORTING AS A FACTOR IN THE STUDY OF HEALTH CONDITIONS IN THE NAVY

In civil public health practice it is necessary to rely, for the most part, upon mortality statistics in studying the epidemiological distributions of important diseases. It is not possible to secure anything like complete, regular or reliable reporting of non-fatal cases. Now and then more or less useful data can be secured by making surveys of small portions of the population in certain communities, and the medical departments of some industrial concerns are in a position to furnish figures for sickness as well as injuries, but by and large even for the small list of diseases which are declared reportable by law as diseases communicable and dangerous to the public health, the cases reported can not be regarded as anything more than a rough index of the prevalence or distributions of those diseases.

In the Navy it is theoretically possible to secure 100 per cent complete reporting of all diseases. In practice it is not quite possible to achieve this because of the difficulty of making all medical officers and such hospital corpsmen as may be on independent duty realize the underlying importance of faithful reporting.

Unless the ultimate value of complete and reliable statistics is appreciated it may seem of little consequence to the medical officer in the field whether, for example, he treats a man with sore throat, really a mild case of acute tonsilitis, for two, three, or even four days, without accounting for the case by form F card, so long as the treatment is good. It does make a difference. Such practice, to the extent to which it is indulged in, affects the accuracy of the vital statistics of the Navy in many ways. In the first place, regardless of cause, it interferes with the making of accurate estimations of average disability and the need for beds for the sick and other medical department facilities. Failure to record cases treated also makes the cost of medical service per patient per day appear fictitiously high.

While the figures for individual causes of disability, especially those for common conditions such as acute tonsillitis, catarrhal

fever, bronchitis, cellulitis, diarrhoeal diseases, etc., may not at the time appear to have any particular significance, the information which reliable statistics for most of the titles in the nomenclature can furnish over a period of years may be very valuable.

At the present time, it is believed, most medical officers are reporting their cases in accordance with the spirit and the letter of instructions. These remarks are not made with the idea that there is any very general tendency to avoid work or that there are many who believe there is anything to be gained by making sick lists smaller than they would be if admissions and sick days were honestly recorded. Nevertheless, one can hardly believe that there was so little actual disability as the morbidity returns from certain ships for the last calendar year would seem to indicate. Analysis of the figures for all ships and stations leaves one with the impression that the practice with regard to putting men on the sick list is not yet as uniform as it should be.

Perhaps there has been a good deal of misunderstanding in the past. Not that medical officers have fooled themselves or the medical officers of other ships in company with them to any great extent, but possibly some medical officers have gotten the idea that the bureau was inclined to look upon a small percentage of sick and low admission rates as *prima facie* evidence of medical department efficiency. There are of course many reasons why it would be impractical, unfair, and generally fallacious to draw conclusions regarding the efficiency of medical department organization and adminstration wholly or principally from study and comparison of the vital statistics of the ship or station. Every medical officer who has tried to account for variations in his sick list understands that, but it may be worth while to make clear the bureau's attitude. To clear up any possible misunderstanding medical officers are advised to read carefully the analysis of the vital statistics of the navy and discussion of some of the factors which seem to make for the occurrence and spread of disease as put before the service in the Annual Report of the Surgeon General, United States Navy, 1924.

It is a good old saying, "Happy is the sanitarian who has no disease to report," but that implies that there is no disease, not merely that statistics collected fail to show the presence of disease, and of course with respect to morbidity in general a certain amount of disability from sickness and injury must be expected under the best conditions. Furthermore, much of the disability must depend upon conditions and circumstances beyond control of the ship or station. It is true that certain factors susceptible to control within the command as well as those which represent essential service conditions may also be responsible for sickness. It is the medical officer's duty to study all matters of possible epidemiological im-

portance with a view to securing the application of preventive measures where indicated, but it is not logical to use statistics which result from the operation of all factors to measure the degree of success attained in dealing with some factors when other factors not subject to control may vary widely. This does not mean that the statistics of individual ships and stations are without value. On the contrary they are of great value, and their value is proportionate to the degree of completeness of reporting and the length of time covered. It is when the figures are used as the basis for comparison currently or for short time periods that unfairness and fallacies are likely to enter into the reasoning process.

At best, statistics merely assist one in studying any problem—medical, economic, industrial, or other—by presenting in convenient form that part of the evidence which lends itself to presentation in the form of figures. Statistics are usually indispensable but at the same time it may be necessary to seek equally essential information that can not be expressed in figures.

It is realized that occasionally a medical officer has been handicapped by a commanding officer holding to the belief that the smaller the sick list the better it looked for the ship. At first glance a long sick list does not look good, and the situation is certainly bad if the causes lie within the power of the ship to control. But under any conditions it is reprehensible to make the sick list look small by keeping the names of men off the sick list who should be carried on the list or by failing to account for the cases by Form F cards, or by discharging men to duty before they are really fit for duty. There is reason in all things. The only logical way to carry on the work of the medical department is for the medical officer to consider in turn and on its own merits the case of each man who applies for relief from real or imaginary troubles. If after applying his best judgment the medical officer is of opinion that the man's disability is such that admission to the sick list is advisable for his own welfare or that the best interests of the ship require admission on account of infectious disease, mental disorder, or other sufficient reason, he should so recommend to the commanding officer without thought of the size of the sick list. The simple rule should be to study each case in turn and admit or not according to the findings, leaving the size of the sick list and rates and percentages to be determined by the purely arithmetical process.

It is possible to skim some of the cream from milk and then by adding water to bring the specific gravity back to the reading that an average sample of rich milk might be expected to give, but such fraud can be detected if the lactometer figures alone are not depended upon. It is possible to have an unusually great amount

of sickness and yet by incomplete reporting make it appear that admission rates and the percentage of sick are about average. However, such a ruse does not reflect credit upon the ship and the attitude of mind that inspires the intent to deceive is not likely to be consistent with the best efforts either to prevent diseases or to diagnose and treat disease. Moreover, the medical officers of other organizations operating under similar conditions soon begin to suspect what is going on.

Low rates, of course, may be true rates, but medical officers must realize that when a ship reports admissions and sick days in numbers well below the average for other vessels operating under similar conditions, without evidence to the contrary, suspicion must necessarily be aroused that one or both of two undesirable methods have been employed—either that men have been turned away from the sick bay when they should have been admitted or that they have been put to bed and treated without putting their names on the sick list.

Statistics as compiled monthly and annually from the morbidity data reported by ships and stations have a positive value in that they account at least for a great deal of the sickness and disability which has actually occurred. The bureau of course must have such information for use in connection with its unending study of many epidemiological problems. The figures are published for the information of the service as a matter of general interest and because the information relative to certain important diseases may at any time prove useful. Aside from the direct purpose of indicating the incidence and prevalence of disease, certain rates are published for individual ships and stations with the idea of promoting complete reporting. It is to be hoped that medical officers, when they see figures which look suspiciously low, will express themselves in such a manner as to aid the general cause and discourage wherever encountered the idea that there is anything to be gained by attempting to camouflage existing conditions with erroneous figures.

It should be clearly understood that the Bureau of Medicine and Surgery desires accurate and uniform recording of sickness and disability not because it considers that ships and stations can be or should be judged as in competition with each other on the basis of morbidity returns but because of a cardinal principle of preventive medicine. That principle is that in order to know what preventive measures are required and when, where, and how to apply them it is necessary to know when, where, and under what circumstances cases of disease are occurring or have occurred. The application of the principle is obvious when dealing with such diseases as smallpox, cerebrospinal fever, diphtheria, etc., diseases which everywhere for the purposes of health department administration are recognized as communicable and dangerous to the public health. However, the

principle holds for any disease or injury that may be regarded as preventable, even though immediate investigation or study may be out of the question.

AN INTERESTING EXAMPLE OF MEDICAL AND HEALTH SERVICE ACCORDED A CIVILIAN POPULATION GROUP BY THE NAVY

The Navy maintains a radio station in an isolated region at Cape Hatteras, N. C. In fact there are two stations separated from each other by a short distance with four men at one and seven at the other. To look after the health and medical needs of these men there is a chief pharmacist's mate on independent duty, M. B. Folb.

The station is located near Buxton on an island which contains several villages many miles apart. The people are good Americans *all*, but lack the conveniences of modern communities and hitherto for the most part they have been untaught, at least so far as medical matters and rules of hygiene are concerned.

The island on which they live is sufficiently remote to place them beyond the reach of the local county health organization in its ordinary activities, and the services of a regular physician can seldom be secured. There is no regular physician within a day's journey except one elderly woman practioner who finds it difficult or impossible to cover the many miles of territory between different settlements.

During the past two years the chief pharmacist's mate at the radio station has been called upon with increasing frequency to minister to these people and serve them, as a substitute for a graduate physician. The need there is for a practioner with the qualifications of the fine old type of country doctor who prepared himself as best he could to cope with any affliction of mind or body.

In addition to treating the sick when called upon for aid and advice the chief pharmacist's mate has taught sanitation and hygiene and has done much to bring about organized efforts that will insure better care and nursing of the sick in the future and he has also planned measures to promote the public health in the different villages.

At one time he was endeavoring simultaneously to do what he could for a man with lobar pneumonia in one part of the island and for another patient 35 miles away over the sands ill with typhoid fever and serious complications which eventually proved fatal. He has been sought from far and near, and he has traveled many miles through many a night to serve as the only available attendant in difficult confinement cases. He has brought relief to many a woman with obstetrical forceps when intervention has become neces-

sary and the case has gone beyond the capacity of the ordinary midwife to do anything effectual. In several instances where he has found a woman in the convulsive seizures of eclampsia his efforts have been crowned later with the satisfaction of knowing that mother and child owe their lives to the fact that by study and practice he has fitted himself to meet obstetrical emergencies. He has diagnosed diptheria and administered antitoxin to children in time to save life and has handled other communicable diseases with the acumen of a trained health officer, so that by prompt isolation and other indicated public health measures the danger of spread has been diminished and outbreaks have been prevented.

Folb has not masqueraded as a physician. His services have been widely sought by the people in medical and surgical emergencies as well as in less trying cases with full understanding of his position. As he has stated in reporting his work among the people, he has never misrepresented his rate on the island, but has done the work requested of him as a matter of necessity, putting his knowledge into practice as best he could, and in serious cases of a baffling nature relying upon cleanliness and common reason based upon his understanding of the laws of nature. Occasionally in cases of necessity consultation has been requested by radio, and a naval medical officer from the naval operating base, Hampton Roads, Va., has gone to his assistance by seaplane. In several instances patients in urgent need of hospital care have been taken back by the air route in the ambulance plane belonging to the naval air station, Hampton Roads. The knowledge among the people that patients can be so transported when necessary has not been without embarrassing consequences. There was, for example, a case of orchitis in which, although it appeared that no unusual therapeutic measures were required, the afflicted man and his family were greatly excited, and much clamor for hospital treatment ensued. It was finally agreed that the Coast Guard boat should take the man to Norfolk the following morning, and the Coast Guard station requested headquarters to permit the use of the boat for that purpose. In the meantime someone unknown to the chief pharmacist's mate requested that an airplane be sent by the Navy instead, and, much to the latter's chagrin, the Navy transported that man with simple orchitis to the hospital. In connection with that case Folb wrote as follows: "The writer is only too glad to help these people with requests for naval medical help via airplane when it is a real emergency of life and death, but it seems that some of them are beginning to expect the naval service to transport every case that they fancy deathly ill. * * * These are such an isolated people that the aid extended them by the naval air service and medical department is a God-send to them, and the writer writes so lengthily not

because of any offended pride, but because he sees the probable attempt to abuse that great privilege for every little ill instead of using it for great emergencies only."

The medical department of the Navy is extending medical and nursing services to native populations in various places, including Guam, Samoa, Virgin Islands, and Haiti, and medical officers have organized and carried on public health work in a most creditable manner on a large scale, but this situation is unique in that it has furnished a member of the hospital corps of the Navy a chance to demonstrate what can be done with the training given in the service and the opportunities a man has to educate and fit himself for doing the many important things that may fall to his lot in this great medical organization.

It is not deemed proper, as a rule, to use money contributed by the taxpayers for any such purpose as "pointing with pride" through the medium of printer's ink to the good work that is being done by the medical department of the Navy. It is rather more fitting ordinarily to "view with alarm," at least to a mild degree, in order that attention may be effectively focused from time to time upon matters in which there is room for improvement, for the purpose of better threshing out health and sanitary problems not yet solved. It is refreshing, therefore, in this instance to take advantage of the occasion legitimately presented for favorable comment upon the work that has been done in the isolated region at Cape Hatteras, to refer to the splendid work that is being done throughout the naval service, albeit, as it should be, that is taken as a matter of course. It is particularly gratifying to observe that the interest taken by this chief pharmacist's mate in preventive medicine and the practical results he has accomplished for the people among whom he is working have as a background the training he has received in the course of his regular duties in the hospital corps of the Navy.

Folb summarizes the results of his work on the island among civilians during the calendar year 1924, in his annual sanitary report of the radio station, as follows:

"From January 1 to December 15, 1924, the writer attended 49 obstetrical cases with the following results:

Living births	41
Stillborn	2
Abortions (6 weeks to 3 months)	5
Toxemia of pregnancy (induced labor in the sixth month)	1

"Of the babies born alive but two have died so far, one a seventh-month boy, who was born while the mother had mumps, and the other an eighth-month girl, born with a tumerous mass on the umbilicus. The infant mortality rate for these living births is thus less than 50 per 1,000 so far. There were no maternal deaths. Deliv-

ery was accomplished with forceps in three instances; in one case, that of a primipara, by means of low forceps after eclamptic convulsions had supervened.

"Although it is claimed that women in rural communities are more normal and easier to handle than city women, most of the women on the 'Banks,' when pregnant, must be watched for complications due to malnutrition, damage to various organs resulting from disease in childhood, infected teeth, and the effects of adenoids and infections of the throat and nose. Among the 49 women attended there were a number who were anemic or gave evidence of lesions of the kidneys or heart. One patient who was rheumatic had hydramnios and was much troubled with edema and acidosis. The mothers of both stillborn children were in very poor health. One had valvular disease of the heart with irregularity, and the other had pyorrhoea with badly infected teeth. The first baby was a breech presentation, out of which the writer made a footling. The child apparently had been dead not more than 24 hours, but the woman had been in labor two days when the pharmacist's mate reached her bedside, and the condition of her heart precluded sending her off by boat or airplane; consequently he had to sacrifice the child's welfare for the mother's sake, and he simply stood by and trusted to mother nature to advance matters until he could safely interfere and terminate the delivery. The second baby was an anencephalic monster. That case was reported in the sanitary letter for November.

"There are undoubtedly many abortions and complications where the writer's assistance is not requested, being regarded by the people as merely excessive uterine bleedings. The fair results obtained by the naval representative are due to an intensive campaign of common sense. The women-folks have learned to apply for advice and examination when they become pregnant. Needless and dangerous digital examination of parturient women has been discontinued, and all sorts of fetishes have just about been done away with in taking care of the sick. There is now more willingness to trust to nature to rectify many ills, if given a chance, and preventive medicine with proper nutrition and sanitation is slowly but surely taking hold here.

"Most pleasing results have been obtained by the routine administration of the citrates of potassium and sodium with small doses of potassium iodide to all gravidous women. The combating of acidosis in these cases nearly always brings them to labor normally. The writer is apparently confirmed in this treatment by Doctors Haden and Guffey ('A case of pernicious vomiting with low blood chlorides and marked response to sodium chloride therapy'—American Jour-

nal of Obstetrics and Gynecology, October, 1924), though the writer uses gland therapy in hyperemesis gravidarum. He also makes use of obstetric pituitrin, ovarian substance, thyroid in tablet form, thyroidectin, and mammary substance, but uses them with great caution.

"The pharmacist's mate also examined 141 grammar-school children and 20 high-school children. Of the former, only 30 per cent were normal; 62 per cent had diseased tonsils and adenoids. The remainder had one or more of the following defects: Anemia, heart lesions, nephritis, conjunctivitis, ascariasis, and uncinariasis. Of the high-school children, 80 per cent were normal. The others had adenoids and were at the foot of the class. The picture was so eloquent that the writer addressed these older children and explained to them that they were in high school because of the law of the survival of the fittest, and that those who had diseased growths in the nose and throat were there in spite of that handicap.

"The work the writer has done among these people has been of the pioneer type, and he has but been blazing a trail for some regular physician who might come here in the future. The writer has formed a Red Cross chapter on the island, but has refused to hold any office except that of unofficial advisor, and he has negotiated with the Milbank Memorial Fund executives and gotten $2,000 as a donation for these people to enlarge their school into a junior high school, with a place for a Red Cross room to be used as a health center for work in preventive medicine among the six villages of the island.

"A graduate Red Cross nurse was also procured. She gave a three weeks' course in home nursing and hygiene in each village, and it is a pleasure now to see how well the women nurse their sick, and with what intelligence they help the accoucheur in a lying-in chamber.

"The writer has had to treat epileptics, cretins, hyperthyroid cases, pneumonias, and the usual run of cases seen by a country doctor, but it is his preventive medicine teachings that have done the most good. He feels that his work of blazing a trail is about done and he hopes to see the day when a graduate physician will settle among these people. The county health officer and the State Board of Health have given him the finest support and encouragement possible, realizing that the naval representative does the work herein described, not as an interloper, but as one who can not morally abandon a people in need of help.

"In conclusion, the writer wishes to express his sincere appreciation of the help and encouragement extended him in this work by his superiors, and by the fine actions of the chief radiomen in

charge, past and present, and of the other radiomen towards the civilian and coast guard populations."

METHOD OF RECORDING MULTIPLE DISEASES EXISTING IN THE SAME PERSON, ALL BEING DISCOVERED THE SAME DAY

The case of a certain hospital corpsman gave rise to a good deal of discussion among several medical officers, and it therefore appears probable that the following comment will be useful to others.

It was suspected that the man in question was concealing venereal disease. He was, and his concealment of infection was particularly unfortunate because he was serving as a dental technician. Upon examination he was found to have soft chancres, a syphilitic chancre, a copious discharge of gonorrhoeal pus from the urethra, enlarged glands, and crab lice.

The case should have been recorded as follows: On the day that his disease was discovered he should have been admitted with chancroid for record and discharged; admitted with gonococcus infection of urethra for record, a suitable note being made relative to treatment; discharged, and admited with syphilis. A note should also have been made that he had pediculosis pubis. Naturally, a form F card should have been returned to account for the chancroidal infection, another card to report the case of gonorrhoea, and, when the case was disposed of, a third card to account for the syphilitic infection.

It is to be hoped that few men will be so unfortunate as that patient was and that few cases of any kind will require as much paper work in the course of a 24-hour period. However, what is wanted is the full truth about the occurrence of venereal diseases in the Navy, and for that matter the occurrence of all diseases, particularly all important communicable diseases.

Every form F card received in the bureau is edited and if found complete and apparently correct it is passed on to the machine room where a statistical machine card is punched to record the data. The punch card does not record the identity of the patient and each card represents a separate case.

Now, there are certain good reasons for keeping record of the percentage relationships of cases of chancroid, gonorrhoea, and syphilis to total cases of venereal disease, and especially of the ratio between admissions for gonorrhoea and admissions for syphilis. This ratio serves as a useful index of the completeness with which cases of gonorrhoea are being reported from year to year.

A case of gonorrhoea is, nevertheless, a separate case of gonococcus infection, for the purposes of epidemiological study, even though the

individual acquired the infection from the same source and at the same time that he contracted syphilis, and likewise chancroid if that infection was also contracted. It is true that the disability, little or great as it may be, affects only one individual, and his disease may have resulted from only one exposure, but this consideration is outweighed by the importance of securing complete reports for each type of infection.

The letters A. C. D.—admitted with contributory disease—are not applicable to cases like the above because no one of the diseases depended in any way upon either of the others. They merely happened to have been acquired at the same time. The connection between them was epidemiological rather than clinical.

Although the letters A. C. D. were not involved in this case, it may not be out of place to mention that a good many form F cards bearing these admission letters are being received without statement on the back of the card to indicate the primary disease or condition for which the patient was originally admitted. Medical officers will please note that the instructions require this.

CAN IT BE TAKEN FOR GRANTED THAT WATER DISTILLED FROM POLLUTED SALT WATER ON BOARD SHIPS OF THE NAVY EQUIPPED WITH LOW PRESSURE DISTILLING APPARATUS WILL ALWAYS PASS FROM THE DISTILLER FREE OF LIVING DISEASE PRODUCING MICROORGANISMS?

This question was raised by the medical officer of the U. S. S. *Colorado* several months ago. Again, recently, the medical officer of the U. S. S. *Utah* put substantially the same question, stating that the literature available aboard ship did not give him the desired information. He had learned from the engineer officer of the ship that the water in the evaporators does not reach 212° F. before passing as a vapor to the condensers but ranges from 141° F. to a maximum temperature of 190° F. in a vacuum of 24 inches, equivalent to 3 pounds pressure absolute. He asks, "Would a temperature of 141° F. to 190° F. under the conditions stated be sufficient to kill bacteria causing water-borne diseases?" "Again, would the change from a liquid to a vapor, irrespective of temperature, in itself destroy bacteria?"

It is not possible to answer these questions at this time as definitely as medical officers might like to have them answered. According to data obtained on board the U. S. S. *Colorado*, the lowest temperature attained in the first effect evaporator shell was recorded as 194° F., and it appeared that the average temperature was 198.5° F. According to a statement furnished by the Bureau of Engineering, the water is subjected to this temperature for an average time of 3 min-

utes and 41 seconds when the plant is being operated at its designed capacity. A temperature of 190° F. with a holding period three minutes should suffice to destroy all nonspore-bearing pathogenic microorganisms in water, but the possibility that the water will at times fail to be heated to that temperature and the possibility that the holding period will be less than three minutes under some conditions must be taken into consideration. The plants on board the U. S. S. *Colorado* and U. S. S. *West Virginia* are designed for operation up to 10 pounds pressure on the first evaporator coil, and the lowest pressure recorded during the period covered by observations taken from the log of the *Colorado* was 4 pounds. It was stated that the pressure is within the complete control of the operator and that the plant can be operated at 10 pounds pressure when in polluted waters, thus giving a higher sterilizing temperature.

The lowest pressure recorded was 4 pounds and the lowest temperature 194° F. The medical officer of the U. S. S. *Utah* stated that he learned from the engineer officer of that ship that the temperature of water in the evaporators ranges from 141° F. to 190° F. maximum in a vacuum of 24 inches or the equivalent of 3 pounds pressure absolute. It would therefore appear that it is the practice on board some ships to operate the plant at pressures well below 4 pounds absolute pressure with corresponding lower temperatures.

With regard to the likelihood of living bacteria going over with the water vapor as it passes from the evaporator into the condenser or distiller, it would at first thought appear that there is safety here inasmuch as the microorganisms are particulate masses, but we do not know of any experimental work, if any has been done, that settles this point. At any rate various causes may operate to carry a certain amount of water from the evaporator along with the vapor.

The plan was considered of conducting tests at the United States Naval Medical School for the purpose of checking up bacteriologically the distillation of experimentally polluted water at the various reduced pressures and temperatures described for Navy distilling plants, but it was found impractical, for the present at least, to carry out the necessary tests in a practical manner. Laboratory apparatus which consists largely of glass does not lend itself to reproduction of the conditions actually taking place on board ship during the distillation of water. It would therefore appear necessary, if experimental work seems to be indicated to settle the point as to whether pathogenic microorganisms can be recovered in the distilled water, to do the work on board ship under service conditions. But, obviously, several conditions would have to be brought

under real control by the investigators if the results of any such scientific investigation were to have any practical value beyond demonstrating, perhaps, that under extremely or unusually low evaporation temperatures living microorganisms could be made to pass over in water distilled from harbor water concurrently determined to be heavily contaminated with gas-forming bacilli of the *B. coli* group. Such a demonstration would not necessarily indicate the danger likely to be encountered under service conditions with efficient operation of the distilling plant. To gauge that danger it would be necessary to conduct repeated experiments in waters known in each instance to be polluted, the distilling plant being operated accurately at various rates as measured by the rapidity with which the water was distilled and at different temperatures and pressures.

It is not clear at the present time that such an investigation is really necessary, although it would seem desirable when opportunity presents to determine whether under the worst conditions that can be arranged it will be possible to recover living microorganisms in the distilled water. Meanwhile, medical officers should bear in mind the questions which have been raised and consider carefully any evidence that points to the possibility that the distilled water is causing trouble. Those in a position to do so might well collect samples of freshly distilled water at times when it appears that the ship is distilling while in polluted water. It would not be difficult to apply the standard American Public Health Association tests for determining the presence of members of the *B. coli* group of bacilli. Aside from the question of testing the water, it would appear advisable for medical officers to discuss the matter with engineer officers and advise care in distilling polluted water with a view to preventing the temperature of the water in the first evaporator effect from falling below 190° F., the water being distilled as slowly as practicable.

PARSIMONIOUS ECONOMY IN THE USE OF FUEL FOR SUPPLYING HEAT, LIGHT, VENTILATION AND FRESH WATER ON BOARD SHIP NOT CONTEMPLATED BY THE RULES FOR ENGINEERING PERFORMANCES

For the information of medical officers and possible assistance to them in considering health conditions and in making suitable recommendations in instances where it appears that hygienic requirements are in danger of being lost sight of contrary to the intentions of the Navy Department the following paragraphs are quoted from "Rules for Engineering Performances, 1924–25, United States Navy":

"211. *Fresh water is a military commodity.*—Unless it can be obtained from outside, it can only be had at the expense of fuel. To

burn fuel in order to replace water wasted shortens needlessly the cruising radius, reduces the fuel endurance, and places extra burdens on the fuel carriers. On the other hand, the efficient operation of the evaporating plant and the utilization of heat otherwise wasted will furnish an ample supply of fresh water.

"212. *There is no reason why lights and fans should not be turned off while not in use.*—Forming the habit of so doing will work no hardship. The output of the generators should be regulated with a view to furnishing a liberal supply of light and power. Once thus regulated, attention should be paid to the water rates of the prime movers and auxiliaries.

"213. Economy may also be obtained by the following:

"(*a*) Restriction and deprivation of necessary light.

"(*b*) Lack of ventilation.

"(*c*) Scarcity of heat.

"(*d*) Insufficient allowance of fresh water for officers and crew.

"(*e*) Restriction or curtailment of running boats, including the use of open boats where covered boats are available.

"The large gains in economy are within the engineering plant itself, and unless there be a serious shortage of fuel the above restrictions are forbidden. Restriction is justified only to the point where waste is prevented. It is better to permit a slight excess in expenditure of fuel for these essentials than to risk creating a feeling of dissatisfaction on the ship and adversely affecting the health and comfort of the personnel.

"214. A correct understanding of the word 'economy' is necessary in order to wholeheartedly support the spirit of the Rules for Engineering Performances. As applied to the competition, economy means efficient administration. It does not mean stinginess, parsimony, or a generally miserly attitude. It does not mean the absence of spending, but it does mean spending wisely and to the best advantage. Very often military necessities demand generous expenditures of fuel or supplies, but the successful accomplishment of such military demands is not attained unless these expenditures are wisely and efficiently utilized."

DATA RELATING TO REACTIONS FOLLOWING ADMINISTRATION OF ARSENICAL COMPOUNDS

The obvious interest with which medical officers generally have responded to the requirements of Bureau Circular Letter, serial No. 362–1924, of December 6, 1924, is appreciated. Those who had instances of severe reactions to report, along with the first Form A (Monthly Report of Venereal Diseases) to be submitted after receipt of the circular letter, had manifestly given considerable thought to

the subject and in general the required information appeared to have been presented as completely and concisely as possible.

In a few cases the arsphenamine or neoarsphenamine preparation used was not precisely named. By the phrase, "name of the preparation as labeled," it was intended that the manufacturer's name should be included.

It is desired that the name of the preparation used and the number of doses administered should be given in each monthly report, even when there have been no unpleasant reactions, because it is manifestly important to determine as definitely as possible for each preparation what percentage of doses given is followed by manifestations of poisoning, as well as to study the cases in which fatal or nonfatal poisoning has occurred.

It is not likely that a digest can be made of the results in a large enough series of cases to warrant generalization for some time to come, but it is believed that useful information can be furnished when a sufficient number of reports have been received to justify publication of the results of analysis.

Medical officers are requested to make a note of the fact that the name of the arsenical preparation as given should include the name of the manufacturer as well as the name under which the drug is marketed.

With reference to the article on arsphenamine and neoarsphenamine poisoning which appeared in the February number of the BULLETIN, it will be remembered that it was stated therein that 14 cases of fatal poisoning occurred in the Navy during the five-year period, 1919 to 1923, inclusive, but that the names of four of the patients could not be traced at the time. Three of the four cases have since been traced. Two of these deaths occurred in 1919. One followed the administration of arsenobenzol, 0.6 gram given intravenously, and the other, as recorded, followed the intravenous administration of 0.6 gram salvarsan. The third death occurred in 1921 following injection of the full contents of an ampule containing arsenobenzol which was given unneutralized in the belief that it was neo-arsenobenzol. Fortunately, that is the only death that has resulted in the Navy from this inexcuseable mistake.

The following information relative to these three cases was taken from health records:

CASE I

A fireman, third class, Filipino, 22 years old, reenlisted June 18, 1919. Died September 17, 1919.

Medical history:

November 26, 1917.—Admitted to sick list with chancroid.

U. S. S. *Pompey.* (No statement.)

June 15, 1918.—Epidemic influenza.

August 14, 1919.—Wassermann taken at United States naval hospital, Olongapo, P. I. Positive (one plus).

August 28, 1919.—Wassermann taken at United States naval hospital, Olongapo, P. I. Positive (three plus).

August 30, 1919.—Syphilis. General glandular enlargement. Old scars on shaft of penis.

September 4, 1919.—Wassermann (three plus).

September 8, 1919.—Arsenobenzol, 0.6 gram. No reaction.

September 15, 1919.—Arsenobenzol, 0.6 gram. Given intravenously in 200 cubic centimeters salt solution.

September 16, 1919.—Had a temperature of 103° F., but not thought to be serious.

September 17, 1919.—Temperature below normal. Patient had nose bleed about 7 a. m. At sick call (8 a. m.) patient apparently in good condition. He reported feeling good. Patient said he paced the deck during the night and seemed delirious—drank much water and vomited several times. At 9.05 a. m. he died suddenly, about 45 hours after the last injection.

The dose this man received was one-sixth of the solution made from six tubes prepared at the time for five other patients. He was neither the first nor the last of the men injected. The 0.6 gram arsenobenzol was given in 200 cubic centimeters of salt solution. One of the other patients had a temperature for one day with no sequelae. The other four had no symptoms following their injections. The only autopsy finding mentioned was a thrombus extending from the right ventricle into the pulmonary artery.

CASE II

A seaman, second class, enlisted May 18, 1918. Died June 6, 1919. Age at the time of death, 26 years 5 months.

Medical history:

July 2, 1918.—Admitted to sick list with gonococcus infection of urethra. Usual symptoms.

October 4, 1918.—Epidemic influenza. United States Naval Training Station, Gulfport, Miss. Usual symptoms—no complications.

October 23, 1918.—Readmitted with gonococcus infection of bladder. Pus cells in urine and few gram negative diplococci.

April 23, 1919.—Chancroid. Patient came aboard the U. S. S. *Ozark* with a draft of men; caught up on physical examination; typical chancroid.

April 27, 1919.—Readmitted with chancroid. Ulcer not responding to treatment. Wassermann April 22, 1919—negative. May 1, 1919—ulcer not responding to treatment.

May 1, 1919.—Transferred to the United States naval hospital, Key West, Fla., with chancroid.

May 15, 1919.—Wassermann reaction was positive and diagnosis was changed to syphilis on May 19, 1919.

May 20, 1919.—0.6 grain salvarsan given intravenously.

May 27, 1919.—0.6 grain salvarsan given intravenously.

June 2, 1919.—0.6 gram salvarsan given intravenously.

June 3, 1919.—Severe reaction three hours after injection; temperature, 103° F., falling to 100° F. six hours later, with normal pulse and respiration.

June 4, 1919.—Patient seized with severe abdominal pain and griping during the night. Fell upon attempting to go to head. Vomiting and purging. Stimulation and soda bicarbonate. Purging continued during day with feeble, frequent (120) pulse. Respiration, 34. No urine voided during 24 hours and no bladder distention. Marked nervous symptoms requiring restraint.

June 5, 1919.—Purging controlled. Conditions otherwise unchanged. Marked circulatory depression during the night.

June 6, 1919.—Patient gradually failed, passing into a state of coma at 1 a. m. with convulsion at 2.25 a. m. Temperature 107.6 by axilla. Rapid decline with death at 4.30 a. m.

Post-mortem findings:

Both kidneys swollen; cut surface show pyramidal shaped hemorrhagic areas.

Both lungs present hypostatic congestion more marked in right lower lobe.

The liver greatly enlarged and engorged with blood.

The spleen much enlarged and congested.

CASE III

Seaman, enlisted March 3, 1919. Died March 2, 1921. Age at time of death, 20 years, 6 months.

Medical history:

April 15, 1920.—Admitted to the sick list with chancroid. U. S. S. *South Dakota.* Went to duty same day under treatment.

February 8, 1921.—Syphilis (Wassermann, two plus). On the same day 0.6 gram neoarsphenamine given intravenously. Same day went to duty under treatment.

February 23, 1921.—0.6 gram neoarsphenamine was given intravenously.

March 2, 1921.—0.9 gram *arsenobenzol* was given at 9.15 a. m.

Almost immediately a marked reaction set in. About an hour and a half following the injection patient died.

Subsequent investigation brought out that there was some arsenobenzol on board although the medical officer at the time did not know this, as he had neither seen nor given any since being attached to the ship. He had been giving neoarsenobenzol or neoarsphenamine for about three months. At the time of preparation of the solution there was no label on the ampule as it had been washed off in a bichlorid solution. The powder went into solution with little or no difficulty and a clear yellow solution resulted.

Autopsy findings:

Lower lobe of left lung firmly adherent, posteriorly and laterally; a number of adhesions in upper right and left lobes.

Thymus gland present, measuring 5 by 1 by 1½ centimeters.

Athermanous patches in aorta.

Heart normal. Abdomen not opened.

TROUBLES OF THE SANITARIAN IN SANTO DOMINGO

The following editorial comment was taken from the January 28, 1925, number of "The Nation":

"In bestowing upon the inhabitants of Santo Domingo the benefits of modern hygiene our military officials there recently turned their attention to the sale of bread and rolls and decreed that 'each

roll shall be wrapped in paper.' The Dominicans could not seem to get it through their heads that it was better to pay 20 cents for a dozen rolls with the privilege of having them neatly done up in 12 separate packages than 15 cents for 12 rolls in one paper bag. Their newspapers protested that it was not done in the rest of the world, that the baker would have to handle the rolls anyway if he wrapped them up, and that people were too poor to pay the extra price. Not content with that, they said that when our department of sanitation turned its attention to keeping the streets clean, collecting the rubbish, providing an adequate water supply, putting in pavements and sidewalks, and installing a drainage system, then it would be time enough to talk about wrapping rolls in separate pieces of oiled paper. Now, how can a poor American marine, sent out to teach democracy to the heathen, reason with people like that?"

THE NATIONAL TUBERCULOSIS ASSOCIATION CLASSIFICATION OF PULMONARY TUBERCULOSIS

The National Tuberculosis Association's Classification of pulmonary tuberculosis referred to in the United States Navy Nomenclature of Diseases and Injuries is as follows:

LESIONS	SYMPTOMS
INCIPIENT. Slight infiltration limited to the apex of one or both lungs, or a small part of one lobe. No tuberculous complications.	A. (Slight or none). Slight or no constitutional symptoms, including particularly gastric or intestinal disturbance, or rapid loss of weight; slight or no elevation of temperature or acceleration of pulse at any time during the 24 hours. Expectoration usually small in amount or absent. Tubercle bacilli may be present or absent.
MODERATELY ADVANCED. Marked infiltration, more extensive than under incipient, with little or no evidence of cavity formation. No serious tuberculous complications.	B. (Moderate). No marked impairment of function, either local or constitutional.
FAR ADVANCED. Extensive localized infiltration or consolidation in one or more lobes. Or disseminated areas of cavity formation. Or serious tuberculous complications.	C. (Severe). Marked impairment of function, local and constitutional.

This scheme offers definite arrangements, making feasible the exact labeling of any individual case. The following combinations are possible:

Incipient A.	Moderately advanced A.	Far advanced A.
Incipient B.	Moderately advanced B.	Far advanced B.
Incipient C.	Moderately advanced C.	Far advanced C.

For instance, "Incipient A" means an individual with an incipient lesion and with symptoms characteristic of the incipient stage, as defined above.

"Far advanced A," however, means an individual with a far advanced lesion, but with only slight symptoms—a combination not infrequently met with.

STATISTICS RELATIVE TO MENTAL AND PHYSICAL QUALIFICATIONS OF RECRUITS

The following tables were constructed with figures taken from monthly reports submitted by boards of review at naval training stations:

All Naval Training Stations

Cumulative data for November and December, 1924

	Number	Per cent of recruits received	Per cent of recruits reviewed
Recruits received during the month	2, 283		
Recruits appearing before board of review	100	4. 38	
Recruits recommended for inaptitude discharge	77	3. 37	77. 00
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	23	96. 6	23. 00

U. S. Naval Training Station, Hampton Roads, Va., December, 1924

Recruits received during the month	192		
Recruits appearing before board of review	14	7. 29	
Recruits recommended for inaptitude discharge	13	6. 77	92. 86
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	1	93. 2	7. 14

U. S. Naval Training Station, Great Lakes, Illinois, December, 1924

Recruits received during the month	293		
Recruits appearing before board of review	18	6. 14	
Recruits recommended for inaptitude discharge	14	4. 78	77. 78
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	4	95. 2	22. 22

U. S. Naval Training Station, San Diego, Calif., December, 1924

Recruits received during the month	398		
Recruits appearing before board of review	15	3. 77	
Recruits recommended for inaptitude discharge	11	2. 76	73. 33
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	4	97. 3	26. 67

U. S. NAVAL TRAINING STATION, NEWPORT, R. I., DECEMBER, 1924

Cumulative data for November and December, 1924—Continued

	Number	Per cent of recruits received	Per cent of recruits reviewed
Recruits received during the month	245		
Recruits appearing before board of review	9	3.67	
Recruits recommended for inaptitude discharge	9	3.67	100.0
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	0	0	0

ADMISSIONS FOR INJURIES AND POISONINGS, CALENDAR YEAR 1924

Form F cards received in the bureau between January 1 and December 31, 1924, notified injuries and poisonings as follows:

	Within command		Leave, liberty, or absent without leave	Total
	Connected with actual performance of work or prescribed duty	Not connected with work or prescribed duty		
Injuries	3,542	1,933	1,097	6,572
Poisonings	22	144	27	193
Total admissions	3,564	2,077	1,124	6,765

Of these admissions, 83.39 per cent were for injuries and poisonings occurring within the command, and 16.61 per cent for cases incurred while on leave or liberty.

Of the cases incurred within naval commands, 63.18 per cent were connected with the actual performance of prescribed work or duty, and 36.82 per cent were not so connected. Of the total admissions for injuries and poisonings only 52.68 per cent were connected with the actual performance of work or precribed duties; i. e., the result of true naval industrial hazards. The remainder were incidental to liberty, athletics ashore or afloat, skylarking, quarreling, falls other than those connected with work, etc.

Poisoning by a narcotic drug or by ethyl alcohol is recorded under the title "Drug addiction" or "Alcoholism," as the case may be. Such cases are not included in the above figures.

The following cases selected from reports received during the past month are worthy of notice from the standpoint of accident prevention:

Ship.—Lacerated wound of hand incurred while working at a planer on which the safety device furnished therewith had not been installed. The injury was ascribed to the absence of the safety device.

Station.—A white light where there should have been a red one was placed before a blockade of the street at the station. Patient riding a motorcycle crashed into blockade because of the erroneously placed light and suffered a torsion of the knee requiring hospitalization.

Marines.—A marine in carelessly examining a pistol while on sentry duty discharged it and caused a punctured wound of the leg. Man incapacitated 19 days.

Ship.—Chronic lead poisoning in the case of a painter, acquired during the course of a year's service in the paint locker of the ship.

Ship.—Compound fracture of left foot. Man was sitting on a winch when someone turned on the steam "for a joke." Loss of 82 days resulted with a possibility of subsequent discharge from the service because of physical disability owing to the character of injury.

Ship.—Man slipped on an *inadequately lighted* gangway and fell about 15 feet. Patient suffered multiple contusions for which he was carried on the sick list for 21 days.

Ship.—Man hammered a cartridge which exploded, a piece lodging in his hand. The patient was transferred to a naval hospital.

Destroyer.—Water tender discharged from the service for physical disability following 182 sick days because of injury to eye incurred when a steam gauge glass burst and particles of glass lodged in the man's eye. Lack of safety device and faulty gauge glass reported.

Battleship.—Fracture of hand. While coming from lower deck, patient caught hold of hatch cover. The pin holding hatch cover support *being out*, the hatch cover fell on his hand.

Battleship.—Line which was defective from use carried away while coaling ship and permitted coal bag to fall on man's knee causing a contusion of that part.

Ship.—Case of drowning. Although data furnished on the back of the Form F card in this case stated "Negligence not apparent," it would seem that a preventive lesson can be learned from the circumstances surrounding the fatality. Report stated: "Deceased attempted to go over the side of the U. S. S. ———, moored in the Whangpoo River to a destroyer which was tied alongside and connected by a gangway. As he lowered himself and placed his foot on the rail of the gangway, he slipped and dropped between the two ships and disappeared from view." The gangway is a site where

accidents frequently occur and recently there have been three fatalities connected with gangways. Judged by the statements made in reports and the causes as determined, some of the accidents are clearly preventable, as for example, accidents due to absence of lights or inadequate lighting of the gangway at night; insecurely or inconveniently rigged gangway, lack of hand ropes or unsafe lines, faulty treads, etc. Study of accident cases of this kind indicates that ever changing conditions of sea and tide and mooring make it necessary to keep the question of safety constantly in mind. It appears that constant attention, ingenuity, and frequent inspections are necessary to prevent accidents.

Battleship.—Fall through an unlighted and unguarded open hatchway caused wounds of the head. In reply to inquiry regarding the circumstances surrounding the accident in this case, the following information was furnished: "The hatch in question was one that is always kept closed after sundown. The ship was in drydock at the navy yard and patient had gone to the dock to take a bath. When he returned the light was out and some unauthorized person had left the hatch open. No negligence on his part was apparent. As the hatch is in an unfrequented part of the ship and seldom opened it is considered unnecessary to have it guarded."

HEALTH OF THE NAVY

This report is for the month of February. So far as can be judged from such reports as have been received from ships of the United States Fleet, communicable diseases did not exceed expected prevalence during the month. The movements of the Battle Fleet and Scouting Fleet apparently interfered with the prompt forwarding of communicable-disease reports. Reports from only 28 ships of the Battle Fleet among 72 were received in time for this survey of conditions. Twenty-five of seventy expected reports were received from vessels of the Scouting Fleet. Only 27 cases of influenza were notified by ships of the Battle Fleet and 2 by the Scouting Fleet. In all, 9 cases of pneumonia were reported. No case of measles, scarlet fever, diphtheria, or cerebrospinal fever was recorded.

Reports from shore stations in the United States indicated the continuance of good-health conditions throughout the month of February. Only 61 cases of influenza were reported by all stations. Although this disease appears to have been prevalent in the city of Chicago, no case was notified by the United States naval training station at Great Lakes. But one case of pneumonia occurred. That was reported by the marine detachment at San Diego, Calif.

Measles has not been prevalent this winter either in cities of the United States or at naval stations. Nine cases were notified, seven by the naval training station at Great Lakes.

Weekly reports issued by the Bureau of the United States Public Health Service summarizing communicable-disease reports from more than 100 cities in the United States indicate that scarlet fever has been considerably more prevalent in recent weeks than in average years. The incidence, in fact, appears to have been about twice the expectancy estimated from the figures for corresponding weeks of previous years. Only 10 cases were notified by all naval stations in the United States for the month of February.

DEATHS, ENTIRE NAVY

[Reports received during the month of February, 1925]

	Navy (strength, 97,438)	Marine Corps (strength, 20,636)	Total (strength, 118,074)
Influenza	1	0	1
Pneumonia, lobar	6	0	6
Malaria	1	0	1
Tuberculosis, chronic pulmonary	1	0	1
Syphilis	1	0	1
Malignant growths	1	0	1
Other diseases	5	0	5
Accident and injuries	3	3	6
Drowning	10	2	12
Poisoning	1	1	2
Total	30	6	36
Annual death rate per 1,000, all causes	3.69	3.49	3.66
Annual death rate per 1,000, disease only	1.97	0	1.63

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1925

NAVY DEPARTMENT,
Washington, March 20, 1907.

This UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

Owing to the exhaustion of certain numbers of the BULLETIN and the frequent demands from libraries, etc., for copies to complete their files, the return of any of the following issues will be greatly appreciated:

Volume VII, No. 2, April, 1913.
Volume VIII, No. 1, January, 1914.
Volume VIII, No. 3, July, 1914.
Volume VIII, No. 4, October, 1914.
Volume X, No. 1, January, 1916.
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Volume XI, No. 3, July, 1917.
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PREFACE

The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April, 1907, as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, reports from various sources, historical essays, notes and comments on topics of medical interest, and reviews or notices of the latest published medical books.

The bureau extends an invitation to all medical officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit, and will recommend that copies of such letters be made a part of the official record of the officers concerned.

The bureau does not necessarily undertake to indorse all views or opinions which may be expressed in the pages of this publication.

E. R. STITT,
Surgeon General United States Navy.

NOTICE TO SERVICE CONTRIBUTORS

Contributions to the BULLETIN should be typewritten, *double spaced*, on plain paper, and should have wide margins. Fasteners which will not tear the paper when removed should be used. Nothing should be written in the manuscript which is not intended for publication. For example, addresses, dates, etc., not a part of the article, require deletion by the editor. The BULLETIN endeavors to follow a uniform style in headings and captions, and the editor can be spared much time and trouble and unnecessary changes in manuscript can be obviated if authors will follow in these particulars the practice of recent issues.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received two months prior to the date of the issue for which they are intended.

The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustrations, if not original, should be accompanied by a reference to the source and a statement as to whether or not reproduction has been authorized.

The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc. All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.*

U. S. NAVAL MEDICAL BULLETIN

VOL. XXII MAY, 1925 No. 5

SPECIAL ARTICLES

A BIO-PHYSIOTHERAPEUTIC PROCEDURE IN THE TREATMENT OF NON-MALIGNANT DISEASES OF THE COLON

By H. V. HUGHENS, Lieutenant, Medical Corps, United States Navy

There has been much written about colon pathology, its causes and treatment. To-day the profession is familiar with the principal causes of pathological conditions of the colon. Prolonged error in diet takes its place as one of the most frequent underlying causes. Many colonic disturbances are, no doubt, caused by focal infection the primary site of which is located in the respiratory and upper digestive tracts and in the sinuses. It is thought by some that the colon itself often harbors the primary focus of infection from which stubborn rheumatic, digestive, and other disturbances are manifested.

It is true that for centuries the physician has thought that many of the human ailments are caused by intestinal autointoxication. consequently from time to time the practice has been general to purge the patient regardless of the character of his illness.

Various corrective measures have been used in the treatment of constipation, chronic and acute colitis, colonic stasis, and autointoxication; e. g., agar agar, mineral oil, combinations of mineral oil and agar, exercises of various kinds, and dietetic measures. Some have used "high enemas" of astringent and antiseptic solutions. Surgery of the colon is being practiced. All these have been disappointing.

At the present time the profession is flooded with remedies for the cleansing of the intestinal tract and cure of the conditions mentioned above. Most of these remedies are palliative and produce no permanent good results. On the other hand, cathartics cause many patients to become habitual users. The habitual use of cathartics contributes toward the production of a chronic inflammatory condition of the intestinal tract, especially the colon, with which goes, of course, a chronic infection.

Metchnikoff came out with great claims for longevity and good health by the use of milk containing the *Bacillus bulgaricus*. The reports of various research workers concluding with the very excellent work of Rettger and Cheplin (1) disprove Metchnikoff's theory that the *B. bulgaricus* grew in the intestinal tract. Rettger and Cheplin assert that what Metchnikoff and his pupils observed as *B. bulgaricus* in the feces after the feeding of milk soured with this bacillus was, in reality, not this organism but *Bacillus acidophilus*. Such an error of interpretation could easily have been made, due to the similarity of the two organisms.

Bacillus acidophilus milk cultures have been used in chronic constipation (2) and in tuberculosis of the intestines (3). The milk was taken orally in 1,000 c. c. quantities daily, and fairly good results were obtained.

Norman (4) conceived the idea that to obtain satisfactory results in the treatment of some diseases of the colon, the colon should be cleansed of all the putrefying and fermenting material as a first step in the process, and that exercise of the musculature of the colon is essential in order to bring the atonic type back to a proper functioning state, to overcome acquired partial obstruction caused by adhesions, and to relieve the frequently found spastic conditions.

Acting upon this theory he devised an apparatus by which the colon can be given a thorough lavage without irritation to the intestine or discomfort to the patient. The apparatus is a simple ½-inch three-way cock, rigged for the attachment of two percolators, 1 gallon or more in size; a colon tube, ¾-inch outside diameter with ½-inch inside diameter (Norman's colon tube); and a tube to the waste.

THE TECHNIQUE OF COLONIC DRAINAGE (4)

The nonsurgical mechanical drainage of the colon is a new technique for accomplishing what has heretofore been known as high intestinal irrigation. The technique takes into account the peristaltic cycle of the colon, which enables one to fill the colon throughout its extent with the irrigating fluid.

The irrigating apparatus is arranged so that the valve mounted on the table is on a level with the top surface of the bed or table upon which the patient is to lie. The percolator is filled with the irrigating fluid. The patient is placed on the table or bed in either the right or left lateral recumbent position with thighs flexed to about 45 degrees. (Fig. 2.) The air is expelled from the tube. To prevent the fluid flowing out pressure is made with the thumb and index finger just back of the openings in the tube. The tip of the tube is lubricated and the patient is requested to raise the upper

cheek of the buttocks with the hand; the operator then gently inserts the tube into the rectum for a distance of 3 or 4 inches or until the openings in the tube are just past the internal sphincter. The pressure on the tube is now released and the fluid is allowed to flow in, filling the colon by taking advantage of its peristaltic cycle. After the fluid has passed the splenic flexure, it is well to have the patient assume the dorsal recumbent position.

THE PERISTALTIC CYCLE OF THE COLON

Peristaltic contractions of the colon are initiated by the passage of food residue into the cecal pouch or the dumping of feces into the rectal pouch. The introduction of fluid into the rectal pouch is an artificial measure for stimulating colon peristalsis. The peristaltic pacemaker seems to be situated in the mid portion of the transverse colon at a point commonly known as Cannon's ring. During irrigation, when the rectal pouch is distended, the peristaltic contraction begins at Cannon's ring, spliting into two contraction waves, one traveling toward the cecum and the other toward the rectum. During irrigation we are concerned with the contraction wave traveling toward the rectum, which, when approaching it, increases the pressure of the fluid instilled within the rectum, which creates a desire for defecation. The flow of fluid is then reversed, and instead of flowing into the rectum, it is allowed to escape through the tube into a waste receptacle. The sudden decrease of the intrarectal pressure causes an instantaneous dissipation of the contractional wave and reverse peristalsis sets in, propelling the fluid remaining in the rectum and sigmoid to the higher levels of the colon. This is reenacted until the reverse peristalsis of the lower colon has propelled the fluid into the right half of the transverse colon, when the next stimulus promoting peristalsis will cause the portion of the contraction wave, which is a reverse wave from Cannon's ring to the cecum, to fill the cecum with the instilled fluid. The fluid can be demonstrated in the transverse colon and cecum by succussion sound or by auscultation. This procedure is kept up until the colon is filled from the rectum to the cecum, and it is possible for the colon to retain from a gallon to a gallon and a half of fluid. This requires from five to seven minutes time. The patient is then allowed to go to stool, and it requires from 15 to 30 minutes to empty the colonic tract, the colonic peristaltic cycle being this: A propulsive wave from Cannon's ring to the rectum; a reverse wave from the cecum to Cannon's ring; and a mildly reverse wave from the rectum to Cannon's ring. Whenever a portion of the cecal contents is disgorged to the left side of Cannon's ring, it is expelled during the next cycle. This peri-

staltic cycle explains the churning motion of the cecum and the molding function of the descending colon and sigmoid.

This briefly describes what is seemingly a complicated technic, but one which, when mastered, is rapid, efficient, and devoid of much of the unpleasantness that attends the usual high irrigation. It is designated as a mechanical drainage because that is the prime purpose of its administration. In addition to its diagnostic and drainage value, it is useful in a correctional way, as for hydrostatically stretching adhesions or straightening out angulations of the colon. This is a very painful and dangerous procedure, which should not be attempted by the physician until after he has had enough experience

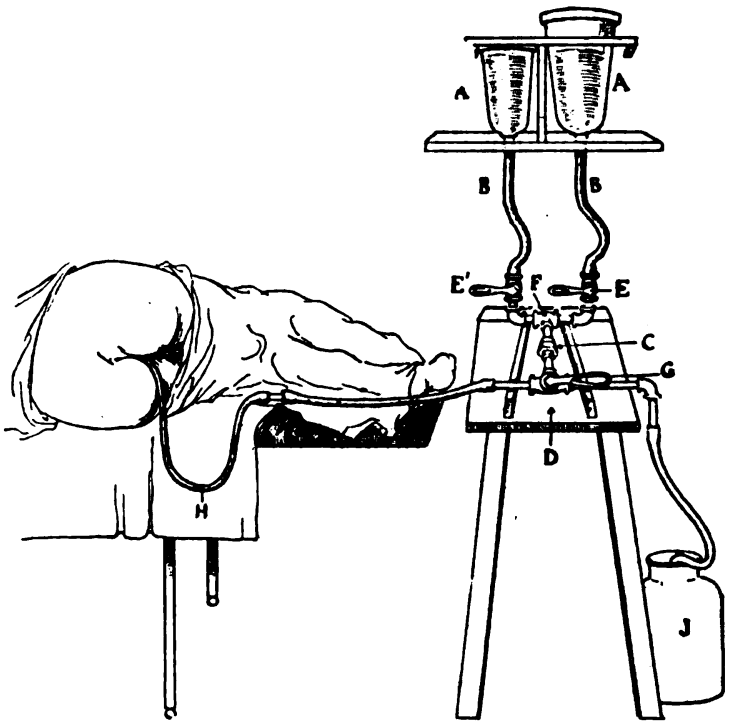

FIG. 3.—Apparatus for mechanical drainage of colon (Norman)

to formulate that intangible something called judgment before subjecting his patient to this nonsurgical procedure

Figures 1 and 2 show the writer's improvement upon Norman's apparatus. Figure 3 shows Norman's original outfit.

DESCRIPTION OF HUGHEN'S COLONIC IRRIGATING APPARATUS

In addition to the below-described equipment it is necessary to have a Norman colon tube. This tube was designed by N. Philip Norman, M. D., of New York City, and is marketed by the Kny-Sheerer Corporation, New York City. If for any reason a smaller tube is desired a reducing glass-tube connector can be used for the attachment of the ordinary colon tube. A ½-inch glass-tube connector is used in making this connection in the regular outfit. Soft

rubber tubing of ½ inch inside diameter is used for connecting the various parts.

The apparatus consists of a three-way valve and adjustable table. A stand and percolator of any size can be used.

Three-way valve.—This is the most important part of the apparatus. A ½-inch three-way valve, the openings of which are 120 degrees apart. The plug of the valve has one round hole piercing it at a 120-degree angle. The valve is cast with connections for ½-inch soft-rubber hose. A flange is cast upon the bottom of the valve in which three $\frac{5}{16}$-inch slots are cut 120 degrees apart. These slots are made at this distance apart so that the openings from the valve can be set upon the table to suit the convenience of the operator. The advantage of this valve is that all openings are round and of the same size, eliminating all chances of clogging.

The table upon which the valve is mounted consists of a piece of sheet iron, baked enameled, ⅛ inch thick by 9 inches square. In the table three circular slots are cut $\frac{5}{16}$ inch wide and 1½ inches long and 120 degrees apart. The valve is mounted on the table by means of ¼-inch bolts and winged nuts. This arrangement permits placing the openings of the valve at any angle desired by the operator. A clamp is made on the table which is so designed as to allow it to be fastened to any sized upright of an irrigating stand. Or it may be fastened to a bulkhead or wall by means of two screws. A bracket is designed by the use of which the table can be easily changed from a wall or bulkhead to a stand.

STATIONARY OUTFIT

If the irrigating outfit is to be set up in the physiotherapy department of a hospital or in any permanent place, the table is fastened to a bulkhead or wall. The drainage opening from the valve is connected by soft rubber tubing of ½ inch inside diameter to the sewer. (Fig. 1.) A hot and cold mixing valve is obtained (the kind used for shower baths) and piped for hot and cold water. It is so piped and arranged that it constitutes a holder for the percolator. By this arrangement the water can be turned into the percolator at the desired temperature and in any quantity desired.

PORTABLE OUTFIT

The three-way plug valve mounted upon the adjustable table can be fastened to any sized irrigating stand. The stand should be of such construction as to support a 1-gallon percolator. The required connections are made, using rubber tubing of ½-inch inside diam-

eter. A 1-gallon pitcher is convenient for use in filling the percolator. The return from the colon is run into a bucket or toilet. (Figure 2.)

This method of treatment is not claimed to be a cure-all, but is one of the newer valuable aids in treatment. Before colonic irrigation is begun, or, in certain cases, along with the irrigations, all known foci of infection should be removed.

The complete physical examination being completed and diagnosis made, cleansing the colon and implantation of the *Bacillus acidophilus* culture is begun. The extent of the manipulation of the intestines depends upon the case and the experience of the operator of the apparatus. It is my custom in chronic cases to start the irrigations of the colon with 2 gallons of warm water, varying the amount as the patient becomes accustomed to the treatment. After the 2 gallons of water is used according to the technique given, about 1 gallon will be retained. The patient then goes to stool and during the process of expelling the water the entire colon is emptied. The milk culture of *Bacillus acidophilus* is then instilled into the colon. One pint of the culture is used, followed by a sufficient quantity of warm water to carry the culture around to the cecum. The treatment is repeated as often as indicated. In chronic constipation and cardiac cases it is usually well for the first week to repeat the treatment every second day. After this the time between treatments is extended as is indicated by the reaction of the patient. The patient is given daily, by mouth, 1,000 c. c. of *Bacillus acidophilus* milk reenforced by lactose in the form of sweet milk or the pure lactose, U. S. P. One pint of sweet milk or 50 to 75 grams of lactose is sufficient to stimulate the growth of the *Bacillus acidophilus* in the intestines.

Error in diet over a long period of time being one of the frequent causes of chronic gastrointestinal disturbances the patient's usual diet is ascertained. Even in the enlisted men there will be found selective tastes and they will not eat the proper combinations, though the combinations may be found in the regular rations. It has been found that patients can not give their usual diet list to the doctor accurately from memory. It is a good practice to have the officer and civilian cases make notes of their dietary as they take it for one week. In this way the usual diet of the patient is obtained and the error will be shown.

The diet list, made up to contain the proper combinations of food, is given the patient and the importance of following the list strictly is explained to him.

SAMPLE OF DIET INSTRUCTIONS GIVEN IN CHRONIC CONSTIPATION

The combinations below should be followed strictly:

TYPE MEALS

Breakfast:
- Eggs or cereal.
- Bread and butter.
- Coffee, milk, or cocoa.
- Fruit.

Luncheon:
- Meat or fish.
- Vegetable.
- Crackers, or bread and butter.
- Salad.
- Milk or cocoa.
- Dessert.

Dinner:
- Meat or fish.
- Potato.
- Vegetable.
- Salad.
- Bread and butter.
- Milk or cocoa.
- Dessert.

Food should be taken at regular times.
Eat slowly. Masticate food thoroughly.
Avoid *fried foods*. Avoid extensive menus.
Have food prepared plain.
Puddings and custards are desirable desserts.
Eat at least one fruit each day.
Do not eat when excited or overexerted.
Water should be taken abundantly.
Do not take much water or other liquid with meals.
Substitute lactose for the glucose sugar with meals.
Drink two glasses of water, not cold, upon arising in the morning and one glass one hour before lunch and dinner.
Drink the *Bacillus acidophilus* milk between meals and at bedtime.
Sweet milk should be taken with at least two of the meals.

MAY EAT	AVOID
Meats and fish	
Fresh meats, broiled, boiled, baked, roasted, or steamed, game, steaks, veal or lamb chops, roast beef, chicken, fish, sweetbreads, brains, broiled tripe, ham, raw oysters.	Salt, preserved, canned, and spiced meats and fish, tongue, stews, goose, duck, kidneys, liver, herring, mackerel.

MAY EAT	AVOID
Vegetables	
Green vegetables, spinach, peas, cauliflower, lettuce, rhubarb, string beans, artichokes, potatoes, asparagus, tomatoes, beets, cabbage slaw.	Turnips, dry beans, onions, garlic, cucumbers, radishes, cooked cabbage, sprouts.
Fruits	
Fresh and cooked fruits, baked apples, pears, peaches, oranges.	Preserves; berries.
Beverages	
Water, mineral water, tea, coffee (with cream and milk sugar), milk, cocoa, chocolate.	Alcoholic and malt drinks, sweet, acidulous, and carbonated drinks, i. e., sodas, coco colas, etc.
Sundries	
Whole-wheat or Graham bread, eggs, limited amount of clear soup, cereals, and plain candy.	Pastry, pies, confectionery, gravies, sauces, poulette, condiments (such as catsup, mustard, tabasco, pepper), hot rolls, hot biscuits, hot bread, hot cakes, thick and cream soups.

A brief description of five of the typical cases treated by the writer during the past year follows. Doctor Norman began the treatment of Mrs. R. and the latter part was given by the writer.

Case 1.—Mrs. R. first came under treatment in June, 1923. Age 57, weight 220, height 5 feet 6 inches. Complains of sour stomach, frequent bowel movements of the unformed fermentation type often causing an excoriation about the anus. She experiences pains in joints and muscles which vary in intensity. Family history negative. Previous illness, childhood diseases. Typhoid fever at 30, mother of eight children, all normal. Patient has been in the hands of her family physician, who had a gastroenterologist in consultation. A chronic otitis media had been treated. Pyorrhea had been present, necessitating the extraction of all teeth. Chronically diseased tonsils were removed. Gastric analysis showed a hypochlorhydria. Gastrointestinal series showed rapid emptying of the colon. No other pathology was indicated. Stools showed undigested food. No ameba nor parasites. Urine negative. Blood chemistry negative. Blood pressure negative. The gastroenterologist and her family physician concluded there could be no permanent relief and prescribed hydrochloric acid and pepsin to be taken regularly after meals. Aspirin to be taken when bones and muscles ached. She was advised to take a dose of Epsom salts once or twice a week.

This patient's condition had existed for about 10 years, gradually growing worse.

This patient has been known to the writer all his life, so he advised colonic irrigations, followed by implanation of milk cultures of the *B. acidophilus*. Patient had unconsciously been an excessive carbohydrate eater. A diet low in carbohydrates and rich in animal protein was prescribed. Fruits and vegetables were cut to a minimum. All medicines were discontinued. Patient took 20 irrigations during a period of three months. After the first few irrigations she felt greatly improved. Patient went to her home with instructions to drink 1 pint of *B. acidophilus* milk daily, to use sweet milk liberally, and follow the diet laid down for her strictly. October 1, 1924, patient was seen again by the writer. She has reduced 20 pounds, she has had no return of the intestinal trouble, and her joint and muscular pains are negligible. She has just completed an extensive tour by automobile and trains and feels in better health than she has for years.

Case 2.—Mr. M. was first seen on August 16, 1923, a retired naval officer, aged 43. Retired for physical disability (neurasthenia) in 1920. Family history and childhood diseases unimportant. History leading up to his retirement covers several nervous breakdowns. His chief complaints were and still are digestive disturbances, pains about the heart, and general inability to perform the responsible duties required of an officer of his rank. Patient has been suffering from constipation for years. He has become an habitual user of cathartics. Patient has consulted eminent specialists and has been treated by all the "Paths" without benefit. Since his retirement patient has tried to do some light work in salesmanship, but can only work until about 11 a. m., when a fullness about the heart comes on, accompanied by extreme nervousness, and he has to quit for the day. A list of the patient's usual diet was obtained, and it was found to contain an excessive amount of carbohydrates and fats. Much of the food was improperly prepared. Patient was a popular member of the wine mess in the old days.

Physical examination.—Sallow complexion, puffiness under eyes, arcus senilis, both eyes, and mild hyperopia. Uses glasses for reading. Teeth and tonsils negative. Abdomen tympanitic. Reflexes negative. Laboratory findings: Urine negative, blood Noguchi negative. Blood pressure S. 136, D. 90. The sounds indicate a flabby heart muscle.

A colonic irrigation was given which demonstrated that there was a spastic condition in the descending colon apparently about the sigmoid.

A tentative diagnosis of spastic constipation and angina pectoris was made.

Colonic irrigations followed by instillation of milk cultures of *B. acidophilus* every second day were begun on August 18, 1923. *Bacillus acidophilus* milk was prescribed to be taken 1,000 c. c. daily by mouth.

August 20, 1923: Patient reported an unusually satisfactory bowel movement.

August 22, 1923: Patient feels much better, bowels better, not so much fullness in abdomen.

August 24, 1923: Patient feels much better, had good bowel movement yesterday. He feels so much better that he goes out to work in afternoon. Patient is now on a diet plentiful in water-soluble vitamines with the fats and carbohydrates restricted.

August 27, 1923: Feels a little nervous (about a week or 10 days after patients are put on this treatment they experience a feeling of lassitude and nervousness, which I attribute to the absence of their usual toxin absorption).

September 20, 1923: Bowels moving fairly well but patient has some financial worry which has quite upset him.

September 24 to 27: Gastrointestinal X-ray series made. X-ray report shows the following findings: Fluoroscopic examination of the chest is negative except the aortic arch is slightly wider than usual. There is no evidence of a saccular dilatation. The shadows resemble those seen in cases of arterial sclerosis with high blood pressure. Esophagus negative. Stomach fills normally and is of the hypotonic type. The duodenal cap fills readily and is normal in outline. Second and third portions of the duodenum normal. Six-hour examination shows the cecum and ascending colon well filled. Meal advanced almost to splenic flexure. Twenty-four-hour examination shows the whole colon well outlined. Forty-eight-hour and 72-hour examinations show the transverse and decending colon well outlined. Some residue in the cecum and ascending colon. Ninety-six-hour examination shows the transverse and decending colon still well outlined. Very small amount of residue in the cecum. The diameter of the haustral segments is considerably smaller than usual.

Conclusions: The transverse and descending colon appear spastic with delay in emptying time. The appendix was not visualized. No organic cause of this condition found. Findings suggest spastic constipation.

September 28, 1923: Irrigation, and milk culture instilled.

November 9, 1923: Patient has had two irrigations and has drunk one to two pints of *B. acidophilus* milk daily during last month. A good bowel movement has been obtained almost daily. Has felt fine.

December 3, 1923: Four irrigations given during last month. Patient feels good. Satisfactory bowel movements daily.

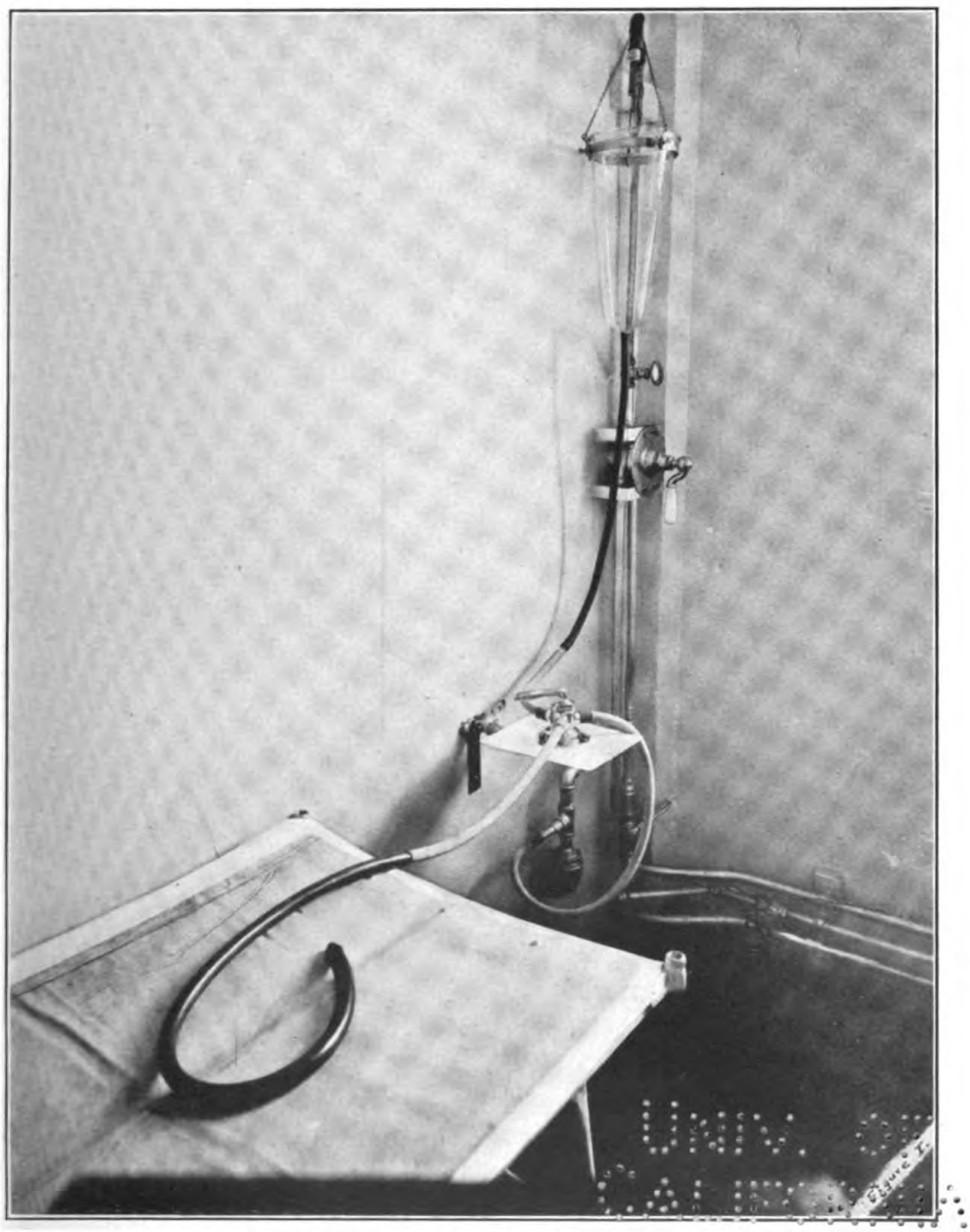

FIG. 1.—HUGHENS' MODIFICATION OF NORMAN'S APPARATUS

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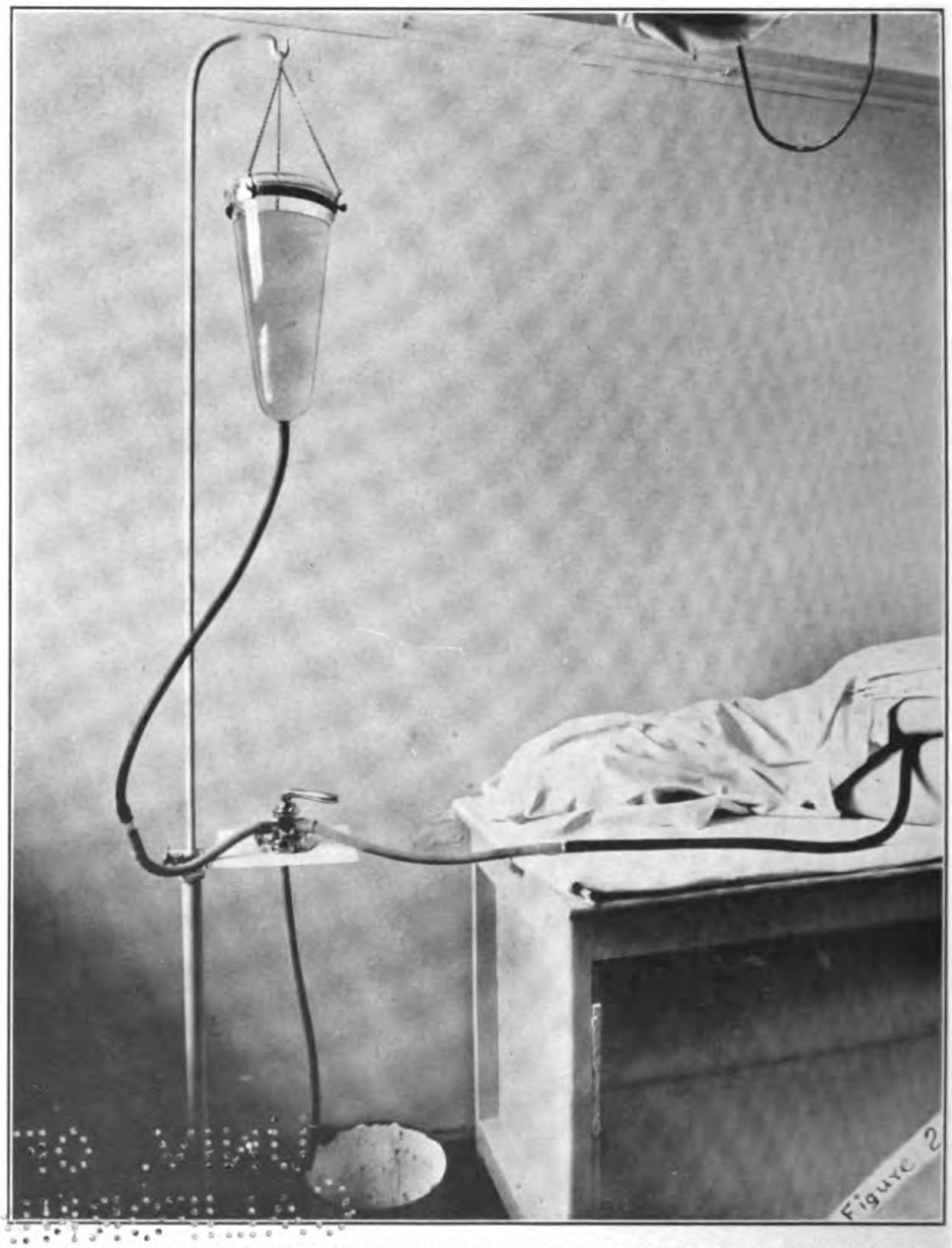

FIG. 2.—SHOWING HUGHENS' MODIFICATION OF NORMAN'S APPARATUS IN USE

January 4, 1924: Three irrigations during last month and patient has drunk milk as usual. Bowels move daily but occasionally feel a little tight. Patient is so much improved that he has rented an office and does as much work as the average normal man. There has been no change in blood pressure. The myocardial weakness persists, but anginal pains have been negligible.

March 4, 1924: Weekly irrigations have been given and patient has drunk milk as usual. Bowels regular and feels fine. The spastic condition of the descending colon seems to have disappeared. Examination of the prostate shows the left lobe to be slightly enlarged and tender. A gentle massage was given. Urotropin prescribed to be taken for two days.

March 11, 1924: Patient has felt better in every way since prostate massage last week. Another massage was given to-day. Gland much less sensitive.

March 21, 1924: Patient feels better. It is thought that the principal trouble now is caused by the irritable prostate. Irrigation given. Patient still drinking the *B. acidophilus* milk.

April 14, 1924: Two irrigations were given during the last month. On March 28 a 24F. sound was passed. Slight resistance was met in the prostatic urethra. Patient has felt much better since sound was passed. The myocardial weakness seems about the same. Blood pressure still 136–90. Glandular formula containing—

Adrenal, total, grs. ¼.
Thyroid ext. grs. ½.
Spermin ext. grs. 2.
Calcium glycerophosphate q. s. for tablet.
Sig. one before meals and at bedtime.

May 1, 1924: Patient has taken a position with the shipping board. He comes for an irrigation occasionally and drinks some *B. acidophilus* milk but not regularly. It is hoped that the above formula will act as a general tonic.

July 1, 1924: Eleven months after treatment began this patient has regular bowel movements and in general considers himself in very good health.

Prior to coming under my care he had been treated by neurologist and gastroenterologist of note and had consulted some of the questionable therapists including a chiropractor from whom he took a course of adjustments. No one ever materially benefited him. His diet and elimination were never, according to patient's statement, given any serious consideration. It is evident that the diet and elimination played the most important part in restoring this patient to health approximating normal.

Case 3.—August 20, 1923: Captain, United States Marine Corps, age 47, height 5 feet 10 inches, weight 180 pounds, florid complexion,

all teeth bad, pus coming from gums, slight tenderness upon pressure over cecum. Blood pressure S. 130 D. 70. Urine negative. Examination otherwise negative. No previous serious illness except war wounds. Has indulged lightly in alcoholic drinks but not excessively and, for several years, has practically abstained from taking anything. Present complaint began in Tropics in early 1922. His case was diagnosed gastritis, chronic catarrhal. Patient's condition got so bad that in August, 1922, he was surveyed to a naval hospital in the United States. The usual procedure was followed in treating such cases. His gastrointestinal series was negative, except for a stasis of the colon. There was some tenderness in the region of the appendix. Appendectomy was suggested to patient, but he declined, and requested to be sent to duty. He was allowed to go to duty about October 1, 1922.

Patient continued to have attacks of gas formation in the stomach accompanied by considerable cardiac distress bordering on collapse. Vomiting relieved this condition temporarily. Patient consulted a civilian gastroenterologist. This specialist suggested a light, easily digested diet, and put the patient on hydrochloric acid and pepsin. Under this treatment patient's condition improved some for a time, but at this time he is in about as bad condition as he was a year ago.

Early in December, 1922, the patient had one of the attacks described above and had to give up and return to the hospital. Under supervision he improved and again refused appendectomy. He was sent to duty after two weeks.

A colonic irrigation was given. Spastic constipation was evident. From the history of the case it is evident that patient has gastritis, chronic, due to improper diet, and chronic constipation, spastic type.

A list of the patient's usual diet was obtained and the dietetic errors corrected. All teeth were extracted and plates made. Colonic irrigation was begun, followed by implantation of milk cultures of *B. acidophilus*. 1,000 c. c. of *B. acidophilus* milk by mouth was prescribed daily. Patient experienced almost immediate relief from his gastric disturbances. The attacks which previously came on about 11 a. m. daily disappeared. Irrigations were given every second day. As improvement was noted the frequency was decreased to two per week, one per week, and then one every two weeks. October 1, 1923, patient was feeling so well that he stopped taking treatments.

September 15, 1924: The writer has been in close daily contact with the patient for the past year. During this time the patient has been performing his duties as a marine officer and has had no return of the alarming gastric symptoms. He has had some mild attacks of indigestion due to failure to adhere strictly to his diet. In general the patient is in very good health.

Case 4.—February 26, 1924: Mr. S., age 39, height 5 feet 9 inches, weight 130 pounds, chief clerk in navy yard. Patient referred to writer by a medical officer. Chief complaint: Indigestion and high blood pressure. He had typhoid fever at the age of 15 years. No other sickness until about two years ago, when he had an attack of lumbago. Had six posterior molar teeth extracted at this time.

Recently upon an insurance examination patient was found to have a systolic blood pressure of 155 mm. Palliative treatment was given by his family physician. Says that he has a pile which comes down at each stool. Patient's diet list shows him to be an extensive carbohydrate consumer. Examination: Tongue is coated brownish. Large reducible hemorrhoid slightly excoriated. Prostate normal. Blood pressure S. 155, D. 80. Blood chemistry normal. Irrigation of colon shows spastic condition of descending colon. Following the irrigation a large amount of feces was expelled. Blood pressure, S. 148, D. 78. Diagnosis: Spastic constipation resulting in intestinal autointoxication. A diet of rational combinations rich in water-soluble vitamins and animal proteins was recommended. Carbohydrates were restricted. Colonic irrigations of warm water followed by instillations of a milk culture of *B. acidophilus* were begun. 1,000 c. c. of *B. acidophilus* milk by mouth daily.

March 4, 1924: Blood pressure before irrigation S. 142, D. 80. After irrigation S. 132, D. 78.

March 8, 1924: Marked improvement is evident. Bowels are moving well. Irrigated and milk culture of *B. acidophilus* instilled.

March 10, 1924: Condition satisfactory. Lactose, gm. 60 daily, prescribed to be used as a substitute for glucose.

March 12, 1924: Feels like a new man. Two good stools to-day. Blood pressure before irrigation S. 142, D. 70. When colon was irrigated to-day some spasticity was evident but marked improvement was noted. After irrigation, blood pressure S. 138, D. 74.

April 8, 1924: Patient feels fine. Since March 12 he has been given four irrigations and *B. acidophilus* cultures. Blood pressure has not been higher than 138 systolic. Instructed to continue drinking the *B. acidophilus* milk. Irrigations discontinued.

May 20, 1924: During past month blood pressure has ranged between S. 128, D. 66, to S. 136, D. 68. *B. acidophilus* milk discontinued. Patient was feeling so good to-day that he rode a bicycle a mile. Later he ran two blocks in order to get to the bank before closing time. A partial collapse followed this exertion. After four hours the patient was again normal.

August 1, 1924: Patient has been in good condition, working daily since last note was made. His systolic blood pressure is 138, diastolic, 80. It is considered that this patient is now practically normal.

The myocardium seems to have reacted nicely, the bowels are normal, and the blood pressure satisfactory. There has been no return of the indigestion.

Case 5.—March 3, 1924: Mrs. C. was referred to me by another patient. Chief complaint: Pain in the side (which she has been told is appendicitis), chronic constipation, and general weakness. Age, 44. Climacteric over at 42. Family history negative. No sickness until about the age of 30 when she began to have cramps at beginning of menstrual periods. Since that time she has had frequent attacks of pain in the right side which were not associated with menstruation. Constipation has been constant since the beginning of this trouble. Various cathartics were used. For the past several years liquid petrolatum and citrate of magnesia have been the principal evacuants used. Appendectomy has been advised by civilian physicians.

Examination: Frail woman, 5 feet 4 inches high, weight 103. No recent trouble with teeth, but advised to have her dentist examine them. Heart: Loud soft systolic murmur was heard at apex and over pulmonic area. Abdomen shows some tenderness upon pressure deep down in right pelvis. .Cecum and colon filled with feces. Genitalia: Negative. A hard rubber pessary was removed from vagina which had been there over one year. Laboratory report: Urine, negative, W. B. C., 9,000. Hem., 70 per cent. Blood pressure, S. 112, D. 80. Colonic irrigation shows slight spastic condition about the sigmoid. A large amount of feces was expelled following this diagnostic irrigation. Tentative diagnosis: Constipation with mild chronic inflammation of colon probably involving the appendix, and myocarditis, chronic.

March 5, 1924: Treatment by colonic irrigation and instillation of milk cultures of the *B. acidophilus.* 1,000 c. c. of *B. acidophilus* milk by mouth daily. Patient advised to take light daily exercise, increasing the amount as she gains strength.

March 8, 1924: Patient feels fine. Bowel movement to-day the first in years without cathartic. Same treatment as on 5th. Patient's usual diet shows poor combinations of food with an excess of fats and a deficiency in the green vegetables. A diet of rational combinations was prescribed.

March 19, 1924: Colonic irrigations given on 11th, 15th, and 19th. Bowels moving well. Patient feels weak. R. Tr. digitalis m.vi, Strych. gr. 1/64, Comp. tr. gentian d. ss. Sig.: One such dose t. i. d. for one week.

March 22, 1924: Colonic irrigation given. No pain in side. Bowels fine. There is a tenderness above and to right of umbilicus which appears to be over pylorus of stomach. Gastrointestinal X-ray series begun.

April 1, 1924: Gastrointestinal report shows mild ptosis of the colon and colonic stasis. Heart tone is better. Blood pressure S. 112, D. 68. No treatment.

April 29, 1924: Colonic irrigation given on 8th, 15th, 23rd, and 29th. Patient has been about the same. Bowels have been moving well, and very little discomfort has been experienced.

May 6, 1924: Right side has been painful during the past week. W. B. C., 10,000; polynuclears, 70 per cent. No treatment given. Milk by mouth discontinued.

May 13, 1924: Right side feels better. W. B. C., 7,500; 67 per cent polynuclears. Heart action much improved. The murmurs are very faint. No treatment. *B. acidophilus* milk by mouth, 1,000 c. c. daily for one week.

May 20, 1924: Side still tender and occasionally painful. W. B. C. 8,800. Blood pressure S. 110 D. 66. Heart tone good.

July 15, 1924: Patient has normal daily bowel movements and is much stronger. She is able to do considerable housework and much more walking than when treatment was first begun. Soreness in right side persists. This patient claims to have improved considerably since beginning these treatments. The constipation is cured and the heart murmurs have disappeared. Exploratory laparotomy has been recommended for the purpose of determining the cause of the pain in the right side.

SUMMARY AND COMMENT

The regular daily emptying of the colon is recognized as a good procedure for maintaining and for reestablishing a good state of health. The problem is, "How can this periodic emptying be best accomplished in disease?" All the well-known cathartics have been tried and found wanting in many cases. Enemata, so-called high and low, have not been satisfactory and colonic irrigations will not cure all cases of chronic constipation.

A combination of colonic irrigations followed by the implantation of milk cultures of the *Bacillus acidophilus*, diet, and rational consideration of the patient's general condition seems to be an efficient means of treating chronic conditions in which constipation is a factor.

According to the research work done by Rettger and Cheplin and the clinical observation of Norman, the intestinal flora can be changed from an unfavorable to a favorable state by the implantation of the *Bacillus acidophilus*. It is certain that this change can be more readily brought about by thoroughly cleansing the colon and then planting the *Bacillus acidophilus* in large numbers directly into the colon. Norman very cleverly explains his technique of colonic drainage. The technique is not hard to master but requires careful thought and some experience before the best results can be obtained.

Physicians who stand above the average in the profession advised Mrs. R. that there was no hope of materially improving her condition. She was put in the class of incurables and told to take hydrochloric acid and pepsin for her indigestion and aspirin for her pains the remainder of her life. Mr. M. had the best treatment possible while in the Navy. After his retirement he had consulted various specialists, good and bad, and his condition was not improved. Captain, United States Marine Corps, had received the regular recognized treatment for his condition, but was not materially improved. Mr. S. had been given the usual symptomatic treatment for a high blood pressure, and long before he knew about his high blood pressure had been given palliative treatment for indigestion. The result was that he was at the point of a general breakdown when he was referred to the writer for treatment. Mrs. C. had made the rounds of the various doctors, but gradually grew worse.

The cases described in this article are typical of the limited number treated by the writer by the procedure given. All were markedly improved or cured. Since July, 1923, the experience of the writer in using the procedure described has been so gratifying that he takes this opportunity to recommend its use in hospitals, where complete data can be kept and close observation of the patients is practicable.

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3. *Bacillus Acidophilus* Milk in Tuberculosis, by William H. Morriss, M. D., J. A. M. A., July 14, 1923.

4. Corrective Treatment of the Commoner Forms of Enterocolitis, by N. Phillip Norman, M. D., New York. International Clinics Vol. 1, 33d series. 1923.

TRYPARSAMIDE AND SULPHARSPHENAMINE IN THE TREATMENT OF NEUROSYPHILIS[1]

By R. P. Parsons, Lieutenant, Medical Corps, United States Navy

Ever since tabes and paresis have been known and recognized, syphilographers and neurologists have observed almost up to the present time that the prognosis in tabes has been hopeless for recovery or for any degree of permanent improvement, and that paresis has been invariably fatal within two or three years after the appearance of paretic symptoms. Also, until within recent years, the outlook in cases of neurosyphilis, exclusive of the paretic and tabetic forms, has been very discouraging.

With each contribution of new antisyphilitic drugs and new methods of attack the hope of the profession has been temporarily

[1] From the Urological Department, United States Naval Hospital, Great Lakes, Ill.

raised, but the promise that these drugs and methods have given has been followed in every instance by disappointment and pessimism. With the advent of arsphenamine in 1910 certainly the results in cases of cerebro-spinal involvement fell deplorably short of expectations. And later, following the work of Swift, Gander, Ellis, and Marinesco on the intraspinal route and the methods of Ayer in cistern puncture, any benefit that this class of cases received was, on the whole, far from being what we had looked for. Particularly has this been true of the paretic group. Indeed, at a staff meeting at the Government Hospital for the Insane, Washington, D. C., in 1921, White called attention to the fact that the average length of life of paretics after admission to that institution had been reduced by nearly half since the routine intensive treatment by the arsphenamines was started there.

The fact that the ablest authorities in this country are in disagreement over the question of whether the troublesome, painful, and costly methods of the Swift-Ellis type have any greater therapeutic value than the ordinary intravenous method, signifies that the former has no great established merit such as has been claimed for it by some workers. It is true enough that there are occasional early neurosyphilitic cases that are benefited by either form of treatment, and it is well known that certain cases which do not respond to ordinary treatment sometime show quite remarkable improvement after Swift-Ellis treatment. Also it can not be denied that Solomon,[2] practically the only remaining ardent exponent of the Swift-Ellis method in this country, very frequently obtains with this treatment, even in paresis, results which are nothing short of brilliant.

But, in general, the therapeutic situation in this field was so unsatisfactory that the great search in the past few years has been directed toward the discovery of new and more potent drugs.

The result of this search was the contribution of tryparsamide to medicine, a contribution which should rank with that of insulin as being one of the two magnificent advances during the past decade.

Although this drug, the sodium salt of N-Phenyl-glycineamide-p-arsonic acid, $C_6 H_4 (NHCH_2 CONH_2)$. (AsO. OH. ONa) was first made by Jacobs and Heidelberger[3] in 1915, and was later studied biologically by Brown and Pearce[4] who used animals infected with trypanosomes and with syphilis; and was used by Keidel and Moore[5] for the treatment of syphilis other than cerebrospinal, much of the credit belongs to Lorenz and Loevenhart[6] and their associates who late in 1919 began their study of the use of tryparsamide in neuro-

[2] Solomon, H. C., and Southard, E. E., Neurosyphilis, Boston, 1917.
[3] Jacobs, W. A., and Heidelberger, M.: J. Am. Chem. Soc. 41: 1581, 1917.
[4] Brown, W. H., and Pearce, Louise: J. Exper. Med. Nov., 1919.
[5] Keidel, A., and Moore, J. E.: J. A. M. A. 82: 528 (Feb. 16, 1924).
[6] Lorenz, W. F., Loevenhart, A. S., Bleckwenn, W. J., and Hodges, F. J.: J. A. M. A. 80: 1497.

syphilis. Since then the drug has been used in the treatment of neurosyphilis throughout this country by many other able observers, notable among whom are Keidel, Robinson, Moore, Lyman,[7] Stokes,[8] and Wile.[9]

The results of these workers are in essential agreement, and rarely can one hear a medical discussion so fraught with sincere enthusiasm as when these workers are speaking of their experiences with tryparsamide in the treatment of paresis.

When we were preparing at this hospital to collect data on a series of neurosyphilitic cases treated with tryparsamide, our attention was brought also to another drug, sulpharsphenamine, which differs chemically from neoarsphenamine only by the oxidation of each neoarsphenamine side chain $NHCH_2OSONa$ to $NHCH_2OSO_2Na$. This drug became of much interest because of the work of Voegtlin, Thompson, Smith, and Dyer,[10] who showed in their experiments on rabbits whose cerebrospinal fluids were inoculated with trypanosomes that sulpharsphenamine given intravenously had a much greater trypanocidal power on parasites in the spinal fluid than other arsphenamines had, and concluded from this as well as from chemical analysis of the spinal fluid after injection intravenously of the various arsphenamines that sulpharsphenamine was capable of greater penetration into the cerebrospinal fluid than any of the other arsphenamines were.

As no reports had been published up to that time on the therapeutic value of sulpharsphenamine in cases of neurosyphilis based upon clinical observations, we began our study a little more than a year ago to determine clinically and serologically the relative merits of tryparsamide and sulpharsphenamine in the treatment of the various forms of syphilis of the central nervous system.

The original plan was to divide all the neurosyphilitic cases admitted to the hospital into two equal groups, one for sulpharsphenamine and one for tryparsamide, with an attempt to have in each group an equal representation of the various forms of neurosyphilis. We were soon obliged, however, to abandon this plan on account of the amazing clinical improvement noted in most of the paretic cases who were receiving tryparsamide, while the paretics on sulpharsphenamine showed no evidence that they were being benefited by that drug. Humane considerations therefore led us to place all the paretics in the tryparsamide group. Opportunity also was afforded by other types of neurosyphilitic patients who remained

[7] Moore, J. E., Robinson, H. M., and Lyman, R. S.

[8] Stokes, J. H., papers read before seventy-fifth annual session, A. M. A., Chicago, June, 1924.

[9] Wile, U. J., papers read before seventy-fifth annual session, A. M. A., Chicago, June, 1924.

[10] Voegtlin, C., Thompson, J. W., Smith, M. I., and Dyer, Helen: U. S. P. H. Reports: Vol. 38, No. 19, May 11, 1923.

in the hospital long enough to observe the results of tryparsamide therapy after a lapse of two months' rest period on cases who had been previously treated with two courses of sulpharsphenamine. These were cases 1, 2, and 4 who became in the tryparsamide series, cases 18, 17, and 19, respectively.

Twenty-seven cases of neurosyphilis were treated during the past year, but only 20 of these received sufficient treatment and complete enough serological examinations to make worth-while reports on their cases below. Eight of these were treated with sulpharsphenamine and 12 with tryparsamide. This is admittedly a meager group from which to draw conclusions, but the results on a percentage basis are for the tryparsamide cases essentially the same as those reported by observers elsewhere who had opportunity to treat much larger groups. Whether the results reported on the sulpharsphenamine cases agree in any way with results obtained elsewhere is not known, as no publication on that subject has been seen.

A course of treatment with tryparsamide consisted of eight weekly injections of tryparsamide and nine of mercuric salicylate. In each case the tryparsamide dose was 3 grams given intravenously in 10 c. c. of water. The mercuric salicylate was given intramuscularly three days after each tryparsamide injection and three days before the first tryparsamide injection, the dose being one grain in one c. c. of liquid petrolatum.

A course of sulpharsphenamine consisted of eight semiweekly injections of sulpharsphenamine and five weekly injections of mercuric salicylate. The sulpharsphenamine doses varied from 0.4 grams to 0.6 grams, depending upon the weight of the patient and were given intravenously in from 8 to 12 c. c. of water. The mercury was given as in the tryparsamide series but was given on alternate sulpharsphenamine days.

Before beginning a course of treatment each patient was examined carefully by an opthalmologist who included in these examinations a charting of the visual fields for form and for blue color. These examinations were repeated a few days after completing each course of treatment, and more often in cases where preexisting lesions of the optic tract were noted, or in cases who experienced any visual disturbances during treatment.

Following is a brief summary of each case, including such points as could not be placed conveniently in tabulated form. All the cases were Veterans' Bureau patients except cases 6 and 15. These two were Navy personnel.

SULPHARSPHENAMINE CASES

Case 1.—A. M. Clinically, meningovascular syphilis, but serologically, paresis. Admitted May, 1923. Seizure of unconsciousness 10 months before admission. Intensive arsphenamine treat-

ment prior to admission. One course of arsphenamine, mercury, and sodium iodide (intravenously, as much as 20 grams at one injection) directly after admission but without improvement clinically or serologically. During sulpharsphenamine treatment complained of blurred vision for about 24 hours after each injection subsequent to the fourth. No improvement followed sulpharsphenamine treatment, except for a possible slight improvement of vision, left eye. Spinal fluid became slightly more typical of paresis after treatment. Later treated with tryparsamide. (See case 18.) .

Case 2.—P. R. Tabes of several years' duration. Treated three years by arsphenamine, neoarsphenamine, mercury, and iodides before beginning sulpharsphenamine treatment. No clinical improvement followed treatment except for a slight decrease in severity and frequency of gastric crises. Fluid became more positive after first course, but returned to negative after second course. Later treated with tryparsamide. (See case 17.)

Case 3.—E. H. Colored. Meningovascular syphilis. Mental picture suggests precox. Definite mental improvement and complete relief from subjective symptoms following sulpharsphenamine. Spinal fluid Wassermann became negative under treatment.

Case 4.—G. D. Asymptomatic meningovascular syphilis. Complained of blurred vision for about 24 hours after every injection of sulpharsphenamine subsequent to the fifth. On admission in May, 1923, there was noted a slight elevation of the right optic disk. This finding later disappeared, but there remained a blurring of the disk outline. Vision on the left side improved under treatment, but on the right it fell to 20/50 when the second course was completed. At that time a slight contraction of the right visual field was also noted. Two months after completing the second course vision in the right eye was 7/100, but in the left eye remained at 20/20. The spinal fluid became more positive after the first course, but less so after the second course. Notwithstanding the visual signs, this patient was later treated with tryparsamide. (See case 19.)

Case 5.—J. B. Tabes. Treated for a year by arsphenamine, mercury, and iodides without benefit. Subjective symptoms were of sufficient severity to prevent working. He had definitely impaired memory and showed very little interest in his environment. While on his second course of sulpharsphenamine he resumed his work as a barber. He became free from subjective symptoms; the mental picture became apparently normal, and he continued working every day for a period of two months, during which he was under observation. The fluid, which was essentially negative before treatment, remained so.

TABLE 1.—*Sulpharsphenamine cases*

Case	Age	Inf.	Wt.	Pupils	K. J.	Romberg	Muscle sense	Bladder	Tremor	Mental
No. 1, A. M.	31	1918	155	Rigid	Normal	0	Normal	Normal	0	Normal.
	After Course I		156	Same	do	0	do	do	0	Do.
	After Course II		155	do	do	0	do	do	0	Do.
No. 2, P. R.	31	1913	137	Unequal, irregular, rigid	do	Marked	Loss in upper extremities.	do	0	Irritable.
	After Course I		137	Same	do	do	Same	do	0	Same.
	After Course II		136	do	do	do	do	do	0	Do.
No. 3, E. H.	35	(?)	122	Normal	Decreased	Positive	Normal	do	0	Apathetic, paranoid, deteriorated.
	After Course I		124	do	Same	do	do	do	0	More affable and communicative but deteriorated.
	After Course II		123	do	do	do	do	do	0	Same.
No. 4, G. D.	34	(?)	178	Small, irregular, rigid	Normal	Slight	do	do	0	Normal.
	After Course I		181	Same	do	do	do	do	0	Do.
	After Course II		174	do	do	do	do	do	0	Do.
No. 5, J. B.	39	(?)	149	Unequal, irregular, rigid	Abs	Positive	do	do	0	Impaired memory, apathetic.
	After Course I		154	Same	do	do	do	do	0	Memory improved, in better contact with environment.
	After Course II		153	do	do	do	do	do	0	Apparently normal.
No. 6, W. M.	36	1910	186	Rigid, L. internal strabismus.	Normal	0	do	do	0	Normal.
	After Course I		181	Same	do	0	do	do	0	Do.
	After Course II		185	do	do	0	do	do	0	Do.
No. 7, A. Pe.	38	1904	165	Normal	do	0	do	do	0	Do.
	After Course I		165	do	do	0	do	do	0	Do.
	After Course II		159	do	do	0	do	do	0	Do.
No. 8, C. D.	35	1913	148	Sluggish to light	Abs	Slight	do	do	Lips	Memory defects, slurring speech.
	After Course I		146	Same	do	do	do	do	do	Definitely improved.
	After Course II									

TABLE 1.—*Sulpharsphenamine cases*—Continued

Case	Vision	Subjective	Blood	Fluid	Cells	Globulin	Curve
No. 1, A. M.	R. 20/20 L. 20/70. Fields normal	Stiffness and pain in neck. Seizures of vertigo.	Negative	4 plus in all dilutions	23	Slight increase	5555331000
	do	Same	do	do	24	Increased	5555522100
	R. 20/20 L. 20/50. Fields normal	do	do	do	24	do	5554311000
	R. 20/30 L. 20/30. Fields normal	Frequent severe gastric crises. Headaches; numbness of feet.	do	Negative in all dilutions	R.	Slight increase	Not done.
No. 2, P. R.	do	Same	do	0.2 c.c. Neg. 0.5 c.c. Neg. 1.0 c.c. 3 plus.	B. C. 14	do	1234310000
	R. 20/20 L. 20/40. Fields normal	Gastric crises less severe and less frequent.	do	Negative in all dilutions	28	Increased	1122100000
No. 3, E. H.	R. 20/25 L. 20/25. Fields normal	Stiffness and numbness in left leg	do	4 plus in all dilutions	20	Slightly increased	0000000000
	R. 20/20 L. 20/25. Fields normal	No symptoms	do	0.2 c.c. 2 plus, 0.5 c. c. 4 plus, 1.0 c.c. 4 plus.	18	do	1121100000
	R. 20/30 L. 20/30. Fields normal	do	do	Negative in all dilutions	55	do	1122110000
	R. 20/40 L. 20/50. Fields normal	do	do	do	24	do	1122210000
	R. 20/30 L. 20/25. Fields normal	do	do	Positive in all dilutions	31	do	2233110000
No. 4, G. D.	R. 20/50 L. 20/20. R. fields slightly contracted. L. normal.	do	do	0.2 c.c. 1 plus, 0.5 c.c. 3 plus, 1.0 c.c. 4 plus.	11	do	2233110000
	R. 20/40, L. 20/25. Fields normal	Gastric crises, numbness of feet and legs.	do	Negative in all dilutions	13	do	0000000000
No. 5, J. B.	do	Much improved, no gastric crises	do	do	25	do	0000000000
	R. 20/30, L. 20/25. Fields normal	Improved, works every day, still numbness feet, legs.	do	do	13	do	1110000000
	R. 20/16, L. 20/16. Fields normal	No symptoms	do	4 plus in all dilutions	62	Increased	5554310000
	R. 20/15, L. 20/15. Fields normal	do	do	0.2 c.c. Neg., 0.5 c. c. 4 plus, 1.0 c. c. 4 plus.	65	Normal	3344321000
No. 6, W. M.	R. 20/20, L. 20/20. Fields normal	do	do	4 plus in all dilutions	71	do	5432210000
	R. 20/20, L. 20/15. Fields normal	Nervousness, precordial pain, palpitation.	do	0.2 c. c. Neg., 0.5 c. c. 4 plus, 1.0 c. c. 4 plus.	109	Increased	3333321000
No. 7, A. Pe.	R. 20/15, L. 20/15. Fields normal	No symptoms	do	Negative in all dilutions	140	do	1122210000
	do	do	do	do	29	Normal	2222100000
	R. 20/20, L. 20/25. Fields contracted.	Insomnia nervousness	do	0.2 c. c. Neg., 0.5 c. c. 1 plus, 1.0 c. c. 3 plus.	54	Marked increase	5544321000
No. 8, C. D.	do	No symptoms	do	0.2 c. c. Neg., 0.5 c. c. 2 plus, 1.0 c. c. 4 plus.	12	Slight increase	5543210000

Case 6.—W. M. Meningovascular syphilis with fluid suggesting early paresis. Appeared for examination in July, 1924, complaining of double vision when looking to the left, due to a left internal strabismus of a few months duration. Examination entirely negative except for the strabismus, rigid pupils, and positive spinal fluid. No change in findings following sulpharsphenamine treatment except for a definite "flattening" of the paretic curve.

Case 7.—A. Pe. Colored. Meningovascular syphilis. Neurologically negative. Under sulpharsphenamine became completely free from subjective symptoms, and spinal fluid became negative except for a persistent syphilitic zone curve.

Case 8.—C. D. Tabo-paresis. Mental picture showed only slight memory defects, and a slight dulling of the intellect, although there was slurring of speech on test phrases, tremor of lips, and fluid suggesting early paresis. Visual fields were slightly contracted. No further contraction of fields followed the first course of treatment. After the first course the mental picture was unchanged, but there was a slight improvement in the fluid. One month after treatment he was free from subjective symptoms, and the mental picture showed a slight but definite improvement. He is receiving his second course of treatment at this writing.

TRYPARSAMIDE CASES

Case 9.—A. Pa. Paresis. On admission in December, 1923, complained of headaches, nervousness and anorexia. A course of arsphenamine, mercury, and iodides had no effect on these symptoms, and his blood remained strongly positive. The blood Wassermann became negative under tryparsamide; subjective symptoms disappeared, as did also the lip tremor, loss of sense of position of upper extremities, and vesical sphincter disturbances. The spinal fluid Wassermann still remained strongly positive after three courses, but some flattening of the paretic curve was produced.

Case 10.—G. G. Tabo-paresis. Typical tabes neurologically with early paresis serologically. The gait became perfectly normal, subjective symptoms disappeared, vision left eye (in which there was optic atrophy) improved slightly, blood Wassermann became negative, spinal fluid became negative with 0.2 c. c. and the curve was "flattened" after three courses of treatment. This case with three others, cases 11, 16, and 20, made a group in which really brilliant results may be claimed.

Case 11.—R. P. Paresis. Markedly euphoric, clothing decorated with various medals and ribbons; childish, antagonistic, refusing examination and treatment when admitted in April, 1924. He returned to work during rest periods; mentality returned to normal, and he became serologically negative except for a persistent paretic

curve which, however, was definitely flattened by the treatment. Is working every day at present.

Case 12.—J. M. Paresis. The mental picture in this case seemed to be definitely precox, although the serology was typical of paresis. Two courses of treatment produced no improvement mentally. The spinal fluid Wassermann was unaffected by treatment, although the cell count, globulin, and curve were reduced. He eloped during the third course of treatment and was since committed to the State hospital from which he eloped prior to admission to this hospital.

Case 13.—P. N. Meningovascular syphilis. Complete symptomatic and serological recovery following two courses of treatment. Was discharged from the hospital as cured.

Case 14.—E. B. Advanced paresis. Rapidly progressing mental and physical decline at time of admission. Treatment produced a marked physical improvement, but the grandiose, expansive mental picture instead of being improved was replaced by a vegetative existence with complete inaccessibility. Blood Wassermann became negative and spinal fluid showed improvement in all phases.

Case 15.—C. H. Hospital corpsman. Asymptomatic early paresis. One year after becoming infected in Haiti it was noted that the pupils were unequal, the left being rigid. He had received three courses of arsphenamine and mercury, but complained of some loss of weight and a noticeable lack of his former physical vigor. Condition never necessitated admission to the sick list. Under treatment, a positive blood Wassermann which had persisted under arsphenamine treatment became negative; and the fluid became less positive in all phases. He regained his weight and feeling of physical well-being. This case was unique in the entire series in that the pupils became normal. This may be explained by the fact that it was the earliest case of all those treated.

Case 16.—J. S. Tertiary visceral lues with also meningovascular involvement. When first seen in 1922 this patient had a markedly enlarged liver, which returned in a few weeks to normal size under treatment by enormous doses of sodium iodide intravenously followed by a course of arsphenamine and mercury. Subsequent arsphenamine and mercury therapy continued over a period of a year failed to affect a strongly positive blood Wassermann. In April, 1924, he was weak, emaciated, and was exhibiting mental symptoms. After completion of two courses of tryparsamide treatment the blood and fluid had become negative and the mental symptoms had entirely disappeared. By October, 1924, he showed a gain of 20 pounds since the institution of tryparsamide treatment. A recent report by letter states that he is now working every day on a farm.

Case 17.—P. R. Tabes. Treated previously with sulpharsphenamine. No clinical improvement was produced by tryparsamide although the serology became completely negative in all phases after treatment.

Case 18.—A. M. Meningovascular syphilis with paretic fluid. Unimproved symptomatically or serologically by two courses of sulpharsphenamine. Symptomatic recovery with definite serological improvement in all phases after two courses of tryparsamide.

Case 19.—G. D. Asymptomatic meningovascular syphilis. Vision left eye diminished after two courses sulpharsphenamine. No further diminution after two courses of tryparsamide. No improvement in spinal fluid findings by sulpharsphenamine. Fluid became negative after tryparsamide.

TABLE II.—*Tryparsamide cases*

Case	Age	Inf.	Wt.	Pupils	K. J.	Romberg	Muscle sense	Bladder	Tremor	Mental
	47	1908	136	Sluggish to light	Normal	0	Partial loss upper extremities.	Partial loss	Lips, tongue.	Apathetic, memory defects.
No. 9. A. Pa.	After Course I		139	Same	do	0	Normal	Same	0	Normal.
	After Course II		135	do	do	0	do	Normal	0	Do.
	After Course III		142	do	do	0	do	do	0	Do.
	33	1918	153	Rigid	Abs.	Marked	Tabetic gait, partial loss upper extremity.	do	0	Do.
No 10. G. G.	After Course I		163	do	do	Slight	Marked improvement.	do	0	Do.
	After Course II		164	Sluggish	do	do	Normal gait, ataxia scarcely noticeable.	do	0	Do.
	After Course III		162	do	do	do	Unchanged since Course II.	do	0	Do.
	42	(?)	136	Normal	Normal	0	Normal	do	Lips	Euphoria, impaired judgment, antagonistic.
No. 11. R. P.	After Course I		143	do	do	0	do	do	0	Normal.
	After Course II		137	do	do	0	do	do	0	Do.
	After Course II		143	do	do	0	do	do	0	Do.
	24	(?)	163	Irregular, unequal, left sluggish.	do	0	do	do	0	Suggestive of precox. Hallucinated, seclusive.
No. 12. J. M.	After Course I		172	Same	do	0	do	do	0	Improved, more accessible, hallucinations less marked.
	After Course II		168	Regular, nearly equal, normal reactions.	do	0	do	do	0	Returned to that at time of admission.
	27	1920	124	Unequal, irregular, rigid.	do	0	do	do	0	Normal.
No. 13. P. N.	After Course I		127	Same	do	0	do	do	0	Do.
	After Course II		123	do	do	0	do	do	0	Do.
	31	(?)	137	Normal	do	Marked	Loss of sense of position upper extremities.	Incontinence	Lips, tongue, hands.	Deteriorated, grandiose delusions, hallucinated, paretic speech.
No. 14. E. B.	After Course I		148	do	do	0	Improved	Normal	0	Apathetic, reticent, seclusive.
	After Course II		131	do	do	0	(?) Will not cooperate.	Incontinence	0	Vegetative, inaccessible.
	24	1923	130	Left smaller than right, left rigid.	do	0	Normal	Normal	0	Normal.
No. 15. C. H.	After Course I		138	Normal	do	0	do	do	0	Do.
	After Course II		139	do	do	0	do	do	0	Do.

	30 | 1912	129	do	do	0	do	do	0	Irritable, hypochondriacal, slovenly.
No. 16. J. S.	After Course I	143	do	do	0	do	do	0	Normal.
	After Course II	145	do	do	0	do	do	0	Do.
	31 | 1913	134	Unequal, irregular, rigid.	do	Positive	do	do	0	Irritable, paranoid.
No. 17. P. R.	After Course I	125	Same	do	Slight	do	do	0	Irritable.
	After Course II	128	Equal, regular, rigid	do	do	do	Frequency	0	Same.
	31 | 1918	152	Rigid	do	0	do	Normal	0	Normal.
No. 18. A. M.	After Course I	153	do	do	0	do	do	0	Do.
	After Course II	155	do	do	0	do	do	0	Do.
	34 | (?)	176	Small, irregular, rigid.	do	Slight	do	do	0	Do.
No. 19. G. D.	After Course I	174	Same	do	0	do	do	0	Do.
	After Course II	174	do	do	0	do	do	0	Do.
	38 | 1915	139	Normal	do	0	do	do	0	Euphoria, grandiose delusions, disoriented.
	After Course I	129	do	do	0	do	do	0	Euphoria but no delusions, oriented, impaired judgment.
No. 20. L. S.	After Course II	132	do	do	0	do	do	0	Normal, except for slightly impaired judgment, working.

Case	Vision	Subjective	Blood	Fluid	Cells	Globulin	Curve
	R. 20/20 L. 20/25. Blue fields contracted.	Anorexia, nervousness, headaches.	4 plus	4 plus all dilutions	18	Slight increase	5555543100
	R. 20/25 L. 20/25. Blue fields as contracted.	None	Negative	do	65	do	5555311000
No. 9. A. Pa.	R. 20/20 L. 20. Fields same as after Course I.	do	do	do	89	do	5554210000
	R. 20/16 L. 20/13. Fields same	do	do	do	126	do	2222110000
	R. 20/20 field normal. L. light and dark only optic atrophy.	"Lightning" pains lower extremities.	4 plus	do	36	Marked increase	5555542100
	R. 20/20 field normal. L. same	None	Negative	do	11	Slight increase	5554210000
No. 10. G. G.	R. 20/20 field normal. L. recognizes large objects at 20 feet, counts fingers at 3 feet.	do	do	do	84	Marked increase	5554210000
	R. 20/20 field normal. L. unchanged since Course II.	do	do	4 plus 1 c. c., 2 plus 0.5 c. c., neg. 0.2 c. c.	110	Normal	5542100000
	R. 20/15 L. 20/15. Fields normal	Nervousness	4 plus	4 plus all dilutions	18	Slight increase	5555531000
	R. 20/16 L. 20/16. Fields normal	None	3 plus	0.2 c. c. neg., others 4 plus	24	Increase	5555421000
No. 11. R. P.	R. 20/15 L. 20/20. Fields normal	do	Negative	Negative all dilutions	20	Normal	5554210000
	do	do	do	0.2 c. c. neg., 0. 5 c. c. 4 plus 1.0 c. c. 4 plus.	85	Slight increase	5544431100
	R. 20/15 L. 20/15. Fields normal	do	do	4 plus in all dilutions	130	Marked increase	5555421000
	do	do	do	do	12	Slight increase	5544210000
No. 12 J. M.	R. 20/20 L. 20/20. Fields normal	do	do	do	11	do	5554210000
	R 20/25 L. 20/25. Fields normal	Headaches, pains lower extremities.	do	0.2 c. c. neg., 0.5 c. c. 2 plus, 0.8 c. c. 4 plus.	4	do	3332100000

TABLE II.—*Tryparsamide cases*—Continued

Case	Vision	Subjective	Blood	Fluid	Cells	Globulin	Curve
No. 13. P. N.	R. 20/20 L. 20/20. Fields normal	None	2 plus	4 plus in all dilutions	7	Slight increase	1122110000
	R. 20/20 L. 25. Fields normal	do	Negative	Negative	R. B. C.	Normal	2221100000
	R. 20/20 L. 20/20. Fields could not be done. Can not cooperate.	do	4 plus	4 plus in all dilutions	16	Increase	5555554100
No. 14. E. B.	R. 20/70? L. 20/30. Fields could not be done. (?)	do	Negative	0.2 c. c. neg., 0.5 c. c. 4 plus, 1.0 c. c. 4 plus.	14	Slight increase	5555531000
	Will not cooperate		do	do	14	Increase	5543210000
No. 15. C. H.	R. 20/20 L. 20/20. Fields normal	None	4 plus	4 plus in all dilutions	80	do	5555421000
	R. 20/15 L. 20/15. Fields normal	do	Negative	0.2 c. c. 1 plus, others 4 plus	54	do	5554310000
	R. 20/16 L. 20/13. Fields normal	do	do	do	R. B. C.	Normal	5554310000
No. 16. J. S.	R. 20/30 L. 20/30. Fields normal	Constant severe headache.	4 plus	0.2 c. c. 1 plus, 0. 5. c. c. 4 plus, 1.0 c. c. 4 plus.	23	Slight increase	3442100000
	R. 20/20 L. 20/20. Fields moderately contracted.	None	Negative	Negative in all dilutions	47	Marked increase	4321000000
	R. 20/20 L. 20/20. Fields same as after Course I.	do	do	Negative all dilutions	13	Slight increase	1111000000
No. 17. P. R.	R. 20/20 L. 20/40. Fields normal	Severe gastric crisis	do	do	28	Increased	1122100000
	R. 20/20 L. 20/20. Fields normal	Crises less severe and less frequent.	do	do	11	Slight increase	1110000000
	R. 20/33 L. 20/25. Fields slightly contracted.	Crises more severe. Same frequency.	do	do	15	do	0000000000
No. 18. A. M.	R. 20/20 L. 20/70. Fields normal	Stiffness in neck. Seizures of vertigo.	do	0.2 c. c. 2 plus, 0.5 c. c. 4 plus, 1.0 c. c. 4 plus.	34	Increased	5554311000
	R. 20/25 L. 20/50. Fields normal	None	do	0. 2 c. c. neg., 0.5 c. c. 3 plus, 1.0 c. c. 4 plus.	13	do	4332100000
	R. 20/20 L. 20/50. Fields slightly contracted.	do	do	0.2 c. c. neg., 0.5 c. c. 2 plus, 1.0 c. c. 3 plus.	27	Normal	3221100000
No. 19. G. D.	R. 7/100 L. 20/20. R. field contracted for blue. L. field normal.	do	do	0.2 c. c. 1 plus, 0.5 c. c. 2 plus, 1.0 c. c. 4 plus.	11	Slight increase	2233110000
	R. 8/100 L. 20/25. All fields moderate, contracted.	do	do	Negative all dilutions	4	do	2111000000
	R. 20/200 L. 20/20. Fields same	do	do	do	9	do	2221000000
No. 20. L. S.	R. 20/25 L. 20/25. Fields not done. Can not cooperate.	Nervousness, insomnia	do	0.2 c. c. 2 plus, 0.5 c. c. 4 plus, 1.0 c. c. 4 plus.	124	Marked increase	5533210000
	R. 20/20 L. 20/20. Fields normal	None	do	0.2 c. c. neg., 0.5 c. c. 2 plus, 1.0 c. c. 4 plus.	78	Slight increase	5544321000
	do	do	do	0.2 c. c. neg., 0.5 c. c. 4 plus, 1.0 c. 4 plus.	35	Normal	5432110000

Case 20.—L. S. Paresis. This was the most spectacular case of the series. When admitted in July, 1924, he had reached the convulsive stage and his grandiose delusions and conduct disorders were so marked as to necessitate confinement in a cell in the psychopathic ward. He spent his time writing telegrams to order the purchase of carloads of polo ponies, carloads of lumber, evening clothes, uniforms, athletic equipment, jewelry, expensive automobiles, apartment buildings, real estate, houses of prostitution, etc. He would tear up bed linen as well as his own clothing. His wealth was unlimited. He had two convulsive seizures during the first week after admission. Three weeks after beginning treatment the delusions were disappearing, judgment was improving, and his conduct permitted him to walk about the grounds. Within six weeks he was transferred to the syphilis and urological ward and was permitted to leave the reservation whenever he desired. He soon began making various articles in the occupational therapy department and later became engaged in cleaning and pressing clothes for other patients and sailors. At this work he was earning from $15 to $20 a week and at present is employed as a clerk in a shoe store in Waukegan. All phases of the spinal fluid except the colloidal gold curve became less positive after the first course of treatment. The fluid was further reduced after the second course with a definite "flattening" of the curve.

COMMENT

The results obtained with sulpharsphenamine were disappointing in many respects but distinctly gratifying in others. It was used at first in several cases of paresis but with no success whatever either clinically or serologically. On the other hand, symptomatic relief and serological improvement were obtained to a degree in the other classes of cases, which I have never seen approached with the use of the other arsphenamines. The incidence of visual dusturbances was on the whole about the same as in the tryparsamide series. Two cases complained of blurred vision, one of whom suffered a permanent marked diminution of vision in one eye after the second course of treatment. (Of interest in this connection, 40 cases of early syphilis were treated with sulpharsphenamine at this hospital during the past year with no instances of visual disturbances.)

TABLE III.—*Sulpharsphenamine and tryparsamide*

	Sulpharsphenamine		Tryparsamide	
	Cases	Per cent	Cases	Per cent
Mental	4 cases had symptoms before treatment.		7 cases had symptoms before treatment.	
Improved	3	75	5	71
Neurological	7 cases had signs before treatment.		10 cases had signs before treatment.	
Improved	0	0	6	60
Subjective symptoms	6 cases had symptoms before treatment.		8 cases had symptoms before treatment.	
Improved	2	33		
Recovered	3	50	7	87
Negative	2	25	3	25
Spinal fluid:				
Improved	3	37	9	75
Unchanged	1	12	0	0
Worse	2	25	0	0
Visual, subjective	1	12	0	0
Disturbances, objective	1	12	3	25
Types of cases treated:				
Meningovascular syphilis	5		4	
Tabes	2		1	
Tabo paresis	1		1	
Paresis	0		6	

None of the tryparsamide cases complained of blurred vision and none suffered any diminution of vision, although three cases showed a moderate constriction of visual fields after treatment.

The results obtained with tryparsamide were very striking throughout and in some cases highly spectacular. Of the two paretic cases who failed to improve mentally, one had in all probability a complicating precox condition, and the other was a very advanced case who, in the opinion of members of the neuropsychiatric staff, would have died very soon had he not received tryparsamide. (Of course it is no credit to a drug, however, to prolong the life of a paretic without benefiting his mental condition.)

The results compared favorably with those obtained elsewhere.

Lorenz, Loevenhart, and their associates[11] reported on 59 committed cases as follows:

	Arrested and working	Improved	Unimproved
Paresis, late (42 cases)	21	4	17
Paresis, early (12 cases)	7	5	
Taboparesis (2 cases)	1	1	
Tabes (1 case)	1		
Meningovascular syphilis (2 cases)	2		

And on 29 noncommitted ambulatory cases:

	Arrested and working	Improved	Unimproved
Paresis, asymptomatic (14 cases)	13	1	
Taboparesis (3 cases)	3		
Tabes (4 cases)	3	1	
Meningovascular syphilis (8 cases)	7	1	
This shows a percentage of total cases	66	14	20

[11] Lorenz, W. F., Loevenhart, A. S., Bleckwenn, W. J., and Hodges, F. J.: J. A. M. A. 80: 1497.

Moore, Robinson, and Lyman [12] have reported on 133 cases as follows:

	Well	Arrested, symptoms cleared up	Improved	Unimproved	Worse	Dead
General paralysis and tabo-paralysis (40 cases)	4	9	10	8	4	5
Asymptomatic general paralysis (17 cases)	17					
Tabes dorsalis (24 cases)	6	6	4	6	1	1
Asymptomatic neurosyphilis (15 cases)	13				2	
Meningovascular syphilis (37 cases)	13	8	12	2		2
Percent of total	39.8	17.2	19.5	12.0	5.2	6.0

Woods and Moore [13] have reported concerning visual disturbances, that in 241 cases who received a total of more than 3,000 injections of tryparsamide, subjective disturbances were noted in 10.2 per cent, and objective disturbances in 5.5 per cent. Ninety-four per cent of these reactions occurred before the tenth injection. The predominating disturbance in the objective group was a constriction of the visual fields for form.

The space limitations of an article of this sort prevent a detailed discussion of the visual aspect of this subject; but in a word, the cases in which tryparsamide is strictly contraindicated because of danger to the optic tract are extremely few.

CONCLUSIONS

(1) Tryparsamide is greatly superior to any other drug at our disposal for the treatment of neurosyphilis.
(2) The blood Wassermann in these cases becomes invariably negative or less positive after tryparsamide is received.
(3) Tryparsamide reduces the positivity of the spinal fluid but not with a rapidity to parallel the clinical improvement.
(4) More striking results are obtained in cases of early paresis than in the other forms of neurosyphilis treated with tryparsamide.
(5) In the classes other than paresis, the neurological signs are much less affected by tryparsamide therapy than are the subjective symptoms. Pupillary changes are less affected than any of the other signs.
(6) Sulpharsphenamine is a more valuable drug than other arsphenamines are in the treatment of neurosyphilis.

[12] Moore, J. E., Robinson, H. M., and Lyman, R. S.: J. A. M. A. 83: 888.
[13] Woods, A. C., and Moore, J. E.: J. A. M. A. 82: 2105.

MERCUROCHROME–220, SOLUBLE, IN INFECTIONS OF THE GENITO-URINARY TRACT—A PRELIMINARY REPORT

By J. E. Potter, Lieutenant, Medical Corps, United States Navy

Gonorrhea, with its numerous complications, is considered to be the most prevalent disease of men and women.

Flexner (1) reports that, in certain cities in Europe 200 per cent have had gonorrhea—the average being two attacks.

Morrow estimates that 60 per cent and Forscheimer that 51 per cent of the adult male population of the United States have gonorrhea. He adds that 20 per cent of these men will become infected before they are 21 years of age; over 60 per cent before they pass their thirty-eighth year (2).

Blanchko (2) states that in Berlin among the clerks and merchants 120 per cent have had gonorrhea. In the United States Navy, among classified causes of morbidity during the year, venereal diseases occupied first place by causing 20.9 per cent of all admissions to the sick list and 15.8 per cent of all time lost through sickness and injury.

Accepting the statement of a German specialist, that the ratio of gonorrhea to syphilis is about 5 to 1 (3), we can easily estimate the number of Neisser infections.

In the United States Army, in precedence, gonorrhea stands first (12 plus per cent); as a cause for discharge from the Army, it stands fourth (2). Gynecologists and urologists know that the one etiological factor which produces the most pathological lesions among their patients is the gonococcus.

From time immemorial to the present, hundreds of remedies have been offered and used in the treatment of this specific infection and its complications. Even in the past decade many new remedies have been offered, tried for a while, found to be ineffective in the treatment of gonorrhea, and discarded. But, thanks to the great strides made in modern urology, some more or less efficient remedies have been accepted. However, it has remained for some later investigators to offer a new remedy after careful experimentation with animals, which, the writer believes from his use of the preparation in the treatment of 77 cases, to be or to approach very nearly being, a specific in the treatment of gonorrhea and some of its complications. Hugh Young of Johns Hopkin's Hospital and the Brady Urological Institute in 1919 with his collaborators was the first to introduce Mercurochrome–220, soluble, in the treatment of the genitourinary tract (4). The profession all over the country took to this new remedy like "wild fire" and found it to have all the curative qualities its discoverer stated, being highly antiseptic, re-

markably penetrative, and nonirritating to the mucous membrane of the urinary tract.

Then E. P. Piper (5) reported some interesting work on animals in which he found that, in certain doses per kilogram body weight, Mercurochrome–220, 1 per cent solution, was a most efficient remedy as a haem-antiseptic, i. e., by intravenous injection in animals certain bacterial infections of the blood stream could be abated. Then J. H. Hill and Colston (6), (7), reported some further experimentation with animals showing the bactericidal action of this drug by intravenous medication. Finally, Young, in a series of marvelous articles with his collaborators, has shown not only that Mercurochrome–220 can be used intravenously with safety in man for the cure of septic infection the result of gonorrhea, but also in the cure of peritoneal abscesses (9), in puerpural septicemia (10), in retroperitoneal and in perinephritic infection (11), and scarlet fever cases complicated by erysipelas (12).

Many of the cases reported by Young in these articles demonstrated definitely the specific action of this drug in otherwise hopeless cases, in which, as Young states, the results are almost miraculous.

Following the suggestions offered by Young, other writers have reported case histories of the treatment of pyelitis with calculi (13) and the treatment of acute and chronic gonorrhea (14), 10 cases, with Mercurochrome–220.

In most of the cases so far reported rather large doses have been administered, often resulting in severe and sometimes alarming reactions, necessitating keeping the patients in bed, and, at times, forcing the discontinuation of the drug after two or three treatments because of the resulting supersaturation as evidenced by salivation and stomatitis (8), (10), (14), (15).

In this report the writer wishes to demonstrate that Mercurochrome–220 can be administered very advantageously to ambulatory cases in the dispensary or clinic by giving smaller doses over a longer period with longer intervals between injections, and that definitely positive results may be obtained in cases where our colleagues have not succeeded.

The results of the use of other dyes, especially gentian violet (16) have been very disappointing in two striking particulars. First, this drug given in therapeutic doses produces a marked depression of the cardiovascular system in numerous instances. Second, some patients who were given gentian violet intravenously assumed a marked bluish cutaneous hue—even the cornea turned blue. This alone is a strong psychological factor against the use of such a remedy.

The long interval between the injection and the time the actual reaction occurs, affords ample time and opportunity for a patient treated in a clinic to return to his home.

This report is based on results obtained from treating 62 such patients at the out-patient clinic in the University of California Hospital, and 15 patients at the United States receiving ship dispensary at San Francisco.

METHOD OF ADMINISTRATION

When practicable a kidney functional test and a white blood count were taken before the treatment was given. No patient received the treatment whose phthalein test was below 30, or where a heavy cloud of albumen was found. However, I do not believe this to be a contraindication (5). The leucocyte count taken before and about 4 hours following the injection, showed an average increase of about 2,000 cells per cubic millimeter. Strong catharsis is condemned, before and after the injection, the drug itself having a tendency to produce diarrhea due to its therapeutic properties.

In the treatment of the above 77 cases a 1 per cent solution of Mercurochrome–220, soluble, was used. The solution was prepared not more than one hour before administration, and with freshly distilled and sterilized water. Ten c. c. were injected intravenously as the initial dose, and increased 5 c. c. per dose at intervals of 48 hours, unless the patient showed signs of approaching saturation. This was usually manifested by a prickling and tickling sensation at the ends of the fingers and on other cutaneous surfaces.

Very few patients have equal tolerance for the drug. Those who have the most violent reaction derive the least benefit from its administration. Seven per cent of the cases had a severe reaction.

When a reaction followed the administration, one or all of the following symptoms were observed. 1. Headache and general malaise. 2. Aches and pains of a mild rheumatic type, which disappeared the following day. 3. Nausea and vomiting (unusual). 4. Chill, followed by temperature of 100 to 105 degrees F. 5. Colic-like pains in abdomen followed by diarrhea. 6. All cases which had more than 5 injections showed a moderate loss of weight (5 to 10 pounds).

REPORT OF CASES

Limited space prevents a detailed report of all cases, therefore only one typical case representing a complication and type of infection will be submitted.

Acute gonorrheal urethritis, 24 cases. All discharge stopped after the following number of injections:

2 cases received 2 injections.
5 cases received 3 injections.
5 cases received 4 injections.
5 cases received 5 injections.
7 cases received 6 or more injections.
4 cases received 3 or more injections but still had a discharge. Other symptoms were improved.

All cases that had five or more injections had no recurrence of symptoms, but had a negative smear following instrumentation and deep instillations of ½ per cent silver solution.

REPORT OF TYPICAL CASE

J. H. F., seaman, second class, admitted to sick list at the receiving ship, San Francisco, July 18, 1924, with profuse purulent discharge from the urethra, in which gonococci were present. Routine, ¼ per cent protargol injections and irrigations were ordered. At the end of four days no improvement was observed, so all treatment was stopped. Mercurochrome, 1 per cent, was injected as follows:

	C. c.
7–22–24	10
7–24–24	15
7–26–24	20
7–28–24	25
7–30–24	25

All discharge stopped after he had received five injections, but the urine still contained a few shreds. August 3, 1924, 25 c. c. were injected. Patient complained of a mild stomatitis and prickling sensation in fingers. Mercurochrome treatment was stopped. A size 24 French sound was passed, followed by an irrigation of hot potassium permanganate, 1 to 5,000, and instillation of silver nitrate, ½ per cent. August 8, 1924, a size 28 French sound was passed, followed by the same irrigation and instillation. August 10, 1924, urine clear and no smear was obtainable. Patient discharged as cured.

CHRONIC GONOCOCCUS INFECTION OF URETHRA

Chronic gonococcus infection of urethra—8 cases.
1 case received 2 treatments.
4 cases received 5 treatments.
3 cases received 6 or more treatments.

All discharge stopped after patients received five or more injections.
3 cases were cured.
4 cases showed much improvement.
2 cases were not improved.

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Some cases that could be classified as chronic gonorrhea are reported in other columns of this paper.

REPORT OF CASE

F. A., fireman, third class. Age 25. Admitted to sick list at the receiving ship, July 19, 1924, with a purulent discharge from the urethra in which gonococci were present. Patient contracted gonorrhea at Olongapo, P. I., on February 24, 1922, and has had a chronic discharge ever since (over two years). In June, 1922, patient contracted syphilis but up to the present time has never had a positive Wassermann reaction. He has had 10 injections of salvarsan and 12 injections of mercury. No apparent evidence of syphilis was observed. His prepuce was indurated, adherent to the glans penis, and looked as if it had long been the seat of a chronic inflammation. The prostate was found to be apparently normal. The following treatments of Mercurochrome–220, 1 per cent, were given intravenously with reactions as noted:

7–20–24	10 c. c.	no reaction.
7–22–24	15 c. c.	no reaction.
7–24–24	20 c. c.	no reaction.
7–26–24	25 c. c.	mild reaction.
7–30–24	25 c. c.	mild reaction.
8– 3–24	25 c. c.	mild reaction.

All discharge stopped after the fifth injection. Urine contained only a few shreds. Patient complained of a headache and malaise after the sixth injection, but did not develop stomatitis. August 4, 1924, sounds and ½ per cent silver were used and urine still contained a few shreds. August 6, 1924, urine clear. August 8, 1924, sounds and ¾ per cent silver used; smear negative for gonococcus. August 10, 1924, patient was circumcised and on August 20, 1924, was discharged as cured.

ACUTE PROSTATITIS

All cases showed improvement as follows:

1 case received 3 injections.
3 cases received 4 injections.
3 cases received 5 injections.
4 cases received 6 or more injections.

One case of prostatic abscess was completely cured after 6 injections.

One case of prostatic abscess was much improved with marked amelioration of symptoms, but still has 50 white blood cells to the field.

REPORT OF CASE

L. S. S., seaman, second class. Age, 22. Reported late in the afternoon of July 17, 1924, complaining of total retention of urine and painful vesical distention. He gave a history of gonococcus infection of urethra, first acquired February 20, 1923. He has had frequent recurrence. Examination revealed an enormous prostatic abscess and a urethral discharge with gonococci present.

Treatment.—After all attempts to make him void naturally had failed, patient was catheterized to relieve vesical tension. No further catheterization was necessary. The following injections of mercurochrome, 1 per cent solution, were administered intravenously:

	C. c.
7–19–24	10
7–21–24	15
7–23–24	20
7–25–24	20

Prostatic massage of increasing force followed by irrigation of hot potassium permanganate solution (1–5,000) were also given every other day. All discharge from the urethra stopped after the third intravenous injection, but expressed secretion from the prostate and seminal vesicles still contained 100 white blood cells to the field and gonococci were present

After six injections had been given, patient reached mercurochrome saturation, and this treatment was discontinued. August 11, 1924, the size of the prostate greatly reduced, although the right lobe was still indurated. August 18, 1924, the prostate was normal in size and firm in consistency. Expressed secretion contained only an occasional pus cell. The urine was free from shreds. Instrumentation and injection of a ½ per cent silver solution did not produce a return of symptoms nor a positive smear. Patient was discharged as cured.

EPIDIDYMITIS AND SEMINAL VESICULITIS

Six cases received three injections. The testicle returned to three-fourths normal size and the temperature became normal. The pain was greatly relieved.

Six cases received seven or more injections. Three of these had a vasotomy performed. Mercurochrome was injected both distally and proximally at the time of operation. After the reaction subsided the temperature remained normal and the symptoms improved. Urethral discharge stopped after four injections and the patients reported great relief after two injections.

REPORT OF CASE

M. I. L., Cox. Age 22. Reported for treatment July 15, 1924, with the following history. He contracted gonococcus infection of the urethra July 2, 1922. He has had morning drop and recurrence of the discharge following indulgence in alcohol and sexual intercourse. At examination upon admission a profuse purulent discharge was obtained that was positive for gonococci. Examination of his prostate revealed both lateral lobes enlarged with a few adhesions upon the anterior surface of the right lateral lobe. The prostate was boggy but no areas of induration were felt. He received the following treatment:

7–19–24 ..... 10 c. c.
1 per cent mercurochrome intravenously. No reaction.
7–21–24 ..... 15 c. c.
1 per cent mercurochrome intravenously. No reaction.
7–23–24 ..... 20 c. c.
1 per cent mercurochrome intravenously. No reaction.
7–25–24 ..... 20 c. c.
1 per cent mercurochrome intravenously. Mild reaction.

After four injections all discharge stopped but urine still contained shreds. Prostatic massage was started on July 26, 1924. July 28, 1924, urine was clear and a size 24 French sound was passed followed by silver nitrate solution ½ per cent. July 30, 1924, he developed epididymitis. August 3, 1924, under a general anaesthetic epididymotomy and vasotomy were performed and 5 c. c. of a 1 per cent solution of mercurochrome were injected both distally and proximally. August 4, 1924, the patient felt much better and the temperature dropped from 103 to 99. August 5, 1924, 20 c. c. of mercurochrome were injected intravenously. During the night the patient had a seminal emission which was stained a deep red with the dye. August 6, 1924, swelling in the testicle was reduced to about one-half previous size. The incision was clean. All discharge from the urethra stopped. During confinement in bed prostatic massage was discontinued. August 7, 1924, patient up and about. Mercurochrome medication discontinued because of stomatitis. Sutures removed and the wound was clean. August 11, 1924, urine was clear in two glass specimen. August 12, 1924, smear negative following instrumentation and instillation of ½ per cent solution of silver nitrate. Patient discharged as cured.

CHRONIC PROSTATITIS

All cases showed 100 or more white blood cells to the field before mercurochrome treatment.

3 cases received 2 injections.	W. B. C. to field	15 to 20
7 cases received 3 injections.	W. B. C. to field	15 to 20
2 cases received 4 injections.	W. B. C. to field	15 to 20
2 cases received 5 injections.	W. B. C. to field	5 to 10
11 cases received 6 or more injections.	W. B. C. to field	5 to 10

Three cases that received six or more injections showed partial improvement. Twenty cases showed no improvement.

After 26 of these cases received five or more injections the secretion massaged from their prostate and seminal vesicles contained mercurochrome.

REPORT OF CASE

K. F., age 56. Laborer. Admitted to University of California Clinic, April 25, 1924.

Complaint.—Frequency of urination, pain in back. Urine smells strong. Gonorrhea 20 years ago. Treated by druggist. No trouble since except present symptoms. Complains of slight dribbling and hesitancy upon urination but no blood or stones. Examination shows urine negative for albumen and sugar but glasses 1, 2, and 3 contain shreds. Prostatic examination: Prostate bound down and lobes are irregular. Hard cordlike adhesions between prostate and vesicles. From May 5, 1924, to August 1, 1924, has had prostatic massage and irrigation, sounds and vaccine, with no improvement. 100 W. B. C. to the field. July 23, cystoscopy showed bladder normal, ureteral openings well defined. Trigonum normal, vesicle neck normal, veru slightly injected, opening of ejaculatory ducts unusually large and well outlined. August 4, 1924, through cystoscope, ureteral catheter was passed into ejaculatory ducts and 2 c. c. mercurochrome 1 per cent injected. Also received 10 c. c. intravenously.

8- 6-24	15 c. c. intravenously—100 W. B. C.
8- 8-24	20 c. c. intravenously— 50 W. B. C.
8-10-24	25 c. c. intravenously— 20 W. B. C.
8-12-24	20 c. c. intravenously— 10 W. B. C.

Prostate normal in size. Lost 15 pounds in weight; felt better physically than he had felt for 15 years. Urine clear. Patient discharged as cured.

CHRONIC MYALGIA

Some of the cases reported in other columns above are included in this list showing symptoms of myalgia in various parts of the

body, such as back, thighs, legs, arms, hands, and muscles of the face and neck. The following were cured of myalgic symptoms.

6 cases received 3 injections.
5 cases received 4 injections.
3 cases received 5 injections.
10 cases received 6 or more injections.

Six cases which received six or more injections of Mercurochrome–220, soluble, were greatly improved but not completely relieved of myalgic symptoms.

REPORT OF CASE

C. W. Laborer. Age, 60. Complaint: High blood pressure, backache low down, bladder trouble, and frequent urination. Admitted to genito-urinary clinic, University of California. Denies all venereal infection. Wassermann negative. Urinary trouble: Nycturia 3x. Some hesitancy and dribbling. Examination: Glasses 1, 2, and 3, clear. Albumen and sugar, negative. Prostatic examination: Prostate large and soft, furrow notch firm; few adhesions; vesicles palpable; phthalein total, 45 per cent; 6–21, Cystoscopy: Residual urine, 60; capacity, 450 c. c. Walls of bladder, clear. Vessels clean looking. Trigone hypertrophied and ridge present. Pale ring around vesicle neck. Posterior urethra highly injected with hypertrophy of verumontanum. Blood pressure 178–152. Treatment: June 29, prostatic massage; 100 W. B. C. Until August 1, 1924, very little improvement. August 4, 1924, 10 c. c. mercurochrome intravenously. August 6, 15 c. c.; August 8, 15 c. c.; August 11, had a severe reaction. Forced to discontinue drug for one treatment. August 11, 25 c. c.; August 13, 10 c. c.; August 14, 10 c. c.; August 18, 15 c. c.; August 22, 12 c. c.; August 27, 17 c. c.; August 29, 15 c. c.

After the first five injections, mercurochrome was present in secretion massaged from prostate. Patient lost 15 pounds. Blood pressure dropped to 138–85. All pains in the back have disappeared. Urine clear. 100 W. B. C. to field. Prostate much reduced and firm. Patient feels better than he has felt for the past four years. Still under treatment.

CHRONIC CYSTITIS

One showed no improvement following six injections.

One case which is reported below shows wonderful improvement. He is able to carry on his work, which is that of a bootblack. Symptoms from toxic absorption have disappeared and bladder symptoms are almost cured.

T. G. Age 61. Swiss. Laborer: Admitted August 1, 1924, to genitourinary clinic. Following genitourinary history: Had

gonorrhea 18 years ago. Has not had any trouble till present condition. Two months prior to admission developed pains in lumbar regions and left gluteal region. Had trouble in passing urine. Complains of dribbling; no blood present; no sexual power. Examination: Urine, glasses 1, 2, and 3 cloudy and contained many shreds. Laboratory report from catheterized specimen showed *B. coli* and nonhemolitic streptococcus present. Negative for sugar and trace of albumen. Phthalein test, 30 per cent total. Blood pressure, 130–85. Negative Wassermann. Prostate small but hard and nodular. Few adhesions in both lateral lobes. Secretion contained 100 W. B. C. Bladder capacity, 350 c. c. Treatment: Irrigation with hot potassium permanganate, 1–5,000. August 4, mercurochrome, 15 c. c. August 8, 20 c. c.; mild reaction. August 11, 20 c. c. Still has 100 W. B. C. to the field. August 13, 20 c. c.; August 18, 25 c. c.; August 20, 15 c. c.; August 22, mercurochrome, 15 per cent in bladder, 10 c. c.; August 22, 15 c. c. in bladder followed by sterile water irrigation. August 25, 15 c. c. intravenously. 100 W. B. C. All pain in back has disappeared. Patient has lost about 10 pounds, feels better in every way. August 27, 10 c. c. intravenously. August 29, 30 c. c. in bladder, 15 c. c. intravenously. Urine is almost clear. Has had wonderful improvement since bladder instillations have been started. Still under treatment.

ACUTE GONORRHEAL RHEUMATISM

One case received four injections, much improved.

One case five injections, much improvement.

Two cases six or more injections—cured. Of all the different types of cases reported in this article as having been treated with mercurochrome, the most striking results were obtained in these patients suffering with acute gonorrheal rheumatism.

REPORT OF CASE

E. L. Age 26. Italian laborer. Admitted to genitourinary clinic, University of California, July 24, 1924. Complains of rheumatism and acute gonorrhea which he acquired 6 weeks prior to admission. Smear positive for gonococci. Urinary symptoms, dysuria–O, nycturia–O, hematuria–O. Examination revealed gonorrheal rheumatism in right wrist joint. Joint much swollen and very painful. Treatment: Hot irrigations of protargol ½ per cent twice daily. Blood taken for Wassermann 7–23–24. Report negative. Condition did not improve. July 25, condition not improved.

7–28–24 received 10 c. c. 1 per cent mercurochrome intravenously.
7–30–24 received 15 c. c. 1 per cent mercurochrome intravenously.
8– 1–24 received 20 c. c. 1 per cent mercurochrome intravenously.
8– 4–24 received 20 c. c. 1 per cent mercurochrome. Severe reaction.

Wrist joints showed much improvement, movable without much pain. All discharge from urethra has stopped. Urine contains shreds. Mercurochrome discontinued for one treatment. August 6–9, 15 c. c. August 11, 15 c. c. Urine clear; wrist joints freely movable, normal in size. Has no pain. Discharged as cured August 24, 1924.

CHRONIC SYNOVITIS

Four cases received five injections. Apparently cured of synovitis. Four cases received six or more. Very much improved.

CONCLUSIONS

1. Mercurochrome–220, soluble, is one of the most important new remedies for use in intravenous antiseptic medication.
2. This drug is excreted in large quantities by the kidneys and also secreted through the prostate, seminal vesicles, and other glands of the genitourinary tract. Thus, this dye comes in direct contact with the inflamed areas of this tract by way of the urine and blood stream.
3. To obtain the best results this remedy should be given in small enough doses to avoid too early saturation. Patients who respond best to intravenous mercurochrome injections have mild reactions.
4. Acute rheumatism, synovitis, myalgia, neuritis, arthritis, and other manifestations of absorption from the prostate and seminal vesicles as sites of local infection will clear up rapidly on the intravenous administration of Mercurochrome–220, soluble.
5. A large number of acute gonorrheal urethritis, epididymitis, prostatitis, and seminal vesiculitis cases will clear up rapidly with this medicine.
6. The drug should be freshly prepared and given every 48 hours.
7. Given judiciously, mercurochrome is one of the most efficient remedies to be used in ambulatory cases, i. e., patient can be treated in the dispensary and clinic.
8. In chronic infections of the genitourinary tract, although we have not tried the remedy long enough to report a high percentage of cures, it is the author's opinion that, with continued treatment over a period of several weeks, mercurochrome will be found to be one of the most efficient drugs in the armamentarium of urologists.

In conclusion, I wish to thank Dr. Frank Hinman, head of the department of urology, University of California, for his courtesy in granting me the use of clinical material and records of the urological department of the University of California Hospital. Also, I wish to acknowledge appreciation of the hearty cooperation and assistance of Dr. F. H. Redewill, assistant in urology, during the treatment of cases and the recording of results in the University of California clinic, without whose help and interest this report would have been based upon a much smaller number of cases.

I am indebted to Commander U. R. Webb (Medical Corps), United States Navy, for valuable advice and helpful criticism while I was preparing this report. Lieut. P. V. Greedy (Medical Corps), United States Navy, rendered me assistance in treating cases reported from the receiving ship at San Francisco and contributed useful suggestions that were used in writing this paper.

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THE UNITED STATES NAVAL PRISON, PORTSMOUTH, N. H., FROM THE ASPECT OF THE MEDICAL OFFICER

By P. T. Crosby, Lieutenant, Medical Corps, United States Navy

The accused is guilty either by plea or proof. The court is cleared to deliberate on the sentence. How many officers, who have been

members of a general court-martial, fully realize the gravity of the situation? How many know or feel any responsibility beyond the fact that the guilty one will spend some period of months or years in a naval prison? How many know what sort of a place the prison is, what the prisoner will do when he gets there, and under what circumstances he will live? Let us follow a general court-martial prisoner into the naval prison at Portsmouth, N. H.

THE NEW ARRIVAL

The new arrival comes to us under guard and in uniform. He is taken to the receiving room where his clothes are taken away and the regulation grays are substituted. His personal effects such as money, jewelry, watch, knife, and other pocket pieces are receipted for and kept by the supply officer. Next he visits the executive officer who explains to him in a few minutes talk what the prison expects of him, his standing as a prisoner, the benefits of good conduct, the results of bad, and gives him a general summary of prison regulations. The supply officer next opens his accounts as a prisoner. The medical officer follows with the routine physical, mental, and intelligence examinations.

In the meantime a cell and a place in the outside working party have been assigned to the newcomer. To recapitulate, the new arrival follows the following schedule:

1. Receiving room.
2. Bathroom.
3. Salvage section for prison outfit, consisting of—two suits of grays, 3 suits of underwear, 4 pairs of socks, 4 handkerchiefs, 1 belt, 1 hat, 2 towels, and 1 pea-jacket or coat.
4. Canteen: Each new arrival is issued $2.50 worth of toilet articles, combs, brushes, pipe with tobacco, cigarettes, and shoe polish.
5. Sick bay.
6. Chaplain.
7. Pay office.
8. Executive office.
9. Assigned to working party which is divided into three classes: (1) General second-class prisoners, (2) scandalous-conduct prisoners, and (3) third-class or rock-pile group.

THREE CLASSES

There are three classes of prisoners. The first class is composed of good-conduct men who have served at least one-third of their sentences. This group is selected with great care—the following factors being taken into consideration—offense or cause of confinement, length of sentence, conduct while in prison, mental and per-

sonality make-up of the prisoner, general ability, and desire for responsibility. This class is again divided into those who are quartered in the dormitory and those who, although they are first class, are not yet qualified for the dormitory but live in the cell block. The degree of good conduct is not alone the deciding factor, but rather, the length of sentence, personality, and kind of offense. Thus, the first-class dormitory is kept filled by the best of the other first class. The second-class group comprises the main body of the prison population. The men in this group are of good conduct and are qualifying for first class. The second-class prisoners are all quartered in the cell block, one to a cell. The third class is the punishment group. They are also quartered in the cell block and have the fewest privileges. The privileges of the three classes are tabulated below under general headings.

PRIVILEGES

	First class	Second class	Third class
Movies	Twice a week	Twice a month	None.
Writing letters	Unlimited	Write once a week	Write once a month.
Smoking	Extra privileges	Ordinary privileges	None.
Outside recreation	Daily	Twice a week	Do.
Visitors	All visiting days	Twice a month	Once a month, relatives only.
Clemency list	Eligible	Not eligible	Not eligible.

THE CELL BLOCK

The cell block, built of steel and concrete, contains 320 cells. The occupant of each cell is responsible for its care and cleanliness. Each cell is 5 feet and 8 inches wide, 10 feet long, and 7 feet and 10 inches high, with the outboard side entirely open except for the bars which form its wall. The other five sides are blank except for a square hole in the rear for ventilation. The cell block, as a whole, is divided down the center from top to bottom and from end to end by a space about 4 feet wide. In this air space all plumbing is open and can be repaired and inspected at all times. Further, this space affords ventilation to and from each cell by way of the above-mentioned air-space holes. Each cell contains one bunk with mattress and blankets, one washbowl, one toilet stool, one chair, and one Manual for the Government of Naval Prisons. Prisoners may have special permission to have books, family pictures, and writing material in their cells.

ORGANIZATION OF PRISON PERSONNEL

The prison population is organized into a battalion of five companies for personnel inspection. This inspection is held weekly on

the parade grounds during good weather and in the cell-block corridors during bad weather. The regulation battalion parade with the prison band is carried out prior to inspection. The commanding officer and staff carefully inspect each man. During the parade and inspection each company is marked on its military bearing, efficiency in drill, and the personal appearance of each member. The best company wins the pennant, with which go extra movie privileges for the coming week. The members of each of the companies are, as nearly as possible, from the same tier of the cell block. The company captain is the tier captain of that company in the cell block. One company is made up of the men from the first-class quarters. This military organization interlocking with the organization of the cell block stimulates morale, and it has been observed that the neat and soldierly majority force their careless brothers to extend themselves without interference by the prison authorities. Following the weekly personnel inspection of Friday afternoon, the weekly material inspection is held on Saturday morning. This inspection is similar to that of the Military Establishment and is held by the commanding officer and staff.

WORK

Along with confinement, work is necessarily a part of the sentence; so it follows that the working details must be organized. The work of the various classes is as follows:

First class:

Inside details.
Clerical.
Garage.
Galley and mess halls.

Second class:

Labor in the navy yard.
Salvage section.
Sanitary details of prison.
Reservation squad.
Clothing factory.
Plumbers.
Carpenters.
Galley and mess halls.

Third class:

Rock pile.
Rock crusher.
Coal pile.

The vast majority of the prisoners are kept busy at manual labor either in the navy yard or on the prison reservation. The minority are employed in special work as plumbers, carpenters, electricians, or garage mechanics, or in the clothing factory or salvage section, or in clerical work in the offices.

SALVAGE SECTION

Located in one of the barracks on the prison reservation is the salvage section, so called because it is here that shoes, clothing, and in fact everything are reclaimed and if possible saved for further use. Socks are mended or darned by machine and hand, oversize underwear is cut down to the various common sizes, oversize salvage shoes from the other branches of the service are cut down, revamped, and turned into common-size working shoes. If it is humanly possible to repair an article of clothing it is done and, if not, the material is used for patches and cleaning rags. Nothing is wasted.

THE MEDICAL DEPARTMENT

The medical department is well equipped with material and personnel to care for the needs of the prison population except for major surgical cases and a few of the graver medical conditions which are to be surveyed medically. These last two classes are sent to the naval hospital, Portsmouth, N. H., where a special prison ward has been constructed.

GENERAL OBSERVATIONS

During the years 1918 and 1919 Lieut. A. W. Stearns, (Medical Corps), United States Naval Reserve, wrote several papers on the importance of a history in detecting psychopathic recruits. This officer was detailed to make further study of deserters, the results of which were published in the United States Naval Medical Bulletin in January, 1925. Doctor Stearns insisted that the writer make some observations on the naval delinquents under his care, notwithstanding the latter's lack of special training.

Those who have read the papers by Doctor Stearns have been, no doubt, impressed with the absolute necessity for detailed family and economic history of the recruit and a careful mental and intelligence test. The following observations and statistics are offered for what they may be worth to those of us who have the mental as well as the physical welfare of the Navy personnel in our care.

Let us consider the average naval delinquent as a class. Probably the vast majority of them are "border line" cases. "Border line" can mean either on the border line between normality and abnormality or it may mean that we have not the necessary means of discovering the positive abnormality. However, this is the class that gets by the recruiting officer and the training station and eventually commits itself. Let us divide the prisoners into three general classes for observation, namely: (1) The scandalous conduct class, including charges of sodomy, oral coition, bestiality, and perversions; (2) miscellaneous crimes, including robbery, theft, embezzle-

ment, alteration of accounts, forgery, assault of superiors, manslaughter, violation of narcotic acts and navy regulations; and, (3) desertion; uncomplicated by a greater crime than the act of desertion.

SCANDALOUS CONDUCT GROUP

The writer has taken a group of 50 for observation. This class of offenders is avoided in polite conversation and is at times lightly talked of from forecastle to fan tail. There is no doubt that the hardened deep-sea sailor of one or more years' service loves to thrill the raw recruit with his knowledge of this class of offenders and their bestial practices. There is, further, no doubt that many of these "border line" recruits are lead to try this mysterious procedure either when sober or under the influence of intoxicants. The writer is of the opinion that these perverted offenders are types of or "border line" cases of dementia precox. Let us gather a few generalizing statistics on this class and compare them with the other two classes of offenders.

Average age of offender	Years	23.7
Oldest offender	do	44
Youngest offender	do	17
Average length of service	do	2.94
Longest service	do	19
Shortest service	do	1
Intelligence test:		
Adequate		33
Inadequate		13
Border line		4
Number with offenses only while in the service		9
Number with offenses only while in prison		14
Number with offenses both in the service and prison		11
Number with no offenses in either service or prison		16

PRIOR OFFENSES IN THE SERVICE

Absent over leave (one offense)	2
Absent over leave (two offenses)	1
Absent over leave (three offenses)	1
Unmilitary conduct while on post	1
Disobeying lawful order of superior officer, etc	5
Failing to pay debt	1
Dirty equipment	1
Shirking duty	1
Selling property of the United States Government	2
Asleep on watch	1
Drunkenness or intoxication	3
Theft	1
Neglect of duty	1
In unauthorized part of ship or station	2
Refusing duty	2
Disrespect to superior officer, etc	1

MISCELLANEOUS GROUP

Next let us consider 50 cases of the miscellaneous group, comprising those who have committed theft, embezzlement, forgery, etc.:

Average age of offender	years	24.6
Oldest offender	do	47
Youngest offender	do	18
Average length of service	do	5.02
Longest service	do	21
Shortest service	do	1
Intelligence test:		
Adequate		39
Inadequate		9
Border line		2
Number with offenses only while in the service		13
Number of offenses only while in prison		4
Number with offenses both in the service and prison		5
Number with no offenses in either service or prison		28

Prior Offenses in the Service

Absent over or without leave (one offense)	6
Absent over or without leave (two offenses)	4
Absent over or without leave (three offenses)	4
Breaking arrest	1
Disobeying lawful order of superior officer, etc	3
Disrespect to superior officer, etc	3
Drunkeness or intoxication	1
Breaking arrest	1
Fighting	3
Gambling	1
Refusing duty	2
Profanity	1

DESERTERS

Lastly, we study the deserters. These offenders were discussed in the Naval Medical Bulletin of January, 1925, but we shall now look at them from a slightly different angle. Let us compare them with the other two classes of offenders as to previous service and prison conduct, age, length of service, and intellectual acquirements. We take a group of 100 for consideration.

Average age of offender	years	22.4
Oldest offender	do	34
Youngest offender	do	18
Average length of service	do	1.5
Longest service	do	7
Shortest service	weeks	2
Intelligence test:		
Adequate		58
Inadequate		31
Border line		10
Epilepsy		1

Number with offenses only while in the service	37
Number with offenses only while in prison	14
Number with offenses both in the service and prison	2
Number with no offenses in either service or prison	47

PRIOR OFFENSES IN THE SERVICE

Absent over or without leave (one offense)	17
Absent over or without leave (two offenses)	5
Absent over or without leave (three offenses)	3
Absent over or without leave (five offenses)	2
Asleep on watch	1
Breaking arrest	1
Disobedience of orders	4
Gambling	1
Neglect of duty	2
Refusing duty	1
Shirking duty	4
Slow in obeying orders	2
Unmilitary conduct	12
Lying or falsehood	1

A general comparison of these three classes brings forth some interesting facts, especially from the standpoint of the behaviorist. The average age varies but little but shows the deserter to be the youngest. The averages show the deserter to have the shortest length of service, the miscellaneous class to have almost double the service of the scandalous-conduct class and three times that of the deserter. Most of the miscellaneous group are adequate in intelligence, while the deserter is in this respect, the worst of the three classes. Previous conduct comparisons show us that the deserter was by far the best behaved while in the active service until the time of his desertion. After being imprisoned he was only one-half as well behaved as those in the miscellaneous group, but his conduct was twice as good as that of the scandalous-conduct group.

In the comparison of the kind or nature of offenses during active-service duty, other than the one which caused imprisonment, we note with interest that the deserter was prone to being absent over leave or absent without leave and unmilitary conduct, showing a growing dislike for the life of the sea and, like the shadow, forecasting coming events. The miscellaneous group is shown, by analysis of their service offenses, to be a well-behaved group, although they show spirit as well as forethought in their transgressing. They were efficient and trusted, and, by this trust, were betrayed into committing the act that caused their imprisonment. It is seen that the scandalous-conduct group during their active service were unstable, unmilitary, and antisocial. Look over the table of their service punishments and see the list of acts which are done daily by psychopaths. Without doubt this table shows irresponsibility,

slovenliness, distraction, inattentiveness, forgetfulness, and impulsiveness.

Lastly, in this general comparison, let us call the reader's attention to the following table. We are struck with the large percentage of offenders of foreign birth or whose parents were foreign born, particularly in the deserter class. It is here evident that the immigrant and the first generation after immigration are unstable, unreliable, and likely to be future offenders. Not that they are of the criminal class, but rather that they have not made a suitable social adjustment. Undecided, bewildered, unsuccessful in civil life, they try the service, only to find the life full of problems which they can not solve or adjust. As a result they commit themselves.

	Deserters	Scandalous conduct	Miscellaneous
Offenders, foreign born	10 per cent	None	4 per cent.
One parent foreign born	5 per cent	10 per cent	2 per cent.
Both parents foreign born	24 per cent	12 per cent	16 per cent.
One parent unknown	2 per cent	None	None.
Both parents unknown	None	None	2 per cent.

When a prisoner arrives at this prison he is as stated examined by the medical officer. This examination is conducted in an office in which there is no third person. No one can hear what is being said by the prisoner or the doctor. This fact is made as apparent as possible to the prisoner without making a statement. On being asked the reason for desertion, the prisoner is informed that his statement will do him no harm and no good; that it is only for medical reasons that the question is asked and a truthful answer expected. The writer believes that the vast majority of these answers are truthful as the prisoner sees the truth, but there are many who evade or even lie and some who refuse to give a definite cause. It should be noted here that a man, enlisted for 4 years, who serves 6 months and then deserts for a short period, will probably get a sentence of 12 or 18 months. Getting one-third of this sentence off for good time, will leave the man free to go his way in about 18 months after enlistment.

In the January 3 issue of the Army and Navy Register, there appeared a note captioned "Intelligence tests of deserters." In this article were given the different percentages expressed by commanding officers of ships and stations for the different causes of desertion. In the following table we can compare the causes given and their percentages with the reasons for desertion given by the above 100 deserters. Some of these reasons do not coincide exactly with causes, but the writer has tried to interpret them on a common scale.

REASONS FOR DESERTION

	Percentage according to commanding officers	Percentage among 100 deserters in prison
Poor recruiting	74	[1]31
Homesickness, home influence, forced marriage or threat	67	31
Improper handling of men by officers and chief petty officers	54	12
Intemperance (alcohol or drugs)	31	5
Failure to comprehend seriousness of offense	20	3
General conditions in cities of the United States	20	1
Too much money given to men at one time	19	0
Too lenient treatment in prisons	17	0
Leave not granted as requested	14	7
Not enough talks on morale	13	0
General discontent	13	21
Sea life not congenial	11	5
Poor discipline	10	5
Overwork	10	1
Injustice of court-martial	6	1
Too frequent change of station	4	1

[1] Inadequates.

CONCLUSION

It is admitted that statistics may be as unreliable as they may be reliable and are often misinterpreted. It is further admitted that group statistics are prone to varied conclusions. Each case must be studied by comparing the individual's behavior with his intelligence; his home and economic past with his heredity. In the Navy as well as in civil life there are many round pegs trying to fit into square holes and many of these pegs will not fit anywhere. However, the writer believes that many men who may or may not be "border line" cases are committing themselves to various offenses, particularly desertion, because they can not adjust themselves to Navy life and military discipline. They run away from their troubles and after thinking it over, about 50 per cent of them come back voluntarily. It is a problem which the naval service can work out for itself. Can some of these men be helped in their adjustment? It is believed they can be.

EPIDERMOPHYTOSIS

By W. B. WOLFE, Lieutenant (Junior Grade), Medical Corps, United States Navy

Epidermophytoses of the hands, feet, and genitocrural region are assuming an ever-increasing significance as methods of diagnosis and treatment are being refined. Although this group of fungus diseases has been long recognized by laboratory workers and dermatologists the average practitioner is not aware of their etiology, and being unskilled in their diagnosis, finds his misdirected therapy of no avail (1). Recent studies of the cultural characteristics of the epidermophytes, together with further efforts at classification, have

done much to clarify our knowledge of these troublesome cousins of the yeasts and molds, while careful clinical and pathological studies of well-established cases have supplied us with the necessary data to combat these always uncomfortable and often crippling affections.

So it is that to-day we more fully understand the significance of a group of skin diseases which in the past were known only by descriptive dermatological terms, and are far better equipped to treat them than our predecessors who were harrassed with a multitude of diagnostic titles such as dyshidrosis, neurodermite, intertrigo and eczematoid intertrigo of the toes, dermatitis infectiosa eczematoides, callositas, puritus ani, eczema, pompholyx, cheiropompholyx, all of equally vague etiology, since it has been very well established that infection with the *Epidermophyton cruris* or other related member of the trichophyta may result in any or all of the above-named conditions (2). That the epidermophytoses are on the increase (3), both in the service and in civil life is attested by the multiplicity of synonyms by which they are known. "Dhobie itch," "golfer's itch," "boiler-plate itch," "black-gang itch," "jock-strap itch," are but a few of these appellations, and every ship and station seems to have its characteristic and picturesque name to describe them. The particular significance of this group of diseases to the naval medical officer is apparent when we consider that they are highly contagious parasitic infections, that the presence of a single case is a potential source of infection in a large group of men, that the disease is hard to eradicate if allowed to become endemic, and that it entails not only a considerable amount of discomfort and interference with the discharge of duties, but may be actually crippling or may result in severe secondary infections which will demand later surgical interference.

Trichophytosis, which is the diagnostic title now used in the Navy nomenclature, is a disease of the skin and its appendages which is due to a vegetable parasite closely related to the common molds, the trichophyton. There are four clinical varieties classified according to the predilection of the infecting agent for various sites. Trichophytosis capitis (ringworm of the scalp), trichophytosis barbae, (sycosis, barber's itch), trichophytosis corporis (tinea circinata), trichophytosis unguium, and epidermophytosis (eczematoid ringworm of the genitocrural region, the hands and feet), are all very closely related to each other. Indeed the numerous varieties of trichophyton infection were formerly believed to be caused by one and the same agent until the advent of the epoch-making work of Sabouraud and Whitfield (4).

In this paper we shall concern ourselves chiefly with the so-called eczematoid ringworm, or epidermophytosis, as it affects the hands and feet and genitocrural regions since these have the greater sig-

nificance to the naval medical officer. It may be defined as a chronic fungus disease of the skin affecting most frequently the genitocrural, genitoanal, scrotocrural regions, the axillary and mammary folds, the interdigital spaces of the toes and fingers, the volar surfaces of both hands and feet, and often also the nails, whose growth is favored by heat and moisture and is accompanied by varying degrees of pruritus.

It is exceedingly interesting to trace the history of our knowledge of the epidermophytoses because these infections which have been prominent in dermatological discussions of the last few years and are as yet not well known to the general practitioner, have been very clearly described and carefully studied for the last 50 years. It is perhaps to Hebra, the famous Viennese dermatologist who first described the eczema marginatum which bears his name, that we owe our first inkling of the fact that the etiologic organism of eczema marginatum and the epidermophytoses elsewhere are the same, for he noted as early as 1869 that in long standing cases of eczema marginatum identical lesions might be found under the breasts, and on the neck, thighs, and sacrum. Pick and Kaposi, also of the Vienna school, noted that these diseases were in the nature of an "epidermomycosis," and in 1870 Tilbury Fox reported the first recognized case of trichophytosis of a volar surface, having studied a severe case of typical ringworm which began on the dorsum of the hand and progressed to involve the interdigital folds and palmar surfaces of the fingers, while in 1888 Pellizari reported the coincidence of volar epidermophytosis in selected cases of trichophytosis capitis. The modern conception of the clinical identity of dyshidrosis and ringworm of the volar surfaces we owe to Djelaleddin-Moukhtar (5), who presented cases before Fournier's clinic and demonstrated in the eczematoid dyshidrotic type the presence of the mycelial threads of the fungus and gave us our first comprehensive monograph on the subject. This was followed in 1905 by the researches of Castellani who proved that the "dhobie" itch made famous by American troops in the Philippines was a variety of trichophyton, although a few years later Sabouraud (6) showed that this fungus was not a trichophyton but a member of another genus, the epidermophytes, and named it *Epidermophyton inguinale*. In 1902 and again in 1908, Whitfield (8), who was a coworker of Sabouraud described cases of ringworm of the hands and feet which were "indistinguishable from an ordinary outbreak of vesicobullous eczema," and in 1910 Sabouraud succeeded in culturing the *E. inguinale* from cases of intertriginous eczema of the toes.

Then, in November, 1911, Whitfield (9) and Sabouraud presented their findings before a meeting of the dermatological section of the

Royal Society of Medicine. Perhaps it is to the masterly work of Sabouraud that we owe most of our knowledge of both the clinical and mycologic aspects of the disease, and his book "Les Teignes," Paris, 1910, contains the best classification and discussion of the fungi, and remains to-day the most authentic treatise on their culture and clinical manifestations. The most comprehensive study since the work of Sabouraud is the study of dyshidrosis by Kaufmann-Wolff (10), who painstakingly analyzed a series of 25 cases from a clinical, histologic, and mycologic standpoint. Her work was published in 1914, the same year in which Culver and Montgomery (11), American workers, analyzed a case of infection of the feet following eczema marginatum, in which the epidermophyton was recovered. Hartzell (12), in 1915, described a similar case. The next important contribution was the monograph of Ormsby and Mitchell (13). published in 1916, which maintained the contention of Moukhtar that dyshidrosis was an epidermophytosis. In 1919, White (14) published the results of 165 private cases, and in 1921 White and Greenwood (2) published their latest studies and a résumé of previous investigations and a plea for standardization of media for further study in America. The latest available papers are those of Greenbaum and Klauder (15), Mitchell (16), Ruggles (17), and with a generally awakened interest in the subject, papers are appearing in greater numbers in many of the better journals. One of the best of these is the paper of Feldman and Ochs, in the Journal of Tropical Medicine and Hygiene for June, 1923 (18).

White and Greenwood, combining the work of previous investigators, have divided the disease into six distinct types: (1) the macular, (2) vesicular, (3) macerated, (4) hyperkeratotic, (5) papular, and (6) nail infections.

The eczema marginatum of Hebra is the best example of the macular type. It presents, early in the disease, more or less discrete slightly elevated brick-red macules on the upper inner aspects of the thighs. This condition is very prevalent among the enlisted men, particularly those who have returned recently from the tropics (1). An examination of marines returning from Santo Domingo, who were admitted to the United States Naval Hospital at San Diego from the U. S. S. *Henderson*, for other complaints, revealed almost 50 per cent infected with epidermophytosis either of the genitocrural or volar regions. One patient (Fig. I) exhibited typical lesions on the feet, hands, genitocrural and pubic regions as well as on his body and in the axillæ.

Epidermophytosis is usually bilateral in the genitocrural region, but when it occurs on one side only it usually affects the left thigh

due no doubt to the almost universal custom of carrying the scrotal sac against the left thigh. These separate lesions coalesce, presenting almost always the typical marginate festooned border, whose edge is raised slightly, and perhaps of a deeper red than the center of the lesion; and almost always there is a fine ring of tiny vesicles at the periphery. Unlike the ordinary tinea circinata this lesion does not, however, clear up at the center, and it may retain its red maculation for years. This is the type known as "dhobie itch," "jock-strap itch," or "athlete's itch." It is questionable whether the American troops who were troubled so severely with this affection in the Philippines acquired it in the Tropics, since it is quite possible that the fungus was present in their temperate zone homes, but owing to unfavorable conditions of growth remained quiescent. It is interesting to note that the laundryman was incriminated in the spread of the itch. While this has not been proved in the case of the dhobie itch (1), it is undoubtedly true that the promiscuous use of athletic equipment tends to spread the disease in gymnasia locker rooms and showers. Very often the genitocrural infection is the mother area from which the infection is carried to the hands, feet, or glabrous surfaces of the body, and where the epidermophyton lesions can be found on the dorsum of hands or feet, or on smooth surfaces, a history of previous lesions on the volar surfaces or in the genitocrural regions may usually be elicited.

The pruritus is far more variable than the physical conformation of the disease. I have seen cases in which the macular area extended above the symphysis and halfway down both thighs, and involved both penis and scrotum, in which there was practically no discomfort and the lesions were discovered in the course of a routine examination, and at the same time other paients will complain of the most intense itching from rather scattered macules.

The vesicular or dyshidrotic type exists endemically among certain classes of naval men, firemen, stokers, galley cooks being particularly susceptible. One patient entered the ward with a well-marked ezema marginatum as well as an epidermophytosis of the toes and stated that every man on his watch was similarly affected. It is limited to the hands and feet, the initial lesions being found on the lateral aspects of the digits (Fig. 2). As the process continues the interdigital webs and the backs of the fingers, toes, and hands are affected. The vesicles are fairly large, deep, and usually have a bluish core. The content is usually clear, unless there is a coexistent secondary infection, and new vesicles are not marked by any hyperemia. If the roof of the vesicle becomes torn in the course of the disease, desquamation occurs, leaving a red smooth shining surface exposed. These vesicles if they remain discrete may desquamate and be unnoticed by the patient. Ormsby and Mitchell believe that the

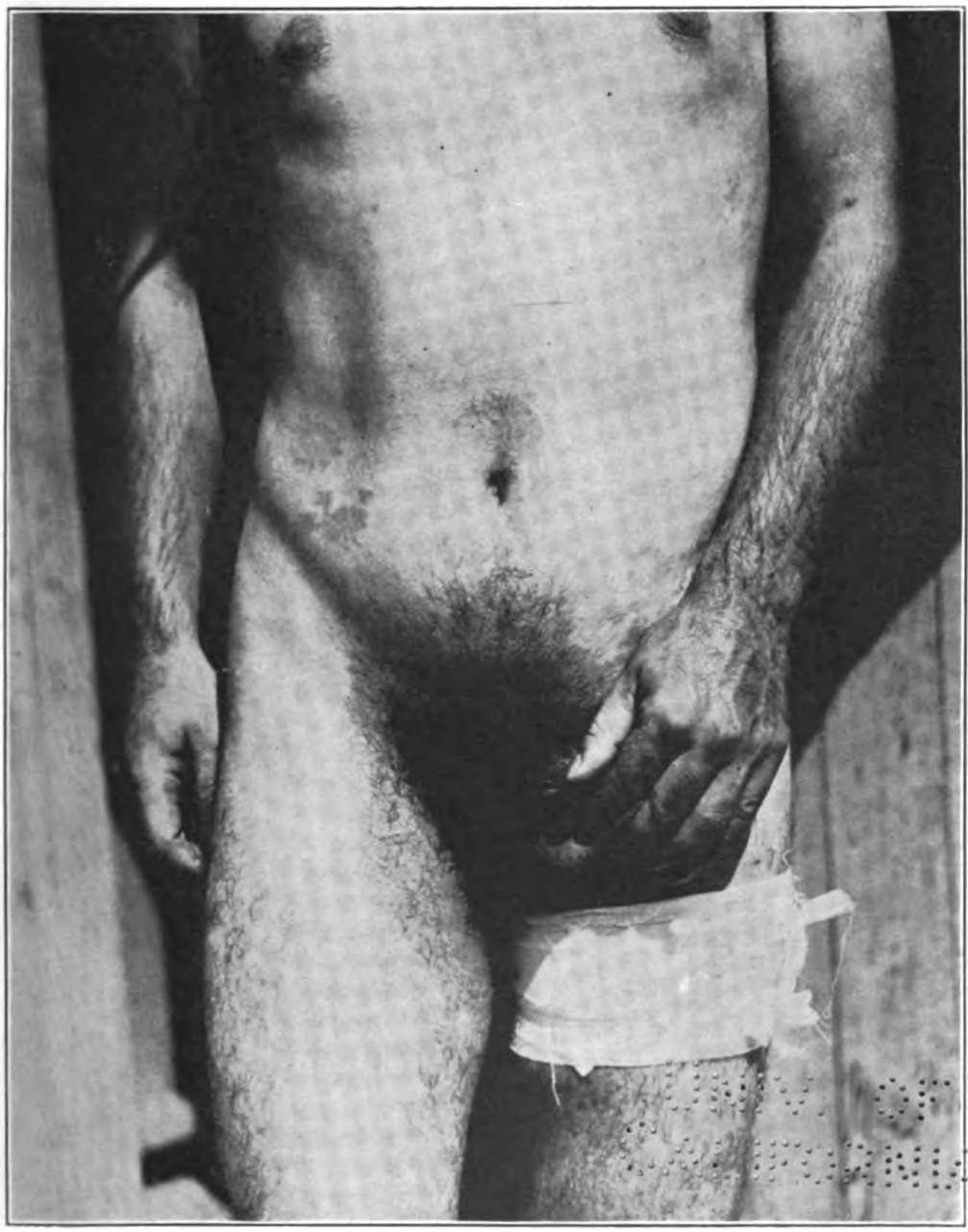

FIG. 1.—ECZEMA MARGINATUM. TYPICAL MARGINATE CONFORMATION. ALL SITES OF PREDILECTION INVOLVED

520—1

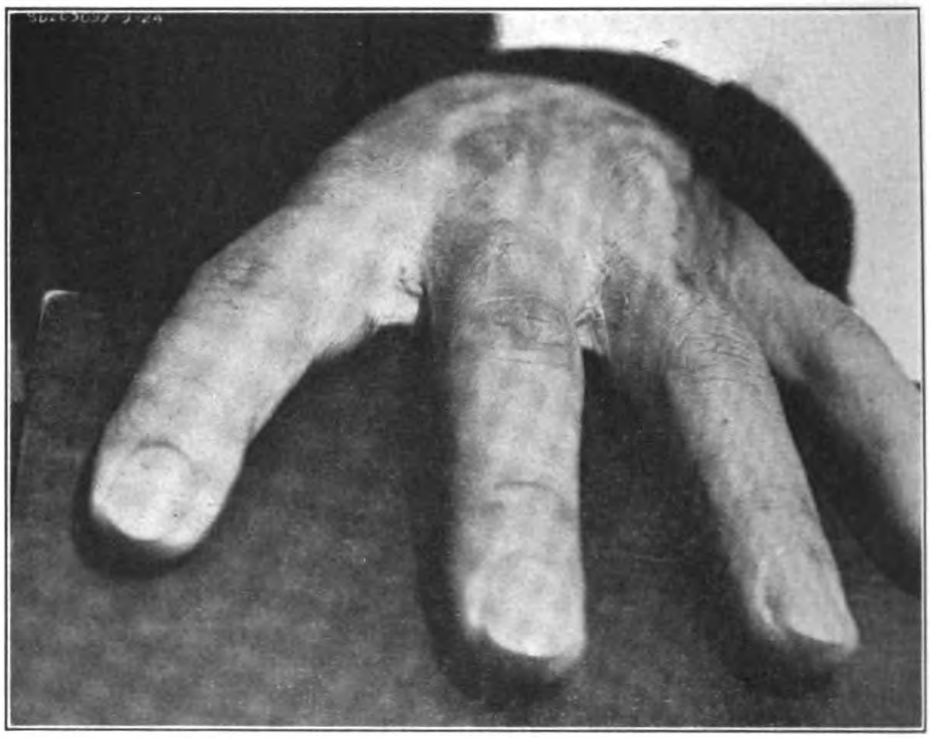

FIG. 2.—ECZEMATOID RINGWORM OF THE HANDS

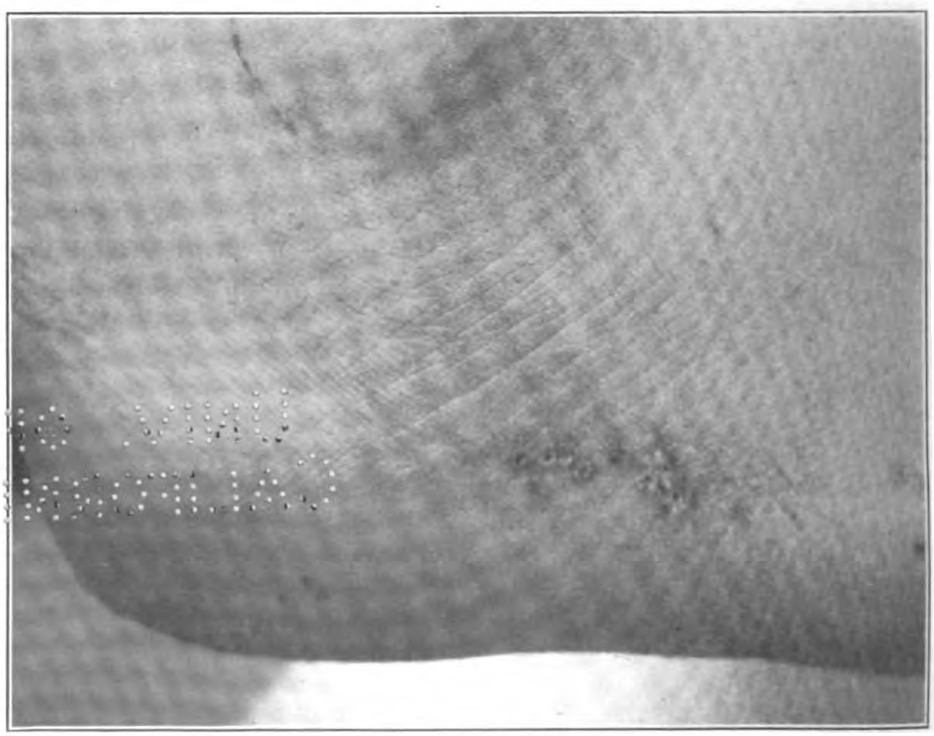

FIG. 3.—DEEP VESICLES ON THE FOOT

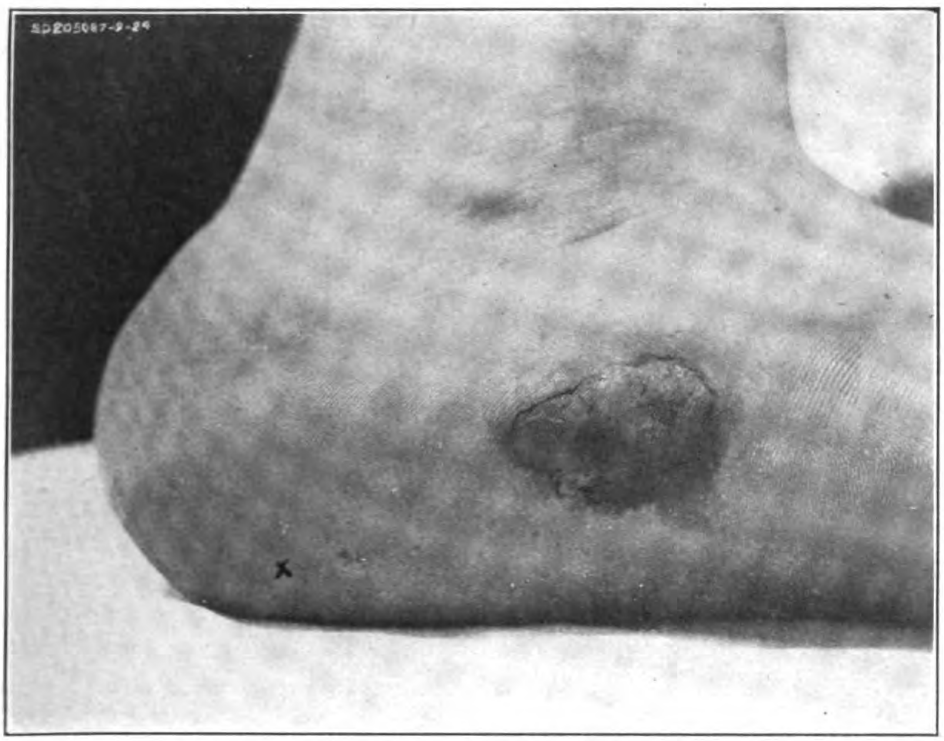

FIG. 4.—DEEP ULCER ON MESIAL ASPECT OF SOLE, SHOWING MARGINATE CHARACTER

FIG. 5.—LESIONS BETWEEN FOURTH AND FIFTH TOES, THE COMMONEST SITE OF INFECTION

factors that influence the further course of the disease are (1) the number of vesicles and their distribution, and (2) their location (13), while the type of infecting organism doubtlessly determines the future outcome. If the vesicle should not rupture a thickened keratotic button (Fig. 3) may be formed under which the mycelial elements persist.

This is in all probability the manner of formation of the hyperkeratoses. The usual course is for the vesicles to group and form large confluent bullæ. Such bullæ are particularly prone to secondary infection. I saw one case in which an epidermophytosis of the foot was unrecognized until a severe cellulitis of the leg, which called for a large incision, directed attention to the lesions on the sole of the foot. The location of the lesion determines its character. The constantly exposed dry corneum of the palm of a sedentary person presents an entirely different aspect from a similar lesion on the thickened heel of a man whose feet are in constant contact with hot boilerplates. In these latter lesions it is often possible to find tiny vesicles which actually contain the mycelial elements centered in the midst of large hyperkeratotic areas which show no fungus growth microscopically or in culture (Fig. 4). This would lead us to believe that the hyperkeratotic processes were the result of frequently repeated vesications which were not followed by complete desquamation.

Following the vesicular stage of the disease we often find a secondary process of maceration, for this phase may occur in any location where heat and moisture are constant. Sabouraud early notes that interdigital surfaces of the fourth interspace of the toes is the region most commonly affected by the macerating processes (Fig. 5). His original description is: "The interdigital folds of the fourth and fifth toes are most frequently affected, although this process is shared by all such folds. In the depth of the fold a cheesy magma, usually white and easily removed, may be found. The macerated, white, shiny, moist epidermis appears beneath this mass. When scraped large plaques similar to a false adherent membrane are removed. Farther from the fold itself the vesicular character of the lesion becomes more apparent and more definite, but these vesicles are usually few, and generally in various stages of development" (19). Lesions similar to these described by Sabouraud in the interdigital folds may be found in the intergluteal folds, and in this locus are invariably marked by severe pruritus.

The macerated process may extend backward on the plantar surface of the foot, where the typical marginate desquamation occurs, but in the great majority of cases the epidermophytosis manifests itself by lesions in the interdigital folds of the fourth and fifth toes, and on the contiguous plantar surfaces. Another almost con-

stant and very painful characteristic of the disease in this region is the marked fissure which may exist at the base of the fifth toe (Fig. 5). This occurs in almost all the cases of epidermophytosis in men whose bare feet are constantly in contact with hot steel plates aboard the ship. The fissures are so painful that they may effectually cripple the patient, and, of course, they offer a portal of easy access to secondary infecting organisms.

The soft caseous masses which are known by the laity as "soft corns" are caused largely by shoes which favor the growth of the epidermophyton. Only too often a shoe is so shaped that it molds the fourth and fifth toes closely together. As a result the normal desquamating processes are interfered with, a collection of squames occurs, and because of the close apposition of the toes this epithelial detritus is seldom removed. The result is that a perfect culture medium for the parasites is formed by the macerated epithelial cells.

Fischer (20) has proved conclusively that the epidermophyton prefers a warm moist habitat by noting that in his pulmonary cases in which various hot moist applications had been made vesicular eruptions appeared from which the epidermophyton was cultured. Clinical evidence of this preference may also be adduced by the fact that many of our service men who are severely troubled by the "dhobie" and "spic" itch in the Tropics find that these troublesome affections vanish on removal to a high dry climate in the United States, to return in the identical places as soon as climatic conditions prevalent in the Tropics supervene. Aside from this point we find the organism growing best in those locations in which aeration is poorest, and removal of exfoliated epithelium hindered by the anatomic configuration, as in the scrotocrural, genitocrural, axillary, mammary, and intergluteal folds. The common coincidence of hyperhidrosis with epidermophyton lesions on the feet was noted by the early investigators, and to-day we find that among the conditions which most favor the spread and persistence of epidermophytosis in civil life, the custom of wearing heavy woolen socks which can not be boiled properly, and the increasing attendance at golf clubs and gymnasia are preeminent, just as in the service infection of the feet is spread among crews by service conditions which make working in bare feet necessary.

Whereas diagnosis of the preceding types is not difficult if we are cognizant of the etiology and pathology of epidermophytosis, the hyperkeratotic type which affects the soles and palms offers some differential problems. Due to the fact that the characteristic vesiculation may be entirely absent, the lesions on the soles often resemble a psoriatic process with moderate lichenification and desquamation, or may even simulate a syphilide of the squamous variety.

Scrapings from the desquamating areas seldom show the epidermophyton unless they are made from the deeper tissues. The diagnostic points are the peculiar orange yellow, translucent character of the thickened areas, the coexistence of the sago-grain vesicles deep in the skin, the presence of the keratotic processes at other than pressure points, and the existence at the same time of vesicular or macerated lesions of the feet.

The lichenoid condition is but rarely met with; in the nails, where epidermophytosis may be particularly troublesome, the lesion is characterized by a friable, transversely ridged, brittle nail which shows a tendency to undergo distal disintegration. The nail is usually of a dull opaque color.

It is hardly the scope of this paper to enter into a discussion of the mycology of the epidermophyton, its cultural characteristics and the laboratory technique of identifying the various genera and subtypes. The laboratory recognition of the epidermophyton is often very unsatisfactory even in cases which show typical lesions. Greenwood (2), in an article which deals with the technical side of laboratory recognition of the fungi in very careful and complete style, says "the culture and identification of parasitic fungi or even their microscopic discovery in scales and hairs is always a matter involving time and patience. For some reason the usual clinical manifestations of the mycotic infections are out of all proportion to the amount of fungous growth found, and it is very often a matter of long and careful search before the parasite is discovered." The reader is referred to the original work of Sabouraud (7), to the excellent chapter in Stitt's Practical Bacteriology (1), and to the articles of Ormsby and Mitchell (13), White and Greenwood (2), and Greenwood (3), for further discussion of the mycology of epidermophytosis.

The fungi may often be recognized microscopically particularly when there is no complicating secondary infection by proper selection of material and proper treatment thereof. If vesicles are present, old vesicles, or those which show signs of desquamation, usually give the best results, for the fungi are more numerous in such lesions. The top of the vesicle is removed with a sharp knife and inverted on a slide, covered with 30 per cent sodium or potassium hydroxide, covered by another slide, warmed, and examined through a high, dry objective with the light cut down so that the refractile hyphae appear to better advantage. Sabouraud (21) advises boiling the scrapings in a watch glass until some disintegration takes place. Scrapings from the periphery of the lesions will usually give good results in the absence of vesicles. The epidermophytes appear as fine mycelial threads running in all directions through the field,

with quadrilateral spores in chains, at frequent intervals. One of the distinguishing characteristics of the epidermophyton is that it never attacks the hair, although it grows well in the genitocrural region. Cultures, grown according to the technique of Sabouraud (22) on maltose "proof" medium appear as downy, slightly eccentric, hood-like buttons surmounted by a "duvet" or tuft, and are divided by radiating furrows. The cultures are usually the color of an unripe lemon.

To the naval medical officer the recognition and treatment of the disease by clinical signs is more important because facilities for extended and careful mycologic studies are as rare as the incidence of epidermophytosis among the enlisted personnel is frequent.

The treatment obviously must be directed toward the elimination of the fungus and the relief of the symptoms. The fungus may be combated in two ways: First, by making the conditions of further growth unfavorable, destroying sources of reinfection, education of the patient in the nature of his disease and its spread; and secondly, by destroying the fungus where growth has already taken place in the skin. The contagious nature of this disease must never be overlooked, and the patient must be made to realize that not only is it notoriously spread by the promiscuous use of jock straps, athletic hosiery of one kind or another, towels, and other fomites, but that it is autoinoculable from one site to another in the same patient, and that recurrences are frequently caused by reinfection from improperly washed clothing.

As to the symptoms, they vary not only with the site of infection, but very probably with the type of fungus and with the patient's susceptibility. The pathologic changes which occur with the invason of the epidermophyton are far less serious than those which are found when the hair is invaded. There is usually some hyperemia with a slight exudation of cells in the papillae of the corium, and between the cells of epidermis, and almost always there is a parakeratosis which may become very marked particularly on the soles and palms. The epidermophyton grows peripherally, undermining the epidermis, so that the lesion on the sole presents a circle of hyperkeratosis and desquamation at the periphery, while the center may be a partially healed ulcer filled in with graulation tissue. There is also frequently found a type of lesion first described by Djelaleddin-Moukhtar (5), in which deep seated vesicles (Fig. 4), are found in the center of a hyperkeratotic desquamating ring. Because of their depth these little vesicles appear like closely studded sago grains which the older textbooks describe as pompholyx or cheiropompholyx, and which, because of the nature of the infection, are frequently associated with dyshidrotic or hyperhidrotic feet.

The patient should be instructed that cleanliness and dryness of the affected parts are paramount in effecting a cure. Clothing which comes in contact with the infected areas should be changed daily, and wherever possible boiled. Wool sox, underwear, or gloves are to be absolutely tabooed. When the epidermophyte has infected the feet particular emphasis should be laid on boiling the sox, and the feet, sox, and shoes should be liberally sprinkled with a dusting powder of zinc oxide, talc and 5 to 10 per cent salicylic acid (18).

There seems to be but little doubt that the epidermophyton presents strains of variable virulence just as the trichophytes vary in different sections of the country. This may account for the variation of opinion concerning different therapeutic agents (23); and the therapeutic indications detailed in this paper which have proved very effective for the tropical and far western varieties may require modification on the Atlantic seaboard. I have found the simple compound benzoic-salicylic acid ointment of Whitfield the most effective means of combating the disease. In cases where the itching is a pronounced symptom a single applicatioin suffices to give great relief; and, in the usual cases of eczema marginatum, or in cases of epidermophytoses of the smooth skin, the application of this ointment serves to clear up the lesions in a week. The formula generally employed is:

	Gm.
Acid salicylic	1
Acid benzoic	2
Petrolatum	15

The rationale of the ointment depends on the double action of the two acids, which in these proportions are both keratolytic and parasiticide.

In the early stages the application of a 10 per cent solution of potassium permanganate, where the disease is localized between the toes, or a milder solution in the axillae or groins may serve to clear up the troublesome pruritus. The permanganate solutions are highly recommended by some writers (18), and the continued use of these solutions between the toes is an excellent prophylactic measure in the prevention of recurrences. The permanganate solution is not only a good antiseptic but is sufficiently astringent to prevent the hyperhidrosis which is so favorable to the continued growth of the fungus.

Wherever pustulation has occurred, and whenever a pyodermatitis is present either from scratching or infection or overmedication, the 2 per cent ointment of ammoniated mercury should be used first to combat the secondary infection, and the Whitfield ointment or permanganate applications later.

These are by no means the only solutions that are available for treating these conditions, but I have found them by far the most

effective. The early French writers were very partial to the use of chrysarobin, but this drug has so many disadvantages that I have much preferred the cleaner salicylic preparations. Where it is impossible to procure the Whitfield's ointment the application of tincture of iodine often helps to clear up the lesion, although I have found that this relief is for the most part temporary. Bichloride of mercury in a 1:1000 solution has been found useful and has the added merit of not staining the clothes, and a lotion of 2 per cent of salicylic acid in 70 per cent alcohol is a pleasing application in the inguinal or axillary regions.

In all cases ointments and lotions should be carefully used at first lest some idiosyncrasy of the patient may result in a severe secondary dermatitis medicamentosa in the affected regions. Particularly is this true in the strong salicylic acid preparations.

While this superficial treatment usually serves to clear recent cases and almost all those which occur in the genitocrural, axillary, intergluteal regions, and is very effective in the intertriginous types in the toes and fingers, an entirely different procedure is required where deep vesiculation and considerable hyperkeratosis complicates the picture. Vesicles in all cases must be opened and the tops removed, and on the feet where the sago-granule conformation exists each granule must be pierced. The growth of the epidermophyton takes place peripherally, and under the hyperkeratotic areas one finds the greatest number of mycelial threads. These areas, therefore, must be removed and exposed. The most effective method of treating them is to moisten and apply a potassium hydroxid stick until the thickened layers are dissolved. The very suspicious granulation areas which are found in the center of the lesions must also be surgically opened and curetted or removed with a silver nitrate stick, for it is under this granulation tissue that deep-seated foci persist and account for the tendency to reinfection and the difficulty with which such lesions are eradicated. After these lesions have been surgically prepared they may be touched with the permanganate solution in 10 per cent strength and later covered with the Whitfield ointment. Great care must be observed to apply the ointment or solution beneath the undermined shelf of hyperkeratotic tissue. This is a painful process at first, but gives unbelievably good results in cases which are practically crippled and unable to walk as a result of the pain and itching that is present.

In conclusion it may be said that epidermophytoses presenting eczematoid or dyshidrotic lesions of the volar surfaces are of extremely common incidence in the service as in the civilian population; the lesions are more frequently found in warm and damp weather in men returning from the Tropics or stationed at the south-

ern stations than in cold, dry climates; that it is of paramount importance to recognize these mycotic affections early, and that their incidence aboard ship may be markedly reduced by proper instruction in the care of the feet and clothing; that the infection is most frequently found in the fourth interspace of the toes, the plantar surface of the arches, and over the tuberosity of the fifth metatarsus on the feet, and in the genitocrural and intergluteal regions on the body; that epidermophytoses of the hands and feet are usually secondary to the "dhobie" itch in the genitocrural regions; and that the essential lesions are deep-seated vesicles from whose roofs the fungus may be recovered; that parakeratoses and macerations are frequently secondary to the initial processes; that the disease shows a marked seasonal variation, being more marked in warm weather, and that the fungus is well able to remain latent during months of cold weather; and that in puzzling dermatoses of the feet and hands Whitfield's ointment is a very effective therapeutic test of the presence of the epidermophyton.

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CLINICAL NOTES

URINARY CALCULI

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During the fiscal year 1923–24, six cases diagnosed as kidney or ureteral stone were operated upon at the United States Naval Hospital, New York, N. Y. These cases presented no unusual symptoms and no unusual difficulty in diagnosis or treatment. Five of them proved at operation to be cases of stone and the stones were found at the sites indicated by the urological and X-ray examinations. One of these cases proved a disappointment, as no stone was found.

In reviewing the case histories, pain, accompanied by some slight but recognizable urinary symptoms, such as frequency, nycturia, and the presence of leucocytes and red blood corpuscles in the urine stand out as common to all. The cystoscope and ureteral examinations gave evidence of recognizable differences between the affected and unaffected side in every case except the one in which exploration failed to reveal the presence of a stone. The X-ray pointed the way to the location of the stones in every instance. Without X-ray localization the surgeon would often be balked in his efforts to bring relief to this class of case, for a complete exploration of the urinary tract by surgery is impracticable. In the abdomen the hand of the surgeon may have at least an opportunity to feel most of the abdominal viscera, but the urinary apparatus being retroperitoneal, permits no such easy access to the examining hand. The surgeon must defer in these cases to the opinion of the urologist, whose painstaking examinations through the cystoscope supplemented by the pyelogram, ureterogram, and cystogram give evidence to corroborate the information obtainable from the history and X-ray examination. Even with these aids he will sometimes fail to find the stone when this diagnosis is made. Failures in this field are much less in number and success far more common because of the improvement in exactness of diagnosis produced by the present-day urologist.

In these cases three different incisions (Fig. 1) were used, depending upon the level of the stone. For stones in the kidney or in the kidney pelvis the usual oblique lumbar kidney incision was used, the kidney being lifted temporarily from its bed. For stones

in the ureter, between the kidney pelvis and the brim of the pelvic girdle, an oblique abdominal incision through all layers down to the peritoneum, and 1 inch internal to the anterior superior spine was used, the ureter being exposed by pushing the parietal peritoneum away from the ureter as it coursed downward on the lumbar continuation of the transversalis fascia. For stones located in the

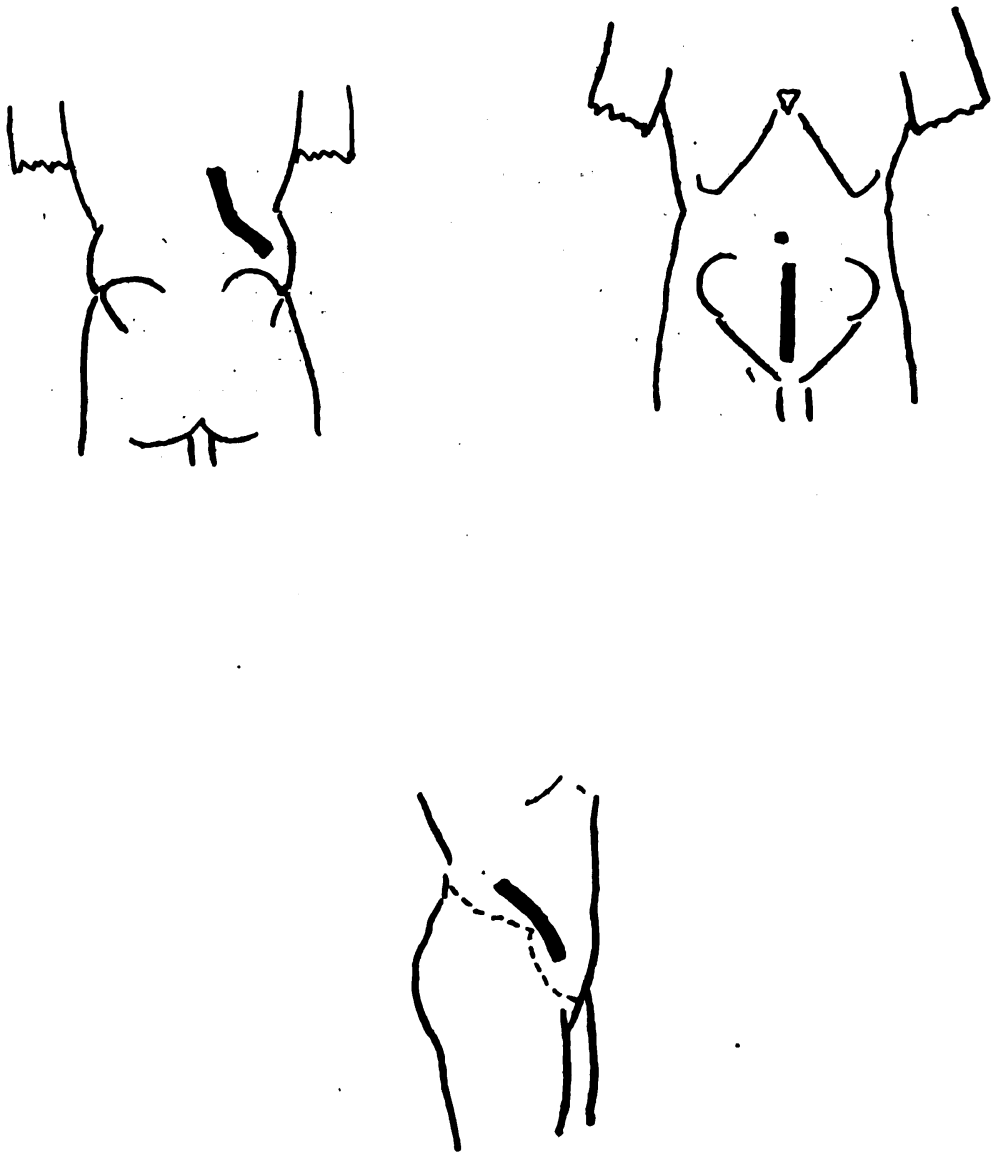

FIG. 1.—Three incisions

ureter between the brim of the pelvic girdle and the bladder, this incision was made between the umbilicus and the symphysis pubis exactly as the midline abdominal incision is made, except that the peritoneum instead of being opened was pushed back with the flat of the hand until the ureter was seen lying on the common iliac and descending into the areolar tissues of the true pelvis on the way

to the bladder. Drainage was used in all cases because of the probability of temporary urinary leakage.

The stones in these cases were found at different levels; one, in the lower calyx of the kidney, necessitating a cut into both kidney pelvis and kidney to facilitate its extraction. Another was found in the kidney pelvis. Another was imbedded in the ureter just below the kidney. The other two had passed farther down until they lay just outside the bladder at or near the third physiological stricture of the ureter (Fig. 2).

Case 4 had no stone, the diagnosis being erroneous. This patient was, unfortunately, thus subjected to an unnecessary operation. His case illustrates the great importance of obtaining, prior to operation, all possible evidence to confirm or deny X-ray evidence of stone. The symptoms of this patient arose from an unstable nervous constitution rather than from the urological entity which they simulated and the presence of which the X-ray examination seemed to corroborate. He left, however, none the worse for his experience in the hospital. All were operated upon to relieve pain, and apparently these men are to-day in excellent health and free from pain. Case 1, in addition, had fever and active vomiting, making operation seem imperative to save the kidney from permanent damage likely to follow obstruction of the urinary stream. In all, recovery was prompt and complete.

Case 1.—A. D. J., baker, United States Navy, age 27 years. Diagnosis: Ureteral calculus. Admitted August 16, 1923. Past history: Fever of unknown origin when 8 years old. Gonorrhea seven years ago. Family history was negative. Present illness: One and one-half years prior to admission while loading ship's stores he had an attack of sudden, acute pain in the right upper hypochondriac region. The pain was not severe enough to warrant an opiate and after a few hours' rest he was able to return to duty. He had no more attacks of this nature until the day before admission, but since the first attack, at irregular intervals he had a little trouble in starting his stream. The day before admission he had an attack similar to the first one. On August 16 there was some pain and tenderness in the upper right quadrant, but on the 17th the pain was lower and radiated to the testes and penis. By the 24th the pain and tenderness had subsided. On August 28th he had a fever of 104° F., leucocyte count 15,250, headache and chills, abdominal pain on the right side and marked splinting of the right rectus muscle. The urine showed many pus cells. Temperature 99.2, September 1. Urine continued to show many pus cells. September 5 and 6 he was very restless, with nausea and vomiting. Temperature rose to 103° F., he complained of very little pain. Physical examination: When admitted there was tenderness on pressure in the upper right quadrant

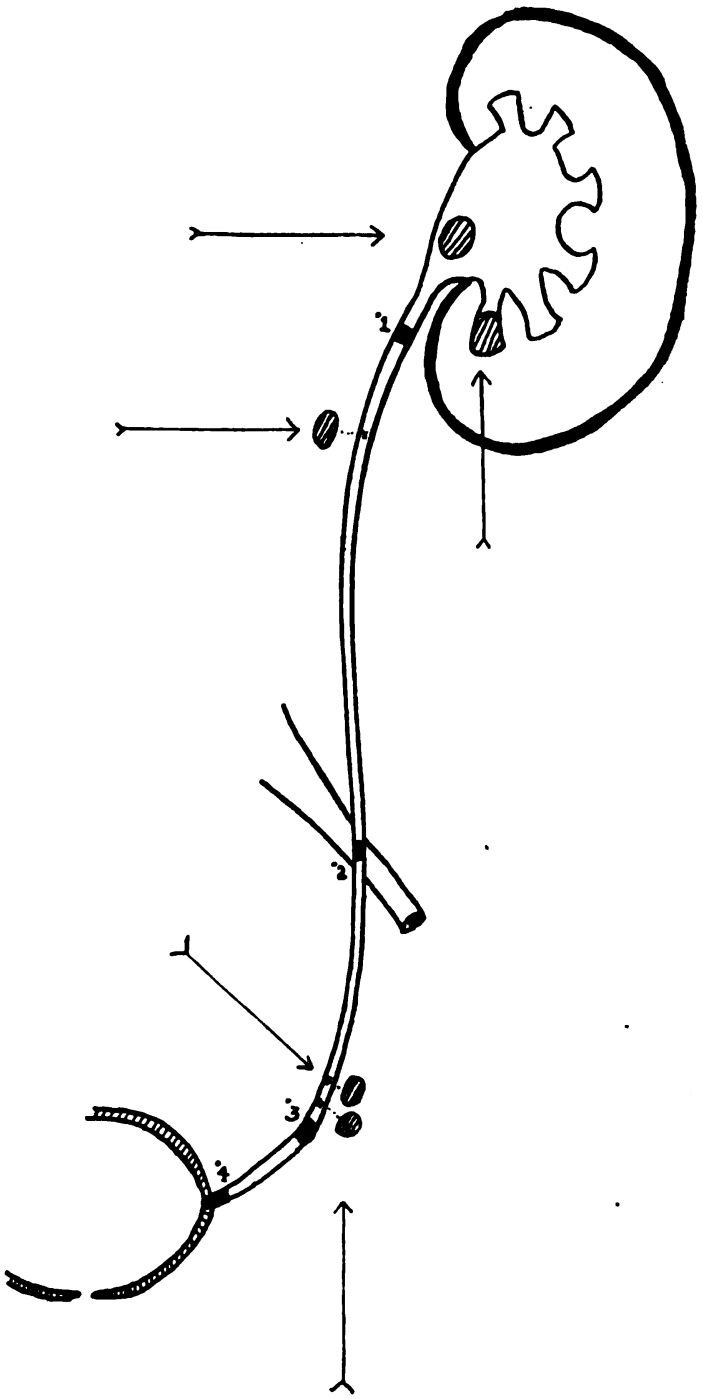

FIG. 2.—Numerals indicate normal constrictions. Shaded areas indicate locations of stones

and costovertebral angle. Urological examination: Cystoscopy: The bladder showed no pathology, except some edema about the right ureteral orifice. The urine showed 50 leucocytes per field, a few sodium urate crystals, a trace of albumin and a few hyaline and finely granular casts. X-ray examination: August 18, 1923. Left kidney negative. Right kidney: Dense body medial to base of right kidney. August 24, 1923 (pyelogram). Dense body in the right ureter about 20 cm. from bladder. Some dilatation of calices and ureter. September 7, 1923, two stones in ureter have moved down about 6 cm. Opaque body in kidney region. October 3, 1923, opaque body still present, but in a different position. Operation: September 8, 1923. Uretero-lithotomy, oblique incision, retro-peritoneal. A stone, the size of a lima bean, lodged in the dilated ureter just below the lower pole of the right kidney, was removed. Urine spurted from the pelvis. Penrose drain. Ureter not stitched together. Result: Uneventful convalescence. He was informed of the opaque body in the right kidney region. This was causing no symptoms and he did not desire further operation. After 30 days' leave, he was discharged from the hospital November 22, 1923, to duty aboard ship.

Case 2.—G. C., veteran, aged 25 years. Diagnosis: Ureteral calculus. Admitted July 20, 1923. Past history: At Chateau-Thierry, in 1918, he received five machine-gun wounds in the right hip and thigh, also a compound fracture of the upper third of the femur which has resulted in about 3 inches shortening of the left leg. Family history: Negative. Present illness: About six months before admission he developed a severe pain and tenderness in the left lumbar region over the kidney, associated with hematuria, pyuria, and frequency of urination. This attack lasted three days, then subsided. During the previous six months he had similar attacks of this nature about every two weeks, lasting about two days. Physical examination: Pain and tenderness over the left kidney. Large scar running across left buttocks and down lateral surface of left thigh. Considerable limitation of motion in left hip and knee. Urological examination: Urinalysis, July 20, 1923, negative. Cystoscopy: July 22 showed a slight cystitis and edema about the left ureteral orifice. The ureters were catheterized and an obstruction met 5 cm. from the left ureteral orifice. X-ray examination: July 23, 1923, left kidney negative. Large, semidense mass in line of left ureter. Bladder negative. Several foreign bodies in the region of the ileum. August 8, 1923, an X-ray examination of the left ureter showed a dense body about the size of a pea, about 6 cm. from the bladder. Operation: August 22, 1923. Uretero-lithotomy, left. Incision, median laparotomy, retro-peritoneal. A stone the size of a kidney

bean, rough and mulberry-like, was found close to the bladder in the ureter, which was incised longitudinally and sutured with one silk stitch. Penrose drain to site of ureteral incision. Result: Following operation the patient had a fever for several days and the wound broke down. The wound drained pus for about two weeks. He was discharged from the hospital October 29, 1923. The wound was entirely healed and patient weighed 144 pounds.

Case 3.—W. D. S., yeoman, first class, United States Navy, age 25 years. Diagnosis: Ureteral calculus. Admitted November 17, 1923. Past history: Gassed in 1918. Treated in hospital for about two months and made good recovery. No history of abnormal urination or symptoms of kidney or bladder trouble prior to present illness. Family history: Negative. Present illness: Began two days before admission with a frequent and urgent desire to urinate. The desire to urinate was accompanied with a sharp pain which originated in the penis and radiated into the right testicle and upward into the bladder and lower abdomen. During the following 48 hours the pain and desire to urinate became very acute. Frequency of urination 12 to 15 times during the day and 3 or 4 times during the night. No hematuria or pyuria. On November 18 a small, firm, white mass was seen to pass from the urethra. After this, symptoms subsided slightly. Physical examination: When first seen he presented no evidence of being acutely ill. There was moderate pain on pressure in the region of the bladder, right testicle, and cord. Urological examination: Urinalysis, November 19, albumin negative, many leucocytes, few red blood cells, some renal and squamous epithelium and a few calcium oxalate crystals. Cystoscopy, November 20. The bladder mucous membrane was normal in appearance except at the trigone and in the region of the right ureteral orifice, where it was markedly congested. Right ureteral orifice was reddened and edematous in appearance. A No. 7 catheter entered the orifice and easily passed for 9 cm., when it met with an impassable obstruction. Some bleeding followed. The left orifice was normal in appearance. March 18 a No. 11 catheter was passed to the stone in the right uterer. Procaine, followed by sterile oil injected. Meroxyl (1 to 2,000) was instilled into bladder March 31, as a three-glass test showed some cystitis, accompanied by frequency and burning of urination. This was continued daily for about six weeks. May 1 evidence of cystitis had disappeared and he was again cystoscoped. The right ureter was dilated to about 14 F. caliber and 10 c. c. each of procaine and sterile oil injected beyond the stone. With a metal instrument the stone was distinctly felt. X-ray examination: November 22, irregular opaque bodies massed in the right kidney region. November 26, right side, cathe-

ter just enters ureter. Left side, catheter up to pelvis. Mass still present in right kidney area. February 17, masses in the right kidney. In the right ureter near the bladder there is a small opaque body. February 26, calculus still present and in the same position in the ureter. March 19, stone in right ureter very near entrance of ureter to bladder. Same position as in previous pictures. Operation May 27, right uretero-lithotomy. Medium laparotomy incision, extra-peritoneal. The ureter was found dilated above the stone which was removed from the ureter about 4 cm. from the bladder, in the indurated and thickened area. A flexible probe was passed up and down easily after the removal. Result: He had an unusual amount of gas for a week following the operation. A small sinus formed at the operative wound which healed six week after operation.

Case 4.—A. P., veteran, age 38 years. Diagnosis: Ureteral calculus. Admitted February 26, 1924. Past history: Ordinary diseases of childhood. Gassed in October, 1918, and hospitalized three months before discharge with the diagnosis of neurasthenia. At that time X-ray examination revealed a small, irregular, rounded, calcareous mass the size of a small pea in the lower right lumbar region, just below the tip of the transverse process of the fifth lumbar vertebra. Cystoscopic examination and all clinical tests were negative. Family history: Negative. Present illness: He first noticed pain over the right kidney, radiating down the right ureter. There is some pain in the epigastrium, which has no relation to the taking of meals. Frequency of urination; every half hour. Nycturia; 5 or 6 times. Some tenesmus. About four months ago he passed a few drops of blood. He never passed gravel in urine. Physical examination: Negative; weight, 135 pounds. Urological examination: There was a sense of resistance over the right kidney. No pain over costovertebral angle. No supra-pubic tenderness. Penis normal, no sores, no discharge. Scrotal contents negative. Cystoscopy, February 27, showed trabeculation on the posterior surface of the bladder, otherwise fairly normal. A No. 5 catheter passed to each kidney. A pyelogram was made, using 12 c. c. of 25 per cent sodium bromide solution in each side. Patient was again cystoscoped March 10 and a No. 6 catheter passed to right kidney and X-ray picture taken. Cystoscopy March 14 showed the bladder mucous membrane everywhere normal in appearance. X-ray examination: February 29, probable calculi in right ureter at level of fifth lumbar vertebra. March 11, calculus in right ureter at transverse process of last lumbar vertebra. Operation: March 26, 1924. Exploratory of right ureter through median laparotomy incision, extraperitoneal. The right ureter was not dilated, not strictured.

No stone felt or seen from pelvis of kidney to 2 inches below great vessels in pelvis. Result: April 28 he began to complain of pains in the abdomen. The severity of the pain was doubtful. A few days later he complained of stomach distress, then pain in back and abdomen and constipation. A barium series was made, which was negative. Discharged from hospital June 6, 1924.

Case 5.—R. S., veteran, aged 34 years. Diagnosis: Renal calculus. Admitted January 2, 1924. Past history: In 1918 was thrown from a horse. Later operated upon for left varicocele and chronic appendicitis. Discharged from Army in May, 1919. Returned to his former occupation, chauffeur. Since then has been having sounds passed at the Polyclinic Hospital, New York, where he was told that he had a small urethra and enlarged prostate. Had also been treated for colitis and gonorrhea in 1913. Wassermann negative. Family history: Negative. Present illness: December 31, 1923, when he got up in the morning he had some pain in the right side. He used hot sand bags locally and the pain went away. The pain started in the small of the back, in the right side, and followed the course of the inguinal canal. He had no pain in the right testicle. He had no more pain until the morning of admission, January 2, 1924. When he was at stool pain came on and gradually increased in severity for about two hours. He vomited at the onset of the attack. A dull pain was constantly present and there was an attack of sharp, shooting pain every few minutes. He urinated regularly and without difficulty about six times a day and once or twice during the night No burning upon urination, no hematuria. Physical examination: Negative except for tenderness over right lower quadrant and slight rigidity over the same area. Urological examination: Urine was alkaline; specific gravity, 1.015; negative for albumen and sugar. Few leucocytes.

January 5, cystoscoped. Cystoscope entered with case. Bladder mucous membrane trabeculated on the superior and lateral sides. Left ureteral orifice slightly reddened. Otherwise normal in appearance. Trigone is everywhere markedly congested, especially in the region of the right ureteral orifice. Catheter passed about 4 cm. in right ureter, where it met with an obstruction which could not be passed. Catheter very soft and flexible. Catheter passed in left ureter to uretero-pelvic junction. January 10 he was again cystoscoped. The cystoscope entered with ease. Bladder mucous membrane everywhere normal in appearance. Trigone congested. Left ureteral orifice slightly reddened, otherwise normal. A No. 5 ureteral catheter passed to the left kidney without meeting any obstruction. Right ureteral orifice edematous and bleeds freely. No. 5 ureteral catheter passed about 2 cm., when it met with an obstruction. No urine from right catheter. Left side functions normally

When cystoscoped January 21, the congestion and puffiness noted at the right ureteral orifice had disappeared. There was still a great deal of congestion about the ureter and trigone. February 4, the bladder mucous membrane was everywhere normal in appearance. The blood vessels were markedly increased. A No. 7 catheter was passed to right kidney. A No. 7 catheter was passed to left uretero-pelvic junction. The phenol-sulphonephthalein test was done; appearance time, 3 minutes on left and 7 minutes on right. Fifteen-minute estimation, 4 per cent on left and 30 per cent on right. X-ray examination: January 3, an X-ray examination showed an opaque body on the left side, opposite the third lumbar vertebra. January 10, X-ray report the same as January 3, calculus probably in pelvis of enlarged left kidney. January 28, catheter passed to calculus. Operation: February 13, pyelonephrotomy, left kidney, oblique lumbar incision. Pelvis opened. A rough dark stone the size of a hazelnut was removed from the lower end of the pelvis. Upper portion of pelvis was palpated and no stone felt. Pelvic wall thickened. The ureter admitted a flexible catheter to the bladder. Pelvic wall thickened. The kidney was slightly enlarged. The capsule was fatty and slightly more adherent than normal. Result: He was discharged from the hospital May 2. Urinary function was normal. The ureters were patulous; no stricture.

Case 6.—J. F., veteran, aged 37 years. Diagnosis: Renal calculus. Admitted June 4, 1924. Past history: Ordinary diseases of childhood. Family history: Negative. Present illness: His chief complaint was that of pain in the region of the right kidney and in the abdomen. During the preceding two years he had several attacks of hematuria, the last attack two months ago. At times he has burning urination. Nycturia, 7 or 8 times. No daily frequency. Physical examination: Normal weight, 160 pounds; present weight, 150 pounds. Neither kidney was palpable. There was pain over the right costovertebral angle. Scrotal contents negative, although very tender in the region of the right globus major. Prostate was harder than normal. Right vesicle enlarged. Urological examination: Urinalysis negative. Cystoscopy, June 6, 1924. The ureteral ridge is very prominent. A No. 5 ureteral catheter passed to each kidney without meeting any obstruction. Phenolsulphonephthalein test, 4 per cent eliminated on right and 15 per cent on the left. A pyelogram was made, using 7.5 c. c. 25 per cent sodium bromide solution on both sides. Urea estimation, left 11 mg. per c. c., right 14 mg. per c. c. Smear from left kidney showed many gram positive diplococci and bacilli. Right kidney the same. July 8 the patient was again cystoscoped. There was a generalized irritation of the bladder mucous membrane. Right ureteral orifice much congested. Catheter passed to each kidney. X-ray examination: June

23 (pyelogram) lower pole of right kidney is opposite the upper margin of the fourth lumbar vertebra. An area of increased density in the right kidney which in two different roentgenograms appears in the lower calyx in one and in the pelvis in the other. Probably a stone which changes position. Major and minor calices of each kidney appear to be normal. July 10, 1924, stone is in the lower major calyx of right kidney. Operation: July 17, pelvi-nephrolithotomy (right) through oblique lumbar incision. It was necessary to make a long second incision in pelvis and into kidney substance to remove the stone from the lower calyx. Penrose drain. Result: Left hospital August 20, 1924, symptom free.

LEUCOCYTOSIS IN ACUTE INFECTIONS

By F. S. JOHNSON, Lieutenant, Medical Corps, United States Navy

Usually one does not feel tempted to write upon a subject so ordinary as leucocytosis; for it is a very ordinary condition and a sign recognized almost as routinely as fever. There are so many everyday occurrences, however, not thoroughly understood and merely taken for granted, that we are at times hampered in our endeavors to explain extraordinary phenomena. The understanding of the ordinary subject is not infrequently a prerequisite to further knowledge, and this subject has been chosen because of some important clinical conditions frequently encountered wherein a white blood count is requested and expected to contribute to or substantiate a diagnosis—and sometimes it does and sometimes it does not.

Take, for instance, acute appendicitis. It has been the experience of many to operate on these cases in the face of an absolutely normal white blood count and find a vermiform appendix in all degrees of inflammatory reactions. On the other hand, preparations for an operation are often speeded up because of a leucocyte count of 20,000 and the appendix has shown only a trivial catarrhal inflammation or no inflammation at all. Consternation has ensued. What is the explanation? The leucocyte count is often of great value in the diagnosis of acute appendicitis, but in many instances it can not be relied upon. Almost every surgeon can recall instances when appendectomies have been performed which have amounted to nothing more nor less than biopsies with negative findings; others have shown merely an enteritis, and some only constipation. More than one case of constipation with pain in the abdomen and a leucocyte count of 19,500 has barely escaped the aseptic scalpel and felt perfectly well within 12 hours after a cleansing enema has removed the source of irritation. The signs of peritoneal irritation (1) found at the bedside and in surgical textbooks are of prime importance in diagnosis.

An excellent clinician once said he would rather have an otoscope than a stethoscope when called in to see a sick child. In examining a case of pneumonia, a stethoscope is preferable to a hemacytometer, but the latter, undoubtedly, occupies a very important place. As a rule, one does not practice medicine very long before seeing a patient with central pneumonia in which an increased leucocyte count is one of the first actual signs. Cases of this sort are not uncommon with a leucocyte count of 30,000 and with negative physical signs in the chest for 48 hours except, perhaps, accelerated respirations and an unproductive cough. But here, again, one must be wary. A few years ago, a consultation was held in the case of an old gentleman who apparently was being kept busy by a hypertrophied prostate, but who had a cough, some fever, considerable prostration, and a leucocyte count of 30,000. Pneumonia had been suspected, had been diligently searched for and watchfully waited for. Leucocyte counts had been repeated with the anticipation of finding an error, but, what this particular patient actually had, was a cystitis. In an established case of pneumonia the absence of leucocytosis is of grave import in most instances.

Acute catarrhal fever is a distinct clinical entity. It is often called grippe or influenza. Liechtenstern (2) considers it to bear the same relation to influenza that cholera nostras does to Asiatic cholera. With influenza there is leucopenia and with catarrhal fever there is likely to be leucocytosis. Of course, there are other differential signs, but, at least one indication has been fulfilled when the leucocytes have been counted in these cases.

In these days of typhoid prophylaxis the Widal test does not have the same value it used to have. The blood pictures of typhoid fever and acute miliary tuberculosis are very often the same (3) and recently, a number of cases of acute miliary tuberculosis have been seen in which the differential diagnosis has been established only at the autopsy table. The only uncomplicated form of tuberculosis with leucocytosis is tuberculous meningitis. Pus infections complicating typhoid fever have been observed so many times without appreciable rise in the leucocyte count that very little reliance can be placed upon this finding in this disease; this is not true to the same extent in tuberculosis. The leucopenia of typhoid fever can be changed, however, as was shown by a recent case complicated by *Balantidium coli* infection in which the leucocyte count of 10,500 declined to 6,000 following quinine enemas which cleared up the Balantidium infection. The explanation of this persistent leucopenia in typhoid fever has been based by Friedberger upon the assumption of the production by alexin of anaphylatoxin, which exerts a negative chemotaxis.

COMMENT

A few illustrative conditions are outlined briefly to show the apparent vagaries of leucocytosis. Similar enumerations might be made to reach the proportion of a well compiled catalogue, but to do this would show only effect and not cause, which in all probability is the same in every instance, namely, positive chemotaxis.

The theory of chemotaxis is based upon the study of conditions of surface tension (4), and surface tension is simply the result of the cohesion of molecules. This is lucidly exemplified by suspending a drop of oil in water throughout which it will be distributed as small droplets. Cell motion may easily be imitated by suspending various substances with strong cohesive properties in liquid media. Thus Rhumbler (5), as far back as 1898, demonstrated very strikingly such imitation by placing a drop of clove oil in a mixture of alcohol and glycerin. Changes in surface tension were produced upon the surface of the clove oil by the alcohol, with consequent movements in the oil entirely analogous to those of motile cells in favorable media. In a similar way, chemotactic substances, diffusing to the leucocyte, will lower its surface tension on the side with which they come in contact; pseudopodia will be thrown out on this side and the leucocyte will move in this direction.

But what is the nature of these chemotactic substances in man? Suspensions of pus-producing cocci injected into the tissues of an animal soon become surrounded by a zone of inflammation containing numerous polynuclear leucocytes, which are attracted to the locality by positive chemotactic substances emanating from the cocci. These substances have been extracted from various bacteria, and collections of leucocytes have been produced by their injection. Furthermore, it has been demonstrated that not only bacterial extracts but a variety of other substances have the power of attracting leucocytes in the animal body. Among these are turpentine and croton oil and products of disintegrating tissue cells.

In what way are polynuclear cells increased in the circulating blood? It is believed to be due to the escape of positive chemotactic substances from the point of infection into the blood, where they attract leucocytes out of the tissues and particularly out of their place of formation, the bone marrow (6). An overwhelming dose may paralyze or damage the marrow cells rather than irritate them.

So when a patient has an attack of appendicitis or any other inflammatory reaction, a leucocytosis depends not so much upon whether or not he has a pus-producing infection as upon the escape of positive chemotactic substances into the blood. There must be a number of occult barriers to prevent this escape in many instances. When

we see a desperately sick man in whom a leucocytosis is expected and not observed we think that these substances have escaped, but have overwhelmed the bone marrow.

CONCLUSIONS

(1) It is well to bear in mind that while a leucocytosis may be indicative of an infection somewhere, it does not point to where that infection lies.

(2) A patient may have a virulent pus infection without leucocytosis, depending upon whether or not positive chemotactic substances have entered the circulating blood. Conversely, a high leucocyte count may be obtained in a mild infection.

(3) An absence of leucocytosis in a severe infection, such as sometimes occurs in pneumonia, may indicate that an overwhelming dose of chemotactic substances has damaged the bone marrow.

(4) While the laboratory is a necessary adjunct to the scientific pursuit of clinical medicine and its importance should not be minimized, we should, in establishing the final diagnosis and prognosis, strive to attain and be guided by that finesse in clinical judgment which, reached through experience based upon observation and examination of patients, culminates in the art of medicine.

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THE USE OF EXTRACTIVES OF CHAULMOOGRA AND COD-LIVER OILS IN LEPROSY AND TUBERCULOSIS

By F. J. VURPILLAT, Lieutenant (Junior Grade), Medical Corps, United States Navy

There are no known organisms more exquisitely pathogenic than *Bacillus leprae* and *Bacillus tuberculosis*. It is generally accepted that their virulence, resistance to bactericides, and the inability of the animal body to cope with them adequately are due to their inert and protective fatty capsule. Inseparably associated with this is their class characteristic, that of acid-fastness. These two organisms are in many respects similar in morphology, chronicity of their infections, pathology, and age of infectivity. Inasmuch as within the last 20 years chaulmoogra oil and its derivatives have been shown to have

a more or less specific action on *B. leprae*, investigation was undertaken to determine its possibilities for use against the tubercle bacillus.

Chaulmoogra oil has been used for several centuries in India against leprosy. In 1916 Rogers (1) reported that the fatty acid portion was the active part and that favorable results were obtained in leprosy from subcutaneous and intravenous injections of the sodium salts of the fatty acids, sodium gynocardate and hydnocarpate. In 1917 he reported that even small doses intravenously were followed by softening of the nodules with disintegration and absorption of the bacilli. Then, and since then, a high percentage of improvement in cases and some cures have been credited to chaulmoogra therapy. Rogers hesitated to use it in tuberculosis because "in rare cases of leprosy, prolonged febrile reactions with temporary exacerbations of the disease resulted." "Given by mouth in tuberculosis some gain in weight only resulted, and it causes painful local induration hypodermically." His experiments on animals failed "for want of a virulent bovine culture." He then turned his attention to cod liver oil therapy, which will be noted below.

Hernandez (2) found that addition of 2 per cent chaulmoogra oil to culture media always prevented development of tubercle bacilli. Experiments with it in guinea pigs seemed to confirm its bactericidal action. He tried small injections in six patients with resulting subsidence of symptoms in some of them.

Ostromushkuski (3) claimed good results from the use of copper gynocardate on tuberculous guinea pigs, and also that healthy pigs could be protected from tuberculosis by its use. Cure of infected pigs was not complete.

Walker and Sweeney (4) found that chaulmoogra oil contains bactericidal substances that are approximately one hundred times more active than phenol against acid-fast bacilli. Sodium chaulmoograte inhibits growth in dilution of 1 to 80,000 to 1 to 140,000 and has complete bactericidal power in 1 to 20,000. They found that the bactericidal substances in chaulmoogra oil are the fatty acids of the chaulmoogric series, chaulmoogric and hydnocarpic acids and possibly some isomers; that this bactericidal activity is specific for the acid-fast bacilli and inactive against all other pathogenic organisms tested (staphylococcus, streptococcus, *B. coli*, etc.); that there was no action *in vitro* in any concentration or length of time on the morphology or staining property of acid-fast organisms. They concluded that there was excellent theoretical ground for the application of the chaulmoograte in tuberculosis therapy. Trying it on guinea pigs they injected 12 with doses of one-half c. c. of saline suspension of bacilli to which had been added 12 graded dilutions of chaulmoograte and the mixtures incubated for 24 hours. They

admit criticism of this method. In bactericidal experiments *in vitro* the organisms were actively growing or, presumably, metabolism was active or possible when subjected to the chaulmoograte. This does not hold with a sterile salt solution. What such an injection amounted to was that each pig received a virulent injection of bacilli with a single dose of chaulmoograte of a dilution of 1 to 10,000 or higher which, on dilution with the pig's body fluids became still higher. No further treatments were given. Two pigs which received dilutions of 1 to 10,000 and 1 to 20,000, respectively, lived 139 days. They were then killed, and post-mortem examination showed no tuberculous lesions. Five others with weaker dilutions lived 139 days with tuberculous lesions demonstrable. Three died in 10 days, apparently not of tuberculosis. The remainder died of the infection at various intervals. The number of animals was too small for weighty conclusions, but the experimenters felt that, inasmuch as the two pigs with the most concentrated doses of the chaulmoograte lived without lesions and that guinea pigs are more susceptible to tuberculosis than man, the results were favorable.

Culpepper and Abelson (5), experimenting with guinea pigs, found that the most active, soluble, and least irritating therapeutic derivatives of chaulmoogra oil were the sodium salts of the four fatty-acid fractions, those of the "A" and "B" fractions being the most potent; that the most effective and least irritating method of administration was by intraperitoneal injection; that doses of 1 c. c. of a 1 per cent solution were not toxic; that a virulent suspension of tubercle bacilli incubated for 48 hours with each of the four acid fractions in a dilution of 1 to 10,000 failed to kill any of 12 pigs injected and failed to grow when transplanted.

They infected 24 pigs and treated 12 of these with intraperitoneal injections. Each pig received 0.2 to 0.3 c. c. treatment every three days. All but one of the nontreated pigs died of tuberculosis, while of those treated, only one died. A marked difference in pathological findings in favor of the treated pigs was found. Untreated pigs lost two and one-half times as much weight as the treated ones. Uninfected and treated pigs all lived and gained weight markedly, suggesting some vitamin action. To keep time a constant factor in the experiment, whenever an untreated pig died, a treated one was killed for comparative pathology. The conclusions were very favorable to the chaulmoogra therapy. Biesenthal (6) used sodium gynocardate which was sent to him from India. He gave one intravenous injection weekly of 2 c. c. of a 3 per cent solution for 10 weeks to 10 cases of pulmonary tuberculosis. He noticed no reaction whatever from the drug nor any improvement. This dosage was weak, and inasmuch as no reaction of any kind was observed, one may conclude that the therapy was

hardly given a real test either for frequency, period of treatment, or number of cases.

Walker (7) reported further investigations in 1922. In rabbits he found that the salts of the chaulmoogric acids were more irritating than the esters, the opposite of which was found to be the case with guinea pigs by Culpepper and Abelson. Walker's findings depend on the efficacy of optical activity in determining the presence of chalmoogric derivatives in the tissues and fluids of the body. He found that these acids are metabolized and absorbed readily like other fatty acids. Fifteen minutes after intravenous injection he was unable to find any in the blood or in any tissue or fluid of a rabbit. A mouse injected intraperitoneally and later analyzed showed none. With large and continued doses he found it in the blood, liver, and storage fat.

In rabbits he determined the relative dosage to be 5 c. c. of a 3 per cent solution of the sodium salts intravenously or 5 c. c. of the esters intramuscularly, corresponding to a dosage of 0.0715 gram of the salts or esters per kilo for a 70-kilo man. The butyl and propyl esters were safe in much larger doses. He found that intravenous injection of emulsions of the esters in tolerated doses maintains constantly in the lungs a concentration of chaulmoogric acids far above that proved bactericidal *in vitro;* probably largely in the form of emboli in the capillaries and therefore in excellent position for action on the tubercles. Rabbits treated intravenously showed marked hyptertrophy of the lungs.

Tubercles immersed in the chalmoograte, incubated for long periods and then tested, showed that the drug had not been absorbed by them. It could not be found in the tubercles of treated animals. It was injected directly into external tuberculous lesions and the tissue excised showed none. Inoculation of guinea pigs from tuberculous lesions of treated rabbits infected all of them. Direct injections of the chalmoograte were made into circumscribed caseous joint tubercles of a rabbit. After variable periods the contents were removed and injected into guinea pigs. All were infected.

Walker says that his results from experiments on treatment of tuberculosis in rabbits were not striking enough for any conclusion to be drawn from the incomplete data, but that they were "probably unfavorable." His findings at first sight seem formidable evidence against the therapeutic value of the drug in tuberculosis. However, granting that his method for detecting its presence is beyond reproach, it only showed that the form of the substance originally injected into the living animal was not found at autopsy.

It does not prove that none reached the tubercle, or that it may not have been there or could not be put there in some other form.

What was definitely proved was the comparative inefficiency in live rabbits of two compounds of chaulmoogra oil which were efficacious *in vitro*.

Cod liver oil has been long used empirically in tuberculosis. Rogers made a salt of its fatty acids which he called sodium morrhuate in the same way he had proceeded with chaulmoogra oil. He inclined to the view that since the tubercle bacillus was shown to contain unsaturated fatty acids to which class chaulmoogric acid belongs, other unsaturated fatty acids might prove of value. He used sodium morrhuate in leprosy and reported (8) results similar to those obtained with chaulmoograte. It was then used in tuberculosis by Rogers (9) (10) Muir, Knowles, Ganguill, Davies, and Cochrane in separate localities in India and all except Cochrane reported favorably after a year's trial. Muir and Ganguill summarize as follows: Rapid diminution in amount of sputum; rapid increase in weight; diminution of fever in febrile cases; increase in strength; and diminution of bacilli in sputum. Knowles regards "the marked increase in weight as the outstanding feature of the series; along with this, very often, goes a persistently normal temperature. The general health of the patient often shows marked improvement. For early cases the treatment is an admirable one."

Grafiolo and Spada (11) report 10 cases—7 pulmonary, 2 surgical, and 1 both—with these conclusions: "Sodium morrhuate has a selective action on tuberculous lesions; like tuberculin it may produce local or general reactions which have an unfavorable influence on the course of the disease; 3 per cent strength is undoubtedly too much for some patients and should be reduced to avoid violent reactions; in very sensitive patients injections should not be given frequently nor repeated until the reaction has subsided."

Fontes (12) found that 1 per cent cod-liver oil as well as chaulmoogra oil prevents the development of *B. tuberculosis* cultures. Miller (13), confirmed by DeWitt, found that sperm oil added to the media caused the bacteria to become granular and nonacid-fast.

Walker and Sweeney (4) found that sodium morrhuate did not possess the bactericidal power of the chaulmoograte *in vitro*. However, the local and febrile reactions as well as bacillary changes are certainly evidence of some action *in vivo*.

Boehlke, reporting experience with the sodium morrhuate treatment in Australia, writes as follows: "After using sodium morrhuate now for about four years I feel so convinced of its efficacy, of its superiority over other treatment and of its comparative harmlessness that should a patient (in whom the prognosis was still favorable) fail to improve or to retrogress I would seriously doubt—if the diagnosis has been right, if the patient had followed instructions,

if there were no complications, if the sodium morrhuate had been up to standard." She constantly observed local reaction at the site of subcutaneous injection and believed it to be a specific reaction such as is given by tuberculin. She attributes the indifferent results obtained by others to the use of deteriorated preparations and emphasized the necessity of a fresh and chemically perfect product. The method given is as follows: 3 per cent solution of sodium morrhuate freshly prepared once or twice a week, to which has been added 1 per cent phenol, is sterilized in autoclave. Subcutaneous or intramuscular injections are given every 3 to 5 days, 0.1 or 0.2 c. c., increasing 0.1 c. c. each time if no reaction follows, till a dosage of 1 c. c. weekly is reached (14).

Biesenthal (15) used sodium morrhuate, in a manner similar to that outlined above, on 25 patients with pulmonary tuberculosis, of whom 8 were incipient, the others advanced. All had positive sputum. After four months, 16 showed improvement in physical signs, there was no change in 4, and the disease was progressive in 5. Four sputa became negative.

As to the method of action of chaulmoogric, morrhuic, and possibly other acids, there are several suppositions. It is hardly probable that there is direct action such as is accomplished by metallic bactericides. It is likely that some reaction occurs between the fatty capsule and the fatty acids, the former having its metabolism arrested by some peculiar molecular structure such as is known to exist in chaulmoogric acid only (16) (17). In other words the metabolism becomes "choked in the chains," or, having metabolized these acids into its capsule, it is thereby isolated from its nutrient media by being unable to further metabolize through it. The most probable theory is that the capsule is weakened and becomess vulnerable to antibody action of the host. A "defatted serum" in accordance with such an idea was prepared by Dreyer *in vitro*. In 1920 (20) J. A. Shaw-Mackenzie (quoted by Rogers) recorded experiments showing that the addition of sodium gynocardate, sodium morrhuate, and sodium oleate to pancreatic lipase doubled the fat-splitting effect thereof on olive oil. This suggested a direct stimulating action on tissue lipolysis in the body and possibly a defatting of the acid-fast bacilli *in vivo*, Rogers determined the effect of the antiacid-fast remedies on the blood lipase of lepers, this being known to be low in leprosy and tuberculosis. He found that in 3 untreated cases of leprosy the blood lipase was equal to 0.03 N/10 sodium hydroxide while in the sera of 10 treated cases it was 0.22, or about normal. The lipase of a patient during a severe febrile reaction with extensive bacillary destruction was low. This he attributed to the immediate use of the lipase in that destruction, which removed

it from the circulating blood. Similar research into the lipase content in tuberculosis was undertaken but I have found no report thereon in the literature. Kendall, Day, and Walker (18) found that acid-fast bacilli produce a soluble lipase in their growth which is probably concerned with the metabolism of their fatty capsule.

Against the possibility of specific chemotherapy in tuberculosis it is maintained that since the tubercle is avascular, substances can not be brought to it by the circulation. But the gumma is also avascular and is not immune to specific treatment in this manner. Wells (19) found the tubercle permeable to crystalloids but not to colloids. It is known that it is invaded by iodides, calcium salts, and arsenic. The antiacid fast radical of chaulmoogric acid, or some crystalloid derivative, in combination with the above-mentioned metals might prove effective against the living tubercle.

The tubercle bacillus is more resistant to specific therapy than *B. leprae*, being more virulent and possessing three times greater fatty content. More intensive medication would therefore seem required. However, with other therapeutic agents, a concentration of some of them which is efficacious *in vivo* is too weak against the organisms *in vitro*. The antibody action of the living organism aids materially. Similarly, if the organisms can be defatted by specific chemotherapy, combination with tuberculin or other serum treatment and other agents should prove effective.

The dangers encountered with the preparations so far used are the same as those with other similar medication, namely, painful local reactions, phlebitis, embolism, none of which are insurmountable obstacles. The greatest danger lies in the administration of amounts that would destroy the bacilli in such numbers as to inundate the system with their toxins and against which no antibodies were immediately available. This accounts for the severe febrile reactions sometimes obtained. All these dangers are controllable, and should not preclude the therapy.

As it is, after a review of all the available literature on the subject, which is remarkably small considering the importance of the therapy of acid-fast organisms, it is believed that recorded results from the use of the substances discussed in this paper warrant further experimentation and more general trial in tuberculosis.

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LEPROSY

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This paper is a review of the treatment of 68 patients, over a period of two years at the leper colony, St. Croix, Virgin Islands, United States of America. Four clinical manifestations are discussed: Anesthesia, nodules, ulcers, and naso-pharyngeal infection. The patients are divided into four classes: Men taking treatment, women taking treatment, men refusing treatment, and women refusing treatment.[1]

Forty-two patients have been taking the ethyl-ester of chaulmoogra oil, intramuscularly, in doses varying from one to five milliliters; the variation of dosage being due to individual degrees of tolerance. Twenty-six patients have refused chaulmoogra oil treatment. They belong to a religious sect which believes in healing by the laying-on of hands. But religious scruple is not the sole objection of this group to the intramuscular treatment. Fear of the needle is often the real reason, because many of those who refuse the injections are not averse to using antiseptic dressings and anodynes, when indicated. It is fitting to pay a tribute of high admiration to the courage of those who do take treatment properly, who, week after week, year in and year out, submit to a painful stab in the buttocks.

ANESTHESIA

The average area of anesthesia of 20 men taking treatment was reduced in two years from 28 to 16 per cent. In three men the anesthesia has totally disappeared. The anesthetic areas of two men have increased 6 and 7 per cent, respectively. The apparent backsliding of these two patients may possibly be explained by the

[1] Throughout this paper the word "treatment" will be understood to mean the intramuscular injection of chaulmoogra oil.

fact that the examination two years ago was made by a different medical officer. A factor of error, however, is a dangerous instrument to juggle with, because it works two ways. If it be used to apologize for a retrograde movement it may just as logically be used to explain away improvement. Nevertheless, no factor of error should be big enough to negative the immense decrease in the average percentage of anesthesia of the 20 men.

Twenty-two women who averaged 40 per cent anesthetic have been reduced by two years treatment to an average area of 16 per cent. The anesthesia of one woman has cleared up, and that of two others has increased 4 and 5 per cent, respectively.

Such a graphic improvement in the bulk of the treated patients shows an unmistakable trend in the direction of a cure and encourages them to carry on.

Thirteen men who refuse treatment have increased in their average anesthesia from 64 to 71 per cent. Three of these patients show a decrease of anesthesia. Two of these three are using mercuric ointment for ulcers. The remaining one uses no medicament whatsover, yet his anesthesia is lessening, and his ulcers and nodules are getting no worse.

A probable cause for the change for the better of a few of the patients who take no treatment may be looked for in their altered living conditions. They have been taken from an environment of hard work and near starvation, and placed in one of adequate rest and abundant food. This in itself is enough to arrest almost any chronic malady.

The average anesthetic area of 13 women who refuse treatment has increased from 62 to 66 per cent. Two of these women show a decrease of anesthesia.

The value, from a research point of view, of these 26 patients who refuse treatment is as a control. The trend of the disease in them is for the worse. It is true that the increase of anesthesia in this class has not been so marked as the decrease in the class which takes treatment. But a slow rate of progression is characteristic of untreated leprosy.

NODULES

Of 20 men taking treatment, 8 have nodules. Seven have improved, and one has not improved. Of 22 women taking treatment, 7 have nodules. Six have improved, and one has not improved. This is a gratifying showing for the oil takers, because these nodules are leprous tissue, and their melting away means a definite decrease of the region of infection.

Of 13 men who refuse treatment, 7 have nodules. Three are unimproved, and 4 have had an increase, in both number and size of

lesions. Of 13 women who refuse treatment, 4 have nodules. Three of these are unimproved, and one shows an increase in both number and size of nodules.

To sum up: Of 15 patients who took treatment and have nodules, 13 have improved, and 2 have not improved. Of 11 patients who refused treatment and have nodules, 4 have not improved, and 7 are worse, the number and size of their nodules having increased.

ULCERS

Twenty-six of the 68 patients have ulcers. Twenty-three of these ulcers are on the feet and three are on the hands. The body and head are free from this type of lesion.

Seven men, under oil treatment, have ulcers. One is improved, and 6 are unimproved. Four women in the same category have ulcers. Two are improved and two are unimproved. All of these open lesions are receiving various antiseptic dressings and one hour of sunlight at midday.

Ten men who refuse treatment have ulcers. Four are improved and six are unimproved. All of these men but one receive antiseptic dressings. One man who takes nothing is improving. Among the women who refuse chaulmoogra oil, five have ulcers. Three of these are improved and two are unimproved. One woman who refuses even an antiseptic dressing shows a slow healing of her ulcer.

Of the entire group of ulcers, six are positive for Hansen's bacillus. All of these are on patients who do not take treatment. Four of these positive ones do not use antiseptic dressings. Before the examinations for the causative organism in this series of ulcers were made, all antiseptic dressings were stopped and physiological salt solution was applied for one week.

To sum up: Of 42 patients taking treatment, 11 have ulcers. Of 26 patients not taking treatment, 15 have ulcers. Here, to start out with, is quite a preponderance of ulcers among those who refuse treatment.

There are 11 ulcers negative for the bacillus of leprosy among those who take treatment, and 9 negative ones among the nontreatment patients. The entire 6 ulcers which were positive for the causative organism were on patients who refuse treatment.

If these results are dependable they indicate that no patient taking treatment retains Hansen's bacillus in an ulcer. The continuance of the open lesions, then, in this class of patients should be due to nothing but a secondary infection. However, it is a matter of grave doubt whether the absence of the acid-fat bacillus in the above ulcers has any such significance. It is much more probable that they were present but not found; that they are concealed in the

deeper tissues. At any rate, chaulmoogra oil, intramuscularly, does not exert any specific healing effect on ulcers. The ulcers do not melt away as luetic lesions do under the benign influence of salvarsan.

NASOPHARYNGEAL INFECTION

Of 42 patients taking treatment, 4 who had positive nasal smears in 1922 are negative in 1924. These are all patients who are young and began treatment in an early stage of the disease. Four who had positive smears two years ago are still positive. With the next sentence comes the disappointing part of reporting findings accurately. Five who had negative nasal smears in 1922 are positive at present, and this in spite of two years' continuous treatment. Contradictory as it may seem, two of these five have shown a clearing up of anesthetic and nodular areas. But as they are patients in whom the disease had a good start before treatment was instituted, it is probable that the nasopharynx held the organism two years ago, and that it merely escaped detection at that time.

Of 26 patients who refuse treatment, 10 who had negative nasal smears two years ago are positive now. Two who were positive in 1922 are positive now. It would be pleasing from the point of view of those who take treatment to be able to state that none of those who refuse treatment, and who had positive nasal smears in 1922 have become negative in two years' time. But it can not be done, truthfully, because five of this class who were positive two years ago are negative now. However, it is probably just another case of not finding the organism.

To sum up: The nasal smears of patients taking treatment who are young, in both years and leprosy, tend to become negative and remain so. If the organism has become well established in the mucous surfaces of the upper air passages it tends to run a chronic course and does not yield to treatment.

The sexes were studied separately to see if any information would be forthcoming on the moot question of a predominant susceptibility in one or the other. Some writers hold that men are the greatest sufferers from leprosy. In this small series the men and women are divided quite equally, as to numbers. In the matter of treatment the women apparently show a more marked response. They improve faster than the men, but the difference is inconclusive.

In considering a problem of this kind, the broad, vague term known as "general health" must be allowed its proper place. The oil takers as a whole look better, come less often to the dispensary, seldom complain of the characteristic pains of the disease, and are more optimistic than the religious objectors.

CONCLUSIONS

(1) Chaulmooga oil, intramuscularly, causes: (*a*) A shrinkage of areas of skin-anaesthesia; (*b*) an absorption of nodular tissue; (*c*) little, or no improvement, in the healing of ulcers; (*d*) uncertain effect in naso-pharyngeal infection, except in incipient stages.

(2) Nasal smears must be negative, repeatedly, to be of any diagnostic value.

EXPEDITING THE PAPER WORK

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How often in Government service we long for "short cuts" in our paper work. How frequently we hear bitter comments about it—criticisms that are by no means confined to the younger men of the Corps. In this particular subject, are those of us in administrative positions meeting our responsibility in full measure? Are constructive efforts to lighten the load being made often enough? From paper work, and large amounts of it, we can not escape, but surely something is amiss when at one naval hospital not long ago 14 forms were required to pass a patient through a dental clinic.

As one becomes engrossed in professional activities it is only natural that paper work should grow irksome. Any method that will curtail or prevent duplication of effort in that line will prove most welcome. How often in a year, or even in two or three years, are serious efforts made to lighten the load? How frequently in staff meetings are constructive criticisms in this subject voiced? Far too seldom. Mere knocks will not solve the problem. The remedy lies in elasticity of hospital organization.

We are living in an age of high pressure. Speed and accuracy are constant demands. They can not be obtained 100 per cent if busy doctors are compelled to work a pen one-half or one-quarter of the day. Often the more conscientious one is, the more time must he devote to his paper routine. Such a man, try as he will, can not help at times from neglecting certain features of his clinical work. Now, more than ever before, correct diagnoses are made only by careful evaluation of the data secured. Of these the most important are the history and the physical examination. For properly gathering such data, one hour per patient is none too much time to allow. If one must then rewrite his notes in long hand into health record. hospital, Veterans' Bureau, survey, and other forms, can he be blamed too much if he weakens when he views the pile ahead?

But enough of this line. The reader is remarking, "I have heard all this before—what has the writer to offer?" So far as hospital

administration goes, it is this: The establishment in each hospital of an office manned by civil-service personnel (stenographers) where busy doctors (and who is not busy these days) can take their notes, charts, reports, etc., at definite times allotted to them by the executive officer and there dictate what they wish incorporated into the various reports. Then will reports be legible; then will system in construction and summarizing be more quickly acquired. With permanent personnel in such an office, mistakes in clerical procedures will be enormously reduced, and all along the line will there be a promotion of results. There is nothing new or novel in such a procedure. One of our naval hospitals has already put it into force, and it is common practice in many well-organized civil institutions; in some Ediphones or dictaphones are utilized—incidentally cutting down materially the cost of stenographers.

The writer ventures the belief that such a system can be instituted in our hospitals without an increase in the present number of stenographers. Busy they are at times, but there are many times when they are not. Properly organized, their services can be utilized to tremendous advantage along the line suggested.

NOTES AND COMMENTS

TRYPARSAMIDE

Elsewhere in this issue of the Bulletin there appears an article by Lieut. R. P. Parsons, Medical Corps, United States Navy, on "Tryparsamide and sulpharsphenamine in the treatment of neurosyphilis." In connection therewith, the following article on "Tryparsamide," by H. C. Solomon, M. D., Boston, Mass., which was published in the Therapeutic Column of the Boston Medical and Surgical Journal of December 4, 1924, is of interest:

"Tryparsamide is a pentavalent arsenic compound prepared at the Rockefeller Institute of Medical Research in the quest for a drug for the treatment of trypanosomiasis. The reports on its use for this purpose, though few in number, have been of the most encouraging nature, as they suggest that the drug leads to the sterilization of the blood and cerebrospinal fluid in a very short time and produces clinical recovery.

"In 1923 a report was published by Lorenz, Loevenhart, Bleckwenn, and Hodges, on the effect of this drug in the treatment of neurosyphilis. They report both serological and clinical arrest in 100 per cent of the cases of meningovascular syphilis. In the cases of parenchymatous syphilis, including a good many cases of general paresis, they reported 63 per cent arrested and 15 per cent improved. Not only was the effect on the clinical symptomatology interpreted by them as satisfactory, but they also obtained marked improvement in the spinal fluid findings.

"Some months later, Moore, Robinson, and Keidel reported their results in the treatment of neurosyphilis by tryparsamide and the findings were almost identical with those of their predecessors as regards the spinal fluid improvement and clinical effects. Results as favorable as these had not been reported previously as following the use of any other drug. Subsequent to the satisfactory results obtained by the two above-mentioned group of workers, the Rockefeller Institute released the drug to a number of clinics in various parts of the country, including the Psychopathic Hospital and the Massachusetts General Hospital in Boston.

"At the meetings of the American Neurological Association and the American Medical Association in the spring of 1924, several more reports of tryparsamide in the treatment of neurosyphilis were

presented, including those of Schwab of St. Louis, Stokes of the Mayo Clinic, Wile of the University of Michigan Clinic, Ebaugh of Philadelphia, Solomon and Viets of Boston, and a second report by Moore. It was practically unanimously agreed that the drug was effective and in many instances gave brilliant clinical and serological recoveries in cases of neurosyphilis.

"Our own personal experience has been quite satisfactory. In many cases of paresis and tabes we have obtained results that seemed quite impressive. Improvement of patients' conditions was frequently observed after treatment with arsphenamine had failed to produce anything that we considered as satisfactory. Of course we have many failures also to report, and we believe that tryparsamide will not entirely displace intraspinal, intracisternal, and intraventricular therapy in the treatment of neurosyphilis, but there seems little doubt but that it will take its place as one of the very important drugs in the treatment of these conditions.

"The work of Moore, Robinson, and Keidel brought out one very important point, namely, that tryparsamide has very little, if any, spirocheticidal action in early syphilis, and that it was by no means as effective in primary and secondary syphilis as the arsphenamines. They strongly advise against the use of tryparsamide in early syphilis. It is very interesting to contrast the very beneficial results of tryparsamide in the treatment of late syphilis of the nervous system with the unsatisfactory results in the treatment of early generalized syphilis. An explanation of its apparent value in the former group of cases is not readily forthcoming. From the result of chemical analysis it has been stated that its penetrability into the cerebrospinal fluid is much greater than is that of arsphenamine, which may be one factor in explaining its effects. Another point is that it apparently improves the metabolism as the patients all gain in weight, as well as developing a feeling of well-being when the drug is given. It may be that a large part of its favorable action is due to raising the general immunity of the patient.

"There is one very important drawback in the use of this drug and that is its tendency to produce amblyopia. Like atoxyl, to which it is chemically related, it has a tendency to affect the optic nerve. In from 2 to 5 per cent of the patients given tryparsamide, visual disturbances occur. The majority of these regain their vision when tryparsamide is discontinued. However, in a small number the defect is permanent and in a very few cases the effect may be quite marked. This is a distinct handicap in the use of this preparation and means that it should not be used carelessly, but only with due consideration of the gravity of the condition which one is combating and with the utmost watchfulness to prevent the continued use of the drug when visual symptoms occur.

"A great advantage of the drug is the simplicity of its use. It is an easily soluble powder which does not deteriorate when exposed to the air. It is relatively nonirritating even when given subcutaneously, although its usual mode of administration is intravenously. It causes practically no unpleasant reactions as do the arsphenamines, and when its effects are satisfactory, it obviates the necessity of the more complicated and more uncomfortable subarachnoid injections."

THE FUTURE OF MEDICINE AND HYGIENE IN THE TROPICS

The inaugural address at the opening of the winter session of the Anderson College of Medicine, Glasgow, Scotland, October 14, 1924, was delivered by Dr. Andrew Balfour, director of the London School of Hygiene and Tropical Medicine. In this address Doctor Balfour drew a sketch of our present knowledge of tropical pathology, and endeavored to awaken in the audience a realization of the fact that for those of our somewhat overcrowded profession who are keenly interested in pathological research the Tropics still furnish innumerable problems calling for solution.

The following abstract of the address appeared in the British Medical Journal of November 15, 1924:

"Owing to the remarkable advances that have been made in our knowledge of tropical diseases in recent years, there exists perhaps a tendency to regard this field of inquiry as having been worked out and consequently as lacking in interest. The reverse is the fact. The discoveries already made have opened up new problems and lacunae in our knowledge retard in many ways their fruitful application. Until comparatively recent times the coastal belt from the Gambia to the Niger bore an evil reputation as the white man's grave; through the work of Manson and Ross that region has been transformed, and it might be supposed that we have little more to learn with regard to malaria. Laveran discovered its cause, Ross and others showed how the infection is conveyed, and the Countess of Cinchon many years ago introduced its specific cure. Yet, 13 years ago Professor Stephens, of the Liverpool School of Tropical Medicine, called attention to the following points on which our knowledge was defective: (1) The presence of bodies of uncertain significance in the salivary glands of anophelines; (2) the alleged transmission of malarial infection through the eggs of the mosquito; (3) conditions determining the successful infection of anophelines fed on infected blood; (4) the number of persons that one anopheline can infect; (5) the variation in the percentage of infected anophelines from month to month, and its extent; (6) the

duration of infection in an anopheline, once infected; (7) the penetration of the red cell by sporozoites; (8) the properties of the salivary secretion of mosquitos. Some of these problems have been solved. Bruce Mayne has shown that one anopheline can infect as many as 5 persons; Wright has worked at the functions of the esophageal diverticula, the contents of which mingle with the saliva; and Yorke and Macfie have carried out researches on the salivary secretion itself, and have found that it does not contain a haemolysin. As to the remaining questions, our knowledge is still defective, although Sinton seems to have confirmed Rowley Lawson's view that the sporozoites do not enter the red cells, but adhere externally to their envelopes.

"Again, yellow fever is a disease concerning which much has been learned in recent years. The Americans have solved the problem of its conveyance, Noguchi has discovered its virus, the *Leptospira icteroides*, and a preventive vaccine and curative serum have been prepared. Yet we have still much to learn regarding this deadly malady on the African West Coast. We do not certainly know whether it is the same disease that once ravaged the ports of South America, the West Indies, Bermuda, and the eastern seaboard of the United States. Doctor Carter, of the United States Public Health Service, is of opinion that it is of African origin, but the leptospira has not yet been demonstrated in West Coast cases. Moreover we do not know if more than one species of stegomyia or aedes act as its vector in Africa, we are not sure if any of the lower animals serve as reservoirs for the parasite, and we have great difficulty in distinguishing the malady from Weil's disease, the spirochaetosis icterohaemorrhagica, which not long ago played havoc in a Scottish coal mine. Recently a discovery has been made by Hoffmann of Habana which, if confirmed, is of importance. He has demonstrated the presence of lime casts in the kidneys of patients who have died from yellow fever; their occurrence is, apparently, pathognomonic and will serve to distinguish yellow fever, *post mortem*, from other febrile maladies associated with jaundice.

"To take another instance—bubonic plague. This disease is at the present moment taking toll of human life on the Gold Coast, in Ashanti, and in Nigeria. Its pathology has been fully worked out, the rôle of the rat and of other rodents has been established, the flea has been incriminated, and there is a plague vaccine and plague serum. What further knowledge can be required? Yet plague persists; it slays millions in India, and the rat, its carrier, defies our efforts to cope with him; plague serum is too often a broken reed and our drugs are usually powerless. Rodire's method of killing all female rats caught and letting loose the males—a plan that has been successful in the case of Australian rabbits, and used to

good effect against rats in some limited areas—has been tried; we have attempted to interfere with the animal's family life, its fertility and fecundity, and generally speaking, we have failed. We are only beginning to realize the importance of certain factors; French observers have drawn attention to the possible presence of healthy human and healthy rat carriers of the disease. It is obvious, therefore, that in the group of British colonies referred to, and considering only three of the diseases met with in them, there is plenty to engage the attention of a keen and trained observer; and it may be assumed with tolerable certainty that other diseases remain to be discovered—diseases which at present are mistaken for disorders with which we are more or less familiar and which have to be separated and worked out.

"To turn to another region—the Sudan. Although the Sudan medical service is not under the colonial office, the Anglo-Egyptian Sudan possesses a Government service well worth the attention of the young medical graduate. It is many years since Sir William Leishman, a Glasgow man, discovered the protozoal parasite of the tropical malady, which is found in certain parts of the Sudan, called, after him, leishmaniasis, and by the Indians kala-azar or black fever. We are still ignorant how the parasite effects a lodgement in the human body. There is a fine field for work in this direction although we may conjecture that it is about to be explored with considerable thoroughness by Colonel Megaw and his companions from the Calcutta School of Tropical Medicine. There is, moreover, a new disease existing in the northern Sudan which requires particular attention. It is associated with the presence of a peculiar bacillus which Dr. Andrew Balfour found in the throat and mouth of a British officer in Khartoum, producing ulceration and exercising a markedly depressant effect on the heart. Owing to loss of the culture through no fault of his own, Doctor Balfour was unable to pursue the study of the organism, but it has since been rediscovered by a Canadian medical officer while investigating an outbreak of sore throat among British troops in Khartoum. With regard to sleeping sickness, which is a well known malady in southern Sudan, although we know the trypanosomes which cause it and the tsetse flies which act as their intermediate hosts, and can cure many cases by atoxyl, antimony, Bayer 205, or tryparsamide, we are very far from having exhausted the subject of the old negro lethargy. We are not yet certain whether *Trypanosoma gambiense* and *T. rhodesiense* are one and the same parasite or different species; we still dispute over the question of wild animals as reservoirs of infection; we are uncertain as to the feeding habits of glossinæ, and are still seeking for the best drug to use in the treatment of the disease.

"Nor in the adjoining territory of Uganda is there any lack of medical problems. Plague, malaria, and sleeping sickness are rife in the protectorate, and cerebro-spinal meningitis continues to take toll of the natives. Syphilis is one of the curses of the country, and despite all that has been accomplished in working out its etiology and pathology, there is still much to be discovered, especially in relation to its ravages among the natives and the life history of the parasite. Another spirochaetal disease prevalent in Uganda is tick fever, and it may be said with regard to spirochaetal diseases generally that we are still in the dark as to the morphology and development of the organisms that cause them. In Kenya plague again presents its problems, and in addition there occur there a strange complaint simulating pneumonic plague, and a malady recalling typhus fever, but apparently not lice borne, both of which require elucidation; in this region there is also the important and deeply interesting question of the acclimatization of the white settlers in the highlands. The Germans have worked hard in Tanganyika Territory, but have by no means exhausted its possibilities for the British student as a field for inquiry. There is leprosy, for example—we remain ignorant of its mode of spread, despite theory after theory; and tuberculosis, too common in the coastal towns; it would be very far from the mark to suppose that tuberculosis is a completed chapter in pathology and therapeutics, especially if regarded from the tropical standpoint. Dysentery is also common in both forms in Tanganyika and far from the war having taught us all we need to know about that disease, it served rather to show us how ignorant we are on the subject. So far as bacillary dysentery is concerned there are undoubtedly facts to be unearthed regarding its relation to flies. In some places there is very little dysentery when flies swarm; the infection is there but the flies do not seem to act as carriers. Nor can it be affirmed that we have reached finality in the treatment of chronic amoebic dysentery, and the man who discovers a cure for that disease will earn the gratitude of many a hapless sufferer.

"Rhodesia, the youngest of Crown colonies, presents new subjects for inquiry. At the present moment northern Rhodesia is disturbed by the occurrence of cases of splenic abscesses among the natives, the etiology of which so far remains obscure, and in southern Rhodesia blackwater fever is attracting much attention. Even if we admit that the latter is intimately bound up with malaria, we have yet to learn the precise relationship and how really bad cases can be saved. There is, it may be said, little finality in tropical medicine. We thought we knew all there was to know about undulant fever, since Bruce, a great Scottish worker, isolated the *Micrococcus melitensis* and the commission under his guidance incriminated goat's milk.

Yet it was but yesterday that Bevan, in southern Rhodesia, gave us the first inkling of a link between the organism of Malta fever and that of the contagious abortion of cattle, the *Bacillus abortus* of Bang.

"Again, consider Mauritius, that continent in miniature, the finest and smallest of British colonies. Its diseases furnish food for thought apart from those already mentioned. Why is it that yaws does not occur there? The disease is first cousin to syphilis, and yet it is not a venereal complaint. It has undoubtedly been introduced into Mauritius, but it has not spread. Why has cholera, the water-borne disease par excellence, which has played such havoc in the island on several occasions, disappeared from it entirely, although to all appearance there was everything in favor of its continuance and extension? Why has the chigger flea, which burrows into the skin of the feet, never gained a footing in the colony? In Ceylon we may ask ourselves how we stand with regard to sprue, that malady of frothy stools, sore mouths, emaciation, and anemia, which hurries many a tropical sojourner to the grave. If Scott is right—and there is good reason to credit his findings as regards calcium metabolism and the control of the parathyroids—one puzzle will have been solved; but, even so, there are points about sprue that will still require investigation. The hookworm also causes much mischief in Ceylon; and although, thanks to the Rockefeller workers and others, it has been tracked and can be treated, we have yet to learn definitely the nature and action of its toxin.

"Passing on to Singapore and the Malay States, we greet a worthy son of Glasgow, Sir Malcolm Watson, a household name in Malaya, whose energy, pertinacity, and enthusiasm in antimalarial work have saved many thousands of lives. Malaya has a fine record of research and the practical application of results; but if we take beri-beri as an instance, it is safe to affirm that we have not heard the last about that disease, either there or elsewhere. It is possible that more than one disease masquerades under that name. Diet deficiency, the lack of antineuritic vitamin, will explain much, but it is doubtful if it will explain all. There may be a toxic factor, at present merely suspected and remaining for definite elucidation. Malaya well exemplifies our opportunities, for it was only recently that Stanton and Fletcher determined the cause and worked out the pathology of what they called melioidosis, formerly described by Whitemore as morphine injectors' disease.

"It is possible that there are no more fruitful fields of research than are to be found in Borneo and New Guinea. Passing these over, however, we find the South Sea Islands presenting many problems of pathological interest. There we are faced by the mysteries of

filariasis. Bancroft and Manson first shed light on the life history of the bloodworm, and Low completed the tale. That is an old story, yet the disease remains incurable, save where the surgeon's knife can give relief. In Fiji we have yet to learn why the island is practically immune from syphilis and how best to prevent the extinction of a fine race, decaying under the influence of a civilization that is alien to its sentiments. There is work to be done in those islands; and although Doctor Buxton has it well in hand at the present time, we may be very sure he will leave something for his successors to accomplish. Filariasis will be met with again in Demarara, but, in addition, epidemics of dengue will from time to time occupy the attention. Dengue, dandy, or breakbone fever is one of those partly explored diseases as to the cause of which we are still somewhat uncertain, although there seems little doubt that a blood spirochaete is to blame, as is the case with the very similar sand fly or phlebotomus fever common in Palestine and Mesopotamia. Do we know the cause of pellagra, which will be met with in the Leeward and Windward Islands? Though there is little doubt of its being a dietetic disease, we are not yet certain of its precise etiology, notwithstanding the valuable work of Goldberger. Can we say why Barbados is free from anopheline mosquitos? Is it wholly attributable to the presence of the tiny larvivorous 'millions fish'? It seems doubtful. Why is Bermuda free from anophelines? What do we know about the peculiar form of peripheral neuritis met with in Jamaica? Very little, indeed. And so it is wherever we cast our eyes—everywhere a burden of disease, everywhere work to be done. So far from the interest in tropical research having been exhausted, it may be truly asserted that the earth is literally encircled with unsolved problems awaiting their solution at the hands of the younger scientists of our generation."

THE END OF THE SPECTRUM

"The value of the ultra violet invisible end of the spectrum, with a wave length of approximately 2,000 Angstrom units, has long been suspected in medical therapeutics, and now seems to be definitely established" says an editorial writer in the Boston Medical and Surgical Journal of December 11, 1924. "Hess, Park, Hoag, and others have demonstrated its efficacy in the treatment and prevention of rickets and tetany. Rollier has been its most famous exponent in the treatment of tuberculosis, various observers have claimed unique results from its employment in certain skin conditions, and as is usual with any new and spectacular therapeutic agent, it has been utilized in treating a variety of diseases from asthma to pelvic peritonitis

with results that would be indeed startling if they could always be corroborated.

"The most generally available as well as the least expensive source of ultra violet light comes from the actinic ray of the sun, and at Alpine heights where atmospheric obstruction is at a minimum. Rollier has met with deserved success in its employment in the treatment of tuberculosis. The sanatorium conducted by Lo Grosso at Perrysburg, N. Y., has also afforded a convincing demonstration of its value in this country. In all discussions of the merits of the invisible ultra violet ray, however, it must be remembered that it can not permeate ordinary glass; exposure, to be effective, must be direct.

"In the temperate zone and on the Atlantic seaboard the availability of the natural solar source of the ultra violet ray is at a minimum. During our winters particularly when the sun's rays come always at an angle a greater degree of light-absorbing atmosphere must be penetrated than at Alpine altitudes. The proportion of cloudy days is greater and climatic conditions often prohibit the desirable direct body exposure. To these facts must be attributed, at least in part, our greater incidence of tuberculosis and of rickets. Mankind in this zone is deprived of its most valuable germicidal agent and its most powerful hygienic factors.

"It has been shown that an intense ultra-violet ray is generated by the mercury vapor lamp, and that this ray may be made available by the institution of transparent quartz for glass in the lamp. Such lamps have been in use for a number of years and their value has been clearly shown, even if we fail to accept the claims of some enthusiasts that their efficiency is greater than that of the sun itself. Whatever their virtue may be it depends on the use of transparent quartz as a light transmitting substance, and despite the fact that a large part of the earth is composed of quartz in some form or other, this has been expensive and difficult to obtain in a practical form.

"Recent experiments of the General Electric Co. have shown, however, that fused quartz may be produced in a practical form, and such are the remarkable qualities of this mineral that the world may well be about to enter the Age of Quartz. Fused quartz is now produced under general pressure in the electric furnace at its melting point of about 4,000 degrees Fahrenheit; at this temperature it assumes the consistency of molasses in cold weather. Bubbles are largely eliminated, first by vacuum and then by the pressure obtained. Fused quartz is harder than platinum, with one-seventeenth of its coefficient of expansion. It retains its size and shape under repeated heating and cooling better than any other known substance. It is an almost perfect insulation. It may be heated above

the melting point of gold and plunged into cold water without damage to itself. It is almost three times as transparent as glass, and is practically 100 per cent transparent to the ultra-violet ray, transmitting the entire spectral range from the shortest ultra-violet ray to the longest infra-red, or heat ray. It naturally tends to form such a smooth, reflecting surface that the spectral rays escape from it only with the greatest difficulty, hence light or heat applied to one end of a tortuous rod will be emitted from the other end, almost without loss. One end of such a rod may be placed in a fire and the opposite end will emit the heat while the shaft remains cool.

"The possibilities of such a mineral in therapeutic medicine can be imagined, and they depend largely on this power of transmitting the life-protecting ultra-violet ray. The time may yet come when hospital solaria will be glassed with quartz windows or illuminated with quartz light bulbs. Inaccessible parts of the body may be irradiated by properly shaped tubes. Now that the means are at hand, new and more surprising uses for this substance will undoubtedly be discovered."

THE SIGNIFICANCE OF EXTRASYSTOLES

In the Annals of Clinical Medicine, November, 1924, there appears an article by Arthur L. Smith, of Lincoln, Nebr., entitled "Clinical study of 100 patients with extrasystoles as seen in office practice." Doctor Smith is medical director of an insurance company and, as such, is required to pass upon the acceptability of many persons with extrasystoles as good risks for his company. Therefore, he has made a close study of the significance of this condition and his conclusions, based upon the intensive examination of the 100 cases cited, are of interest and value. All of the patients examined were of the ambulatory class. One patient, a physician, had noticed extrasystoles for 25 years; one had developed them only a few days before, during an acute influenza. Some were not conscious of the abnormality.

"Extrasystoles are premature contractions which are the result of generating and discharging stimuli in any part of the myocardium outside of the sino-auricular node." Irritability is the property of the myocardium most affected by extrasystoles, although tonicity, rhythm, conduction, and contractile power may be changed. Extrasystoles are of three classes, depending upon their origin: (*a*) auricular, (*b*) nodal or bundle, and (*c*) ventricular.

In the cases discussed by Doctor Smith, the polygraph or electrocardiograph was used in all examinations in order to determine the point of origin of the extrasystole without which determination, many believe, no accurate prognosis can be given. In his series the

extrasystole arose in the auricle in 5 cases, in the bundle in 8, and in the ventricle in 87. The heart was normal in size in 91 cases, while in 9 it was definitely enlarged, and these 9 all had unmistakable heart disease. The symptoms complained of were shortness of breath (synchronous with the extrasystole), grabbing, tearing, palpitating, turning of heart, lump, jerking, emptiness, shaking, and fullness. Nine, those with heart disease, showed symptoms of heart failure, while 35 had no symptoms. Coffee, tea, cocoa, or tobacco seemed to be the etiological factor in 21 cases and, when these were withdrawn, the extrasystoles ceased. Aspirin, strychnine, or digitalis accounted for 6 cases, while alcohol was a factor in 3. Infections and toxemias outside the heart seemed to be responsible for 31 cases.

"The treatment consisted of (1) the removal of any exciting factor in the environment; (2) the withdrawal of all stimulants; (3) the attempted removal or correction of any pathological condition; (4) the attempted correction of abnormal functional conditions; (5) proper diet, regular eating and sleeping hours; (6) the administration of sedative drugs. * * *"

Doctor Smith states as regards prognosis: "From an intensive study of these 100 cases I can not believe that the myocardium is impaired in any manner by the extrasystole. While some believe the auricular extrasystole is of 'serious import,' at present I have no reason to believe it differs prognostically from the other two types. As I search each patient carefully for extrasystoles I am coming to believe more and more that this condition, if looked for diligently, can be found in the majority of people."

All insurance companies refuse to accept as a first-class risk a person with an extrasystole. As a medical director for the past two years, Doctor Smith has been accepting applicants with extrasystoles, who are otherwise normal, as first-class risks.

The conclusions reached from this study of 100 cases are as follows:

"Extrasystoles are only symptoms of hyperirritability of the myocardium.

"If carefully sought for they will be revealed in a majority of persons examined.

"They may appear at any age.

"They may be present over long periods of time with no signs of heart failure developing.

"The etiology is varied but is usually extracardiac.

"They may arise in any part of the myocardium.

"They are of no prognostic value.

"They are a symptom and not a disease.

"The cardiographic instruments of precision are essential for their differentiation.

"While a small number of cases are here reported, they have been carefully studied and closely observed over varying periods of time and not one person who had a normal heart muscle and valves at the time of the first examination has developed any symptoms of heart failure nor has one of them shown any signs of cardiac pathology at any time during the period of observation."

PRIZE FOR CANCER STUDY

At the request of the Department of Biology, Georgetown University, Washington, D. C., the following announcement is made:

The commission for the distribution of the prize for cancer study founded by Dr. Sofie A. Nordhoff-Jung, in agreement with the foundress, has resolved to distribute the prize from now on only every two years to the double amount of the sum allotted heretofore, that is $1,000. The next prize will reach distribution in 1926.

NAVY NURSE CORPS

OUTLINE OF THE DUTIES OF THE HOSPITAL DIETITIAN[1]

MERNA M. MONROE, Denver, Colo.

The duties of the dietitian are not yet clearly defined—in each hospital her work is a little different. However, we might say that there are two general types of positions; the administrative and the medical.

The administrative dietitian usually takes the place of the steward. A good dietitian, with proper management, can serve better food for the same money than can a hospital which has no dietitian. The most carefully planned menu, using first-class products, can be completely ruined in its preparation. Knowing this, the dietitian will employ a cook who understands the principles involved in all food cookery and is willing to apply them. She knows that warmed-over food loses much of its value as well as its attractiveness. Consequently, she insists that the food be served as soon as it is cooked, and that hot foods must be served piping hot.

The administrative dietitian is familiar with the pure food laws and the laws of sanitation. Therefore, she employs no kitchen help without making sure that they are free from infectious diseases, because a hospital has people whose resistance to disease is very low. She sees that everything about the store rooms, the refrigerators, and the kitchens is immaculately clean. She trains her employees to be always neat and clean in their work.

Since she has a knowledge of foods and their digestion, she is the one most capable to make out such menus and see that the meals are attractive, satisfying and not monotonous.

We can honestly say that a good administrative dietitian supervises her department with the same meticulous care and tireless effort that a nurse exercises over her patient.

The medical dietitian may or may not make out the menus. If there is no administrative dietitian employed, she usually takes care of the patients' menus at least. Otherwise, she devotes her time to the special diets. Here, it might be well to suggest a few cases in which a special diet is indicated.

In all chronic diseases, regulation of the diet is perhaps the most important of any single measure in the treatment, because oftentimes the disorder was brought about by wrong eating habits.

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[1] Reprinted from Colorado Medicine for July, 1924.

In obesity, diet is the most important factor—not a starvation treatment, but a scientific diet is necessary to prevent any serious after effects. Diabetes depends entirely upon diet. Many gastric and duodenal ulcers are cured by diet. Fevers of long duration should have a high caloric diet; for instance, typhoid and scarlet fevers, and sometimes diphtheria and pneumonia. In hyperacidity of the stomach, we give bland foods; low carbohydrate to prevent fermentation, plenty of easily digested fats to retard the flow of the gastric juice, and enough protein to use up all of the free hydrochloric acid.

Nephritis requires a very careful diet. If there is nitrogen retention we eliminate all of the protein we possibly can; in edema we limit the fluid intake and give a salt-poor diet.

Secondary anemia is helped by including in the diet the easily assimilated protein foods and the foods with a high iron content. A blood-building diet is often ordered for pernicious anemia, but is of little value in the end.

For catarrhal jaundice, give as little fat as possible and restrict the carbohydrates somewhat. When an irritated stomach coexists the diet must be modified to lessen the irritation. If the jaundice is produced by gallstones, a diet is of no benefit; but we can help to prevent the recurrence of stones by avoiding constipation and intestinal putrefaction.

Again, diet plays the most important part in colitis, constipation, and auto-intoxication.

Dietotherapy is not only important in chronic diseases, but is of some benefit in certain post-operative cases.

Appendectomy patients are usually constipated after operation. Put them on a laxative diet for several weeks. After removal of the gall bladder avoid fatty foods at first, and then gradually introduce those with low melting point. All gastroenterostomies should be followed by a special diet for several weeks. After an operation for hemorrhoids it is desirable to give as little residue as possible; consequently, give principally protein and fat foods and carbohydrates with no cellulose.

How does the physician order his special diets? Some doctors prefer to order their diets in terms of foodstuffs; that is, grams of carbohydrates, fat, and protein. Others order in terms of the diagnoses; thus, a diet suitable for anemia, constipation, achylia, nephritis, etc.

Most doctors find it convenient to order according to diagnoses, and leave the matter of food to be allowed and that to be avoided to the dietitian. Oftentimes a doctor prefers a certain diet, and orders it by name; for example, Sippy's diet for gastric ulcer. For

diabetes, Wilder's "Primer for Diabetics" makes the ordering of the diet a simple matter. If you are acquainted with the book you will remember that each day's menu is given. There are three groups of menus: The first group gives 1,190 calories; the second, 1,760; the third, 2,330. When the physician desires a diabetic diet he orders Group I, II, or III; and as the patient improves he increases the diet by ordering another group. This method is easy to follow, and it also eliminates minute calculations on the part of the patient when he must depend upon himself.

When a doctor orders a special diet on the chart he also calls upon the dietitian to explain more fully the condition of the patient. The dietitian then calls upon the patient to explain the diet, and to ascertain any likes or dislikes.

If the patient is to continue the diet after dismissal from the hospital, the dietitian gives instructions not only in regard to what food is or is not allowed but also how it is to be cooked and how variety can be secured.

The special diets are prepared in the diet kitchen by the student nurse under the dietitian's supervision.

As I said in the beginning the dietitian's duties are not definitely outlined. She is pledged to be of whatever service she can in helping to make the patient's meals a pleasure. Let me suggest that a hospital's reputation depends upon its food service and its medical department as well as upon its surgical department. An efficient medical department needs a well balanced dietetic department, and this can be secured by cooperation and constant effort. If any doctor has an idea he would like to have the dietitian try, let him feel free to suggest it.

THE LEPER COLONY OF THE VIRGIN ISLANDS OF THE UNITED STATES

By JENNIE M. JASON, Reserve Nurse, United States Navy

The leper colony of the Virgin Islands of the United States is located on the beautiful island of St. Croix, about 2 miles from the little town of Christiansted. The lepers from the three islands, St. Thomas, St. John, and St. Croix, are here cared for.

The colony was opened in 1908 and was endowed by the Danish Order of Odd Fellows, who gave the buildings and equipment, the latter being sent from Denmark. The municipality of St. Croix donated the land. After the transfer of the islands to the United States in 1917, the Government took charge of the colony and at present funds are available from the Federal Government and the municipalities of the three islands for the support of the place.

The chief municipal physician of St. Croix, who is a naval medical officer, has charge of the colony. He is assisted by another Navy

doctor, who gives the treatments and directs the welfare of the patients. A Navy nurse visits the colony daily and supervises the care of the patients. A native graduate nurse lives on the reservation and she is assisted in her work by 4 lepers who have been trained to help care for the sick. These "leper nurses" are valuable assistants, always cheerful and faithful in their duties.

The settlement is located on the water front, a part of it being inclosed by wire fence. This inclosure, in which are the living quarters of the lepers, is guarded day and night by guards, whose duty it is to see that none of the patients leave the reservation and that visitors do not enter. In this inclosure are the pavilions, hospital, dining and recreation hall, and the various workshops necessary for the upkeep of the institution. Outside the fence, but close to it, is the kitchen in which the meals are cooked. The doctor's office and a dispensary, together with living quarters for the guards, are also outside the inclosure.

At present there are 70 lepers in the colony, the youngest being 11 years old and the oldest about 60. Seemingly, they live a happy and contented life. Through the various papers and magazines that are sent in to them they keep abreast of the times and are interested in the events of the outside world. The people in the towns of St. Croix do not forget these people in their isolation and frequently the band gives a concert for them, usually on a moonlight night. On such an occasion, everyone dresses up in his or her best and presents a very interesting sight.

The pavilions in which they live are laid out in the form of a suburban subdivision with avenues between, filled with a profusion of exquisite tropical flowers. The walls are painted a mellow brick color with green trimmings under red roofs, making a vivid show under the flaming tropical sun. The living quarters are divided into rooms in which two or three patients live comfortably together. The dining room is in a separate building.

The inmates are encouraged to help with the work of the colony, which, by giving them something to do, makes for peace and contentment. To stimulate them even more a small sum of money is given monthly by the municipality for the various details. This money is not actually given to the patients, because if this were done it would be impossible to put it in circulation again. Instead, it is credited to their accounts, payable to their orders, and the books are balanced twice a month by the Navy nurse in charge. Among the various details are: Fishing, farming, carpentry, school-teaching, nursing, sewing, straw-hat making, general laundry work, and caring for the dining room.

The fishermen, in their small boats, navigate among the rough waters of the coral reefs which skirt the shores. The young men do

this work, which requires skill, strength, and courage. Twice a week they go to sea and return with the boat full of the finny tribesmen, to receive a warm welcome because fish to these people is a main article of diet.

The carpenter with his two assistants looks after the various buildings and makes the necessary repairs. This man has lost practically all his fingers yet he handles his tools with surprising skill.

The schoolmaster has been an inmate for 16 years, ever since the colony was opened. Every morning finds him at his task, teaching the young people of the colony to read and write, thus enabling them to pass the time more contentedly than they otherwise would do.

The various religious denominations of the island minister to the spiritual needs of the inmates who are very zealous in their beliefs and derive a great deal of comfort thereby. Religion plays a great part in the lives of all the people of these islands.

Out of the 70 patients in the colony, only 4 are bed patients at the present time. Many of the others have lesions which are dressed daily. The ethyl ester of chaulmoogra oil is administered once a week intramuscularly into the buttocks. Considerable improvement has been shown since this treatment was first started. There are a number of patients who, through certain religious beliefs, will not submit to treatment. These patients, of course, do not show improvement.

BOOK NOTICES

Publishers submitting books for review are requested to address them as follows:

The Editor,
U. S. Naval Medical Bulletin,
Bureau of Medicine and Surgery, Navy Department,
Washington, D. C.

For review.

GYNECOLOGY, MEDICAL AND SURGICAL, by *P. Brooke Bland, M. D., assistant professor of gynecology, Jefferson Medical College; assistant gynecologist, Jefferson Medical College Hospital; gynecologist to St. Joseph's Hospital; gynecologist to the American Oncologic Hospital, Philadelphia; consulting gynecologist to Burlington County Hospital, Mount Holly, N. J., and to the Vineland Training School, Vineland, N. J.; Fellow of the American College of Surgeons, the American Medical Association and the Royal Society of Medicine, London, England, etc.* F. A. Davis Co., Philadelphia.

Bland recognizes a trend toward conservatism in gynecology and in his book he has devoted much space to the medical or conservative phase of his specialty without losing sight of the importance of the surgical side of the work. Organotherapy, radiotherapy, and other modern therapeutic agents are discussed at length while surgical methods are described in detail.

This is an excellent book for the general practitioner as well as for the specialist, the kind of book that a medical officer in one of our island possessions would find invaluable.

OPERATIVE SURGERY, by *J. Shelton Horsley, M. D., F. A. C. S., attending surgeon, St. Elizabeth's Hospital, Richmond, Va.* Second edition. The C. V. Mosby Co., St. Louis, 1924.

In this new edition of his book many surgical procedures, specially developed by the author, are described in full. The sections on blood transfusion and blood-vessel surgery, plastic, and facial surgery, operations for malignant tumors and operations on the stomach and intestines are noteworthy. He gives a most instructive exposition of the arguments against burying the stump of the appendix.

The illustrations are well planned and executed; the language clear and concise; the make-up of the book attractive. Altogether, it is the best one-man, one-volume operative surgery we have seen.

FRACTURES AND DISLOCATIONS, by *Philip D. Wilson, A. B., M. D., F. A. C. S., instructor in orthopaedic surgery, Harvard Medical School, and William A. Cochrane, M. B., Ch. B., F. R. C. S., Edin., university tutor in clinical surgery, University of Edinburgh.* J. B. Lippincott Company, Philadelphia and London.

This book reports the practice of the group of surgeons constituting the staff of the fracture service of the Massachusetts General Hospital. The British and American ideas are harmonized and combined in a substantial agreement on the relative value of different methods of treatment in the varying types of injury.

The authors emphasize the importance of continuing to employ in civil practice the knowledge gained at such great cost during the war, of debridement, direct skeletal traction, the Thomas splint, overhead suspension and roentgen control.

An excellent book which should prove a valuable addition to the libraries of our hospitals.

THE CRIPPLED HAND AND ARM, by *Carl Beck, M. D.* J. B. Lippincott Company, Philadelphia and London.

Based on his many years of experience in plastic surgery, Beck describes the reconstruction of the hand and arm crippled by congenital deformities as well as by injuries, mutilations, burns, and disease.

An excellent book for hospitals and for surgeons who are handling such cases.

DISEASES OF THE HEART, *by Dr. Henri Vaquez, professor of the faculty of medicine of Paris; physician to L'Hôpital de la Pitié; member of the Academy of Medicine, (Paris).* Translated and edited by *George F. Laidlaw, M. D., associate physician to the Fifth Avenue Hospital, New York City; Fellow of the New York Academy of Medicine.* Introduction by *William S. Thayer, M. D., F. R. C. P. S. (Hon.), professor emeritus of medicine, Johns Hopkins University; visiting physician to the Johns Hopkins Hospital, Baltimore; associate foreign member of the Academy of Medicine, (Paris).* W. B. Saunders Company, Philadelphia, 1924.

To one looking for the new and useful among the books of the year, this volume is distinctly a "find." It was written for the general practitioner by one who is without doubt the foremost cardiologist in France, and throughout Latin Europe it has become the most popular textbook on diseases of the heart. The work possesses a charm in style and diction seldom found in medical literature.

The volume contains over 700 pages and the subject matter is presented in five parts. In Part 1 the various modern methods of examination are discussed, including radiology, the graphic methods, electrocardiography and blood pressure. Part 2 treats of the various cardiopathies and arterial hypertension. In Part 3 the arrhythmias

are considered. Part 4 deals with the various aspects of heart failure and Part 5 covers the modern methods of treatment of cardiac disease.

PATHOGENIC MICROORGANISMS, A PRACTICAL MANUAL FOR STUDENTS, PHYSICIANS, AND HEALTH OFFICERS, by *William Hallock Park, M. D., professor of bacteriology and hygiene, University and Bellevue Hospital Medical College and director of the Bureau of Laboratories of the Department of Health, New York City, Anna Wessels Williams, M. D., assistant director of the Bureau of Laboratories of the Department of Health, and Charles Krumwiede, M. D., assistant director of the Bureau of Laboratories, associate professor of bacteriology and hygiene in the University and Bellevue Hospital Medical College, New York City.* Eighth edition. Lea and Febiger, Philadelphia, 1924.

The usefulness and hence the popularity of this practical manual on the pathogenic microorganisms is attested by the fact that in comparatively a few years it has passed through eight editions. The book was first written in order to make available for others the practical knowledge which had been acquired in the work of the bacteriological laboratories of the health department of the city of New York. The first edition was a modest little volume called Bacteriology in Medicine and Surgery. In each successive edition there has been a widening of the field covered until we now have a volume of over 800 pages. Thus, when a third edition became necessary the authors believed it advantageous to include the animal as well as the vegetable organisms and the title of that edition was altered to conform to the text, which had been broadened to give in outline practically the whole field of pathogenic microorganisms.

In the fifth and sixth editions the material was rearranged in order to bring together more closely all of the pathogenic organisms.

In the present edition further rearrangements have been made so that the grouping of different microorganisms conforms more closely to the classification adopted by the Society of American Bacteriologists. The new terminology suggested by this society has been added to the older common names.

Examination of the volume reveals the fact that several new and useful tabulations have been added. The sections on immunity have been amplified. The writers' experiences to date with active immunization against diphtheria have been given. The chapters on the pyogenic cocci, on the paratyphoid bacilli, the dysentery bacilli, and on the higher forms of bacteria, the so-called trichobacteria, have been largely rewritten. Recent additions to our knowledge of scarlet fever, measles, typhus fever, Rocky Mountain fever, and tularemia have been given due consideration. The details of the newer precipitin tests, especially that of Kahn, have been added to the chapter on complement fixation. For the use of students a compre-

hensive summary table or key to the names of the chief lesions and diseases produced by bacteria has been added. This table gives the essential characters of and the pathological conditions caused by each of the commoner microorganisms.

As in the preceding edition the subject matter of the work is considered in three sections, the first dealing with the principles of microbiology, the second discussing the individual microorganisms, and the third treating applied microbiology.

X-RAY AND X-RAY APPARATUS—AN ELEMENTARY COURSE, by *John K. Robertson, associate professor of physics, Queen's University, Kingston, Canada.* The Macmillan Co., New York, 1924.

This small book is, as its author states in the preface, "an attempt to present as clearly and as simply as possible the physical principles utilized in the field of radiology." It is considered that the author has made a success of his attempt.

The illustrations, chiefly diagrammatic, are many of them original and serve to explain and clarify the text. The first chapter explains the elementary principles of electricity and step by step brings the reader to the point of understanding the modern interrupterless transformer. There follow chapters on the induction coil, the origin of X rays and various kinds of tubes, the characteristics of X rays, both primary and secondary, and dosage. Chapters on ionization and deep therapy have been added to the usual subjects presented in text books.

The chapters on ionization and deep therapy are especially commended for their clearness and conciseness in treating with an exceedingly abstruse and, at the best, little known subject.

BASAL METABOLISM IN HEALTH AND DISEASE, by *Eugene F. DuBois, M. D., medical director, Russell Sage Institute of Pathology; associate professor of medicine, Cornell University Medical College.* Lea and Febiger, Philadelphia and New York, 1924.

The subject of basal metabolism has become of considerable importance to the practitioner of medicine during the last few years and in this book will be found an excellent presentation of the subject as applied to normal and pathological conditions.

In the first part of the volume the author deals with metabolism in health. As a preliminary to the main discussion of the subject he presents a brief history of the study of respiratory metabolism, discusses the metabolism of carbohydrates, fats, and proteins, alone and in combination, and reviews certain laws of physics necessary to a proper understanding of basal metabolism. The general principles of the various types of respiration apparatus and the methods of calculation are presented. Then comes a chapter on normal basal

metabolism in which the factors which influence the basal metabolism, the standards of normal metabolism and the influence of age and sex are treated.

At the present time it is customary in many laboratories to express the results of metabolism tests in terms of calories per square meter of body surface, therefore a chapter is devoted to a description of the various methods used to determine surface area, and the relation of basal metabolism to surface area is shown.

In the last half of the book the writer considers metabolism in disease. In this section the chapters on undernutrition, overnutrition, obesity, diabetes, diseases of the thyroid, and fever are of especial importance as they contain many practical hints regarding treatment.

CONCEALED TUBERCULOSIS OR "THE TIRED SICKNESS," by *George Douglas Head, B. S., M. D.* P. Blakiston's Son & Co., Philadelphia, 1924.

In this very readable small volume, the author has made a successful attempt to show that many of those persons who spend years of their lives going from physician to physician in search of relief from their more or less vague symptoms of weakness, indigestion, chest pains, headache, and general malaise, and who are usually told that there is nothing really wrong with them or that they have neurasthenia and that, in order to be well, they must use their will-power, are in reality sufferers from tuberculosis in some concealed form, the involved organ or organs, in many cases, being unknown, and that this may be proved, even in the absence of physical findings, by the use of subcutaneous injection of tuberculin which, in these cases, will give a positive reaction evidenced by a rise in temperature and a temporary exaccerbation of symptoms. These patients desire a diagnosis other than one of a functional nervous disorder and are usually pleased when they are told that they have tuberculosis. Through long carrying of the tubercle bacillus in their bodies they have acquired a relative immunity which renders them comparatively safe from the disease in an active destructive form. The differential diagnosis of concealed tuberculosis from syphilis, myocarditis, gastric or duodenal ulcer, and hyperthyroidism is given. All of these may simulate tuberculosis, but a positive tuberculin test will give the clue to the real condition. Once the diagnosis is established, the usual hygienic and dietetic treatment for tuberculosis is instituted and cure often results. According to the author, there is no danger attendant upon the injection of tuberculin in these cases. On the contrary, direct benefit seems to result. Reports are made of 30 such patients who have responded satisfactorily to the author's treatment.

AN AFRICAN HOLIDAY, by *R. L. Sutton, M. D.* C. V. Mosby Co., St. Louis, 1925.

It is doubtful if many doctors, even though ardent sportsmen, can contemplate such an "African Holiday," but the pleasure of hearing how it might be done will repay any reader of this little book. From the foreword we learn that the basis of the account came from letters home, hence there is a delightful informality and humorous vernacular which holds the reader's interest from the beginning to the end. The vicissitudes of the journey and the hardship endured reflect the author's buoyant enthusiasm. One is impressed by the mention of the financial requirements of the trip that African big game hunting as a recreation is only possible for those with an ample income.

ARROWSMITH, by *Sinclair Lewis.* Harcourt, Brace & Co., New York, 1925.

It is not often that a romance of science appears in fiction. "Arrowsmith" relates the experiences and vicissitudes of a young doctor who is a born scientist. The tale permits the author to display a remarkable knowledge of medical subjects and modern scientific advancement. Even when he permits his imagination to soar he is within the realm of reason. Arrowsmith as a type can hardly be called cultured or refined, but no doubt is a true picture of a vigorous self-willed and self-made man. The story illustrates the impulse of the scientific spirit to lead a young doctor from a country practice through the business methods of civic sanitation to become a prominent member of the staff of a great research laboratory. The character of Gottlieb will perhaps appeal to the reader even more than Arrowsmith. The professor's helplessness during his wife's illness reminds us that the practical application of scientific methods is necessary for those who expect to practice medicine. Gottlieb's definition of a scientist and his opinion of psychoanalysts will not receive universal approval. Manufacturing serologists are pictured in an unsavory light. The spirit of commercialism even invades the research laboratory.

The story ends with the final triumph of the scientific spirit in Arrowsmith and his return to the unconventional life that has characterized his career.

THE DIVISION OF PREVENTIVE MEDICINE

Lieut. Commander J. R. PHELPS, Medical Corps, United States Navy, in charge

Notes on Preventive Medicine for Medical Officers, United States Navy

THE GRAM NEGATIVE, MOTILE BACILLUS

It is now the practice when Form F cards are received reporting typhoid fever, paratyphoid infection, or certain other communicable diseases, to mail questionnaires to the medical officers reporting the cases in ord r that the bureau may know, among other points of epidemiological interest, whether or not the diagnosis in each case was well supported by clinical and laboratory evidence.

With regard to typhoid fever there are of course certain simple laboratory procedures which can be carried out almost anywhere in the service; examination of the blood, for example. With a little effort, except at sea, it is possible to secure a series of serum-agglutination tests to determine whether the agglutinating power of the serum is increasing during the course of the febrile disease. The impossible is not expected. Organizations without complete laboratory facilities operating und r conditions where it is impractical to have diagnostic laboratory work done can not be expected to have cultures made from the blood, stools, and urine, although it is doubtless true that opportunities to forward specimens either to the United States Naval Medical School laboratory or to some other laboratory are sometimes neglected.

On the other hand, it is reasonable to expect that a naval hospital, hospital ship, or station which has full laboratory equipment and the services of a medical officer specially trained to do laboratory work will see to it that the diagnostic laboratory renders adequate service. There is hardly any excuse for a laboratory which can handle blood cultures or isolate a Gram negative, motile bacillus in pure culture from feces, to stop there. Of what value is the laboratory's report that a Gram negative, motile bacillus was isolated? Of course, in a case that is from the clinical viewpoint probably or possibly a case of typhoid fever, the recovery of such a microorganism from the blood stream does carry with it a certain amount of suggestive evidence, but it doesn't clinch the diagnosis. The recovery of a Gram negative, motile bacillus from the patient's stools means nothing.

It is hard to believe that the laboratory man who is content to rest there believes he has done anything worth while. If he does, it is time for him to educate himself. Of course, when the questionnaire from the bureau, seeking the facts in the case, ascertained and ascertainable, reaches the medical officer in due time, he does not always indicate the reasoning processes which were applied in arriving at the diagnosis. And thus, in answering the questions, if he adds the statement that a Gram negative, motile bacillus was recovered from the feces, it may appear that he looks upon such a finding as valuable evidence; whereas, if he were asked about it, he would say, "No; that is what the laboratory reported. We had the report and thought we might as well put it in."

The point is the medical officer who is treating the patient should not be satisfied with such laboratory work if the laboratory is capable of better things. But sometimes one must stop and wonder about the clinical man's attitude of mind and ask whether he has lost all memory of the case, did he fail to keep any records, or was the diagnosis of typhoid fever merely made because the appearance of the patient and the course of the disease made that diagnosis as probable as any other.

Fortunately, instances where the questionnaire leaves one with the feeling that the case was not adequately studied are comparatively rare. It is well to add this comment, because frank and open discussion of medical and epidemiological problems undertaken with a view to making the work of the medical department, already excellent, still better is occasionally seized upon by critics of the destructive type to derogate the work of the medical department in general. The fact that such persons as a rule are incapable of making constructive suggestions does not lessen the annoyance arising from their unjust criticism. Let it be said then that there is abundant evidence that cases in the Navy are being studied, for the most part carefully, and that very satisfactory use is being made of laboratory facilities as well as of instruments of precision in the clinical diagnosis of disease.

That being understood, we may return to the subject and cite examples which seem to justify inviting the attention of medical officers to this matter. A questionnaire relative to a case reported as typhoid fever brought the following answers: Clinical evidence on which the diagnosis was based, dry cough; abdominal pain; vomiting; temperature, 103; pulse, 84; white blood count, 7,750; polys, 58. Bacteriological or blood findings which served to confirm the diagnosis—on Endo's media stools showed a *gram negative actively motile bacillus*. Characteristic typhoid colony, morphologically, bacillus typhosus. Stools were cultured during convalescence and no growth was obtained.

The medical department organization from which this information came is presumed to be equipped with all the facilities of a well-appointed hospital. The records failed to show whether or not the patent had ever received typhoid vaccine. Inquiry brought from the ship aboard which the man was originally admitted to the sick list the information that he was admitted June 13, 1924, with diagnosis undetermined, pneumonia suspected. No mention was made of any evidence that might show whether or not the man had ever received typhoid vaccine. When the matter was again referred to the ship in question the following reply was made, "The records of the medical department do not show length of service of the above-named man or having been given antityphoid prophylaxis aboard this vessel." The inference is that the man was no longer attached to the ship. The information relating to prophylaxis has not yet been obtained but eventually it will be.

Another "Gram-negative-motile-bacillus case" which excited comment at the United States Naval Medical School regarding the apparent helplessness of a laboratory which might have been expected to pursue the bacillus until some idea was obtained as to what it might be, was one in which tissues were forwarded to the school for pathological examination. The patient died after being sick for seven days with pneumonia. The immediate cause of death was regarded as septicaemia. During the course of the disease, punctate lesions of the skin appeared on the trunk and extremities. These progressed to pustule formation. "Blood culture was positive for actively motile gram negative bacillus." Post-mortem findings were reported as follows: "Kidneys showed marked congestion and numerous small abscesses beneath cortex. Lungs: Both lower and right middle lobes showed marked congestion and numerous areas of hemorrhagic consolidation. Cultures from kidneys, lungs, and skin showed same organism as recovered from blood. What the microorganism was, obviously, could not be determined from tissues forwarded in formaldehyde solution."

The lack of interest on this point by those handling the case was surprising.

OUTBREAK OF FOOD POISONING IN THE RECEIVING SHIP AT NEW YORK—HASH MADE WITH CANNED CORNED BEEF REMOVED FROM THE CANS THE NIGHT BEFORE AND ALLOWED TO INCUBATE OVERNIGHT

The following information relative to the outbreak was obtained in response to a questionnaire forwarded by the Bureau of Medicine and Surgery upon the receipt of Form F cards reporting the cases:

The suspected food was corned-beef hash which had been prepared the evening before. The food was inspected by a medical officer on the serving table at breakfast. The recent letter on the subject of poisoning by hash came to mind, but inquiry was not made about the preparation of the hash until after the cases of illness appeared, when both the cook and commissary steward stated the hash had been made the night previously. Neither one knew of the circular letter recently issued by the Bureau of Supplies and Accounts relative to the preparation of hash. Later it appears they tried to claim that the cans of corned beef had been opened the same morning and the hash made that morning. The medical officer's conclusion was that the meat was good, but that it incubated during the night. No laboratory examination was made.

One hundred and ninety-three men ate breakfast in the general mess, including 134 prisoners and 59 other men. Cases occurred in both groups in about the same ratio. The outbreak occurred on a Sunday morning, and many of the men attached to the receiving ship were on liberty over the week end. The first patient reported at the sick bay at 10.30 a. m. Before noon there were about 50 cases. By 4 p. m. the same day all were convalescent, except one man from the Coast Guard vessel *Fanning*, the crew of which together with the crew of the U. S. S. *S-20* mess in the receiving ship. That man was sick for two days with retching and vomiting.

The symptoms which might be expected after ingestion of food contaminated with the toxic products of bacilli of the meat poisoning group were noted. In most of the cases the first indication of illness was the sudden onset of cramps in the abdomen. Most of the patients were pale except when vomiting. Many had more or less continuous pain as well as griping spasmodic pain at intervals. Vomiting for a short time was a common symptom, and most of the men had diarrhea later in the day. Castor oil was given to all shortly after the onset of symptoms. The patients received treatment less than half an hour after they became ill. The stools were typically bile stained and watery and contained mucus. Some of the patients complained of frontal headache and some had cramps in the leg muscles. One referred to numbness of the hands and lips; he showed decided pallor and cold sweat. One man had cramps of the muscles of the shoulder. The pulse was accelerated in rate and rather thready in some cases.

Passing over the question of how it could happen that meat for hash for breakfast was allowed to serve as culture media overnight after all the information that has been published on this subject in the Bulletin during the past year and the instructions issued by the Bureau of Supplies and Accounts upon recommendation of the Bureau of Medicine and Surgery, one must regret that advantage

was not taken of the opportunity afforded by this outbreak to attempt to isolate the causative microorganism. With the New York Naval Hospital within a few minutes' distance it would have been a simple matter to have had cultures made from the stools and urine of the sickest patients on Endo's media. The report does not state whether any of the hash could have been procured for examination, but certainly feces and urine could have been examined. It is important for us to find out whether or not living microorganisms can be recovered from the stools in cases of brief duration—a few hours to a day or two. The bacilli have been isolated in a few outbreaks in cases where symptoms have persisted for two or three days.

It is unfortunate with the facilities available for laboratory work in the Navy that such opportunities to secure useful information are not seized. The whole question of paratyphoid infection and the liability of different types of the paratyphoid bacilli to cause infection and poisoning of different kinds and degrees is involved with the subject of food poisoning. Much remains to be learned about the bacilli which are now grouped in a general way as paratyphoid bacilli. There are probably several types at least of paratyphoid A and many types of paratyphoid B bacilli. The need for more exact epidemiological knowledge relates at one end of the scale to the subject of food poisoning and at the other end to the probable frequency of occurrence and severity of attacks of typhoid fever-like infections caused by bacilli, which from the standpoint of the bacteriologist at least must be classified as paratyphoid bacilli. It is obvious, therefore, that when opportunity presents itself for the isolation of microorganisms which have caused manifestations of food poisoning that the strain should be preserved in culture for careful study in a research laboratory in order that its characteristics and its disease-producing powers may be determined for comparison with other strains.

REMARKS RELATIVE TO THE ADMINISTRATION OF TYPHOID VACCINE TO RECRUITS

In replying to a question bearing on the subject of how best to grade the degrees of severe reactions which in certain instances follow the administration of typhoid vaccine, Commander C. G. Smith, Medical Corps, United States Navy, senior medical officer of the training station at Hampton Roads, Va., made the following remarks: "Men who require rest in bed in their unit dispensary overnight following vaccination are listed as having severe reactions, and men who are sent to sick quarters and kept in bed for periods varying from two to three days are admitted to the sick list and listed as

having severe reactions requiring admission to the sick list." He continues, "We endeavor to give typhoid inoculations on Saturday afternoon so as to interfere as little as possible with recruit training, as I insist upon relief from all drills and exercises for 48 hours after inoculation in all cases, and as there is no work on Sundays there is really only the loss of one day. While this procedure may not be necessary in all cases, I find it a good rule to follow, as in these recruits, who are young, unhardened boys, resistance to disease after inoculation is probably much lowered, even if the reaction does not make them ill, and if they were allowed to drill, the element of fatigue would be much more pronounced and normal resistance further lowered."

Commander Smith has had extensive experience in dealing with recruits, not only at the training station, but in the naval hospital, Norfolk, Va. His judgment that inoculations may affect adversely the resistance of susceptible recruits and pave the way for successful invasion of the tissues by the causative microorganisms of diseases of the respiratory type is corroborated by observations made at the United States Naval Training Station, Great Lakes, Ill., during the World War, when during the winter months when the pneumonias, cerebrospinal fever, common infections of the upper respiratory tract and other communicable diseases, including diphtheria, scarlet fever, and measles, were prevalent, lowered immunity following the administration of triple vaccine certainly seemed to be a factor to be reckoned with.

The experienced medical officer comes to know how carefully recruits must be watched and "mothered" as it were. Medical officers out in the service at large would do well to bear this in mind in dealing with older men who may not be, so far as the delicate mechanisms of immunity are concerned, as tough and thoroughly seasoned as they appear to be. Of course, the danger of lowering resistance is far greater in the months of high death rates—December to May in the United States, and especially in January, February, March, and April—than at other times in the year. During these months carriers of the disease-producing microorganisms which we most fear are very numerous in practically all population groups, and many of them are likely to be convalescent carriers or to have been recently in contact with clinical cases of disease.

There is very good evidence of an indirect epidemiological character and some more or less direct evidence that typhoid vaccine will protect many, perhaps most, of those inoculated. For example, during the course of an extensive epidemic of typhoid fever at Salem, Ohio, in the autumn of 1920, caused by pollution of the whole public water supply, among 210 ex-service men who had been

inoculated between two and three years previously there were only 3 cases, a ratio of 1 to 70, while the ratio among females in the age group 20 to 29 years was 1 case to 8, with presumably no greater exposure. That complete vaccination of the naval personnel is a worth-while measure goes without saying, and there is little doubt that without the additional protection afforded by the inoculations there would be a good many more cases of typhoid fever in the Navy from year to year than now occur, especially among forces granting liberty in ports outside of the United States. Nevertheless, care should be taken to administer the vaccine in such manner and under such circumstances as to minimize the risks of concurrent respiratory disease and also of disability resulting directly from the immunological reaction. Under certain circumstances one might reasonably advocate deferring inoculations for a short time, as when other communicable disease hazards are especially great, so that the vaccine will be administered with little or no risk whatever. In American cities with which the Navy comes into contact the danger of exposure to typhoid infection is now very small indeed. Nearly all of those cities have brought the yearly death rate from typhoid fever down to 5 or 6 per 100,000, and most of them well below these figures, with sanitary measures. In most of the cities, barring the comparatively remote chance of ingesting contaminated shellfish or lettuce or celery, the danger of effective exposure is almost nil. This is a fitting commentary upon the results of the general awakening of sanitary conscience which began about 1910.

COMMENT ON THE VALUE OF STERILIZATION OF MESS GEAR ON BOARD SHIP AS A FACTOR IN THE PREVENTION AND CONTROL OF COMMUNICABLE DISEASES—EXCERPTS FROM THE ANNUAL SANITARY REPORT OF THE U. S. S. "TEXAS" FOR 1924

In the annual sanitary report of the U. S. S. *Texas*, Commander James E. Gill, Medical Corps, United States Navy, discusses the statistical evidence which would seem to indicate that effective disinfection of the crew's mess gear has been an important factor in reducing morbidity on board that ship.

A former report describing the equipment installed in the scullery of the *Texas* is printed herewith, in order that the reader may understand the application of the inferences drawn by the medical officer from his study of the ship's vital statistics for 1923 and 1924.

The dishwashing apparatus now in use in the scullery of the *Texas* was designed and almost entirely built on board ship. The commanding officer of the *Texas* and the medical officer are entitled to great credit for taking the initiative in attempting to solve the

difficult problem of designing suitable apparatus that would be practicable, serviceable, efficient as a washer, economical in the use of fresh water and, at the same time, insure sterilization of all articles. It is understood that the commanding officer, Capt. A. M. Procter, United States Navy, himself, designed such parts of the equipment as could not be utilized from available machines and supervised the manufacture and installation of the complete apparatus.

Vice Admiral N. A. McCully, United States Navy, commander of the Scouting Fleet, commented upon the report of installation in a circular letter to commanding officers of battleships, Scouting Fleet, as follows:

"There is forwarded herewith for the information of all concerned, in case the report has not already been brought to their attention, a very excellent report on the steps taken to improve dish-washing facilities for the general mess of the U. S. S. *Texas*. The figures on sick days per month and on incidence of diseases of the nose and throat, while possibly not wholly conclusive are certainly very interesting, indicating as they do, a 50 per cent reduction for 1924 as compared with 1923, i. e., before and after installation of this apparatus.

"A thorough examination of the *Texas's* installation was made by the fleet surgeon and fleet constructor in connection with the recent request on the part of the *Wyoming* to substitute a 'spray' type of dish-washing machine for the 'dip' type machine now installed on the *Wyoming*.

"Before recommending any changes in existing apparatus the commander Scouting Fleet is circulating this correspondence among battleships of the Scouting Fleet with request for consideration, recommendation, and report based upon service experience in the various ships. It is understood that there is also in use at certain naval hospitals a machine which has received favorable comment. The commander Scouting Fleet would be glad to receive comment from any who have had experience with this machine particularly as to the practicability of adapting it to shipboard conditions.

"The *Texas's* installation creates a most favorable impression as to the thoroughness of procedure combined with a maximum economy of space and fresh water. Certain details of the installation not fully brought out in the inclosed report are as follows:

"(*a*) The first step inside the scullery, the preliminary or spray washing, makes use of hot water from the second or dip tank, the water for this washing being renewed for each meal.

"(*b*) As stated in inclosure, the water in the dip tank or second stage of washing (repeated for some four successive dip-

pings in water at about 170° F.) is used over a period of three days before renewal.

"(*c*) The final or rinsing stage makes use of the original washing machine of the 'dip' type and is considered essential to remove all traces of either soap or grease which may remain after the intermediate dipping process. The surface grease extractor, consisting of a slotted pipe near surface of water, is not very efficient for its designed purpose.

"(*d*) Reference is made in inclosure (A) herewith, to the present unsatisfactory arrangmeent for washing food containers. This consists of placing each container bottom up over a controlled steam jet followed by spraying with cold salt water (salt water used for economy) to reduce the temperature of the containers so that they can be readily handled. The salt water, being ordinary sea water, impairs sanitation when the ship is at anchor in confined and quite possibly polluted waters. Rinsing of either dishes or food containers with ordinary sea water can not be considered satisfactory from a sanitary standpoint.

"It is desired that commanding officers give this correspondence and the inclosed report careful consideration, and that comment and recommendation be submitted to the commander Scounting Fleet for further report to the Bureau of Construction and Repair."

The report referred to by the commander of the Scouting Fleet, a memorandum report entitled, "The scullery on board ship," by Commander James E. Gill, Medical Corps, United States Navy, was as follows:

"From a sanitary point of view, the scullery is one of the most important and one of the most difficult places to operate and keep in a satisfactory condition. The following conditions are taken from observations on the U. S. S. *Texas* and many, if not all of them, apply to other ships in the Navy. The *Texas* was supplied with one of the usual kinds of dish-washing machines supplied to ships of the Navy, viz, the dishes in racks were run on a track through the machine and while passing through were supposed to be thoroughly splashed with hot soapy water and the following defects in operation were noted:

"1. As a dish-washing machine it was a failure. As a result the dishes were washed in common dish water in each compartment, and then run through the machine as a formality.

"2. The knives, forks, and spoons were not sent to the scullery, but were washed in common dish water at each table.

"3. At one meal each week, usually Friday (before inspection), the dishes were not sent to the scullery, but were scoured with sand brick at the mess tables, and washed in common dish water.

"4. The dishes taken to the scullery and run through the machine were practically cold on exit from the machine.

"5. The racks were thrown through the machine so fast that only the merest wetting could take place.

"6. Common dirty dish towels were used at the mess tables.

"7. The compartments in which the messes were set up were with difficulty cleaned up in one hour after messing.

"8. Between messes it was not uncommon to find knives, forks, and spoons handled, used for other purposes than eating and generally dirty and unsatisfactory.

"In regard to No. 4, investigation showed that if the steam were turned on the machine the dishes were so hot when they came out that the men could not handle them, and therefore they turned off the steam. The machine's real virtue turned out to be its fault in practice.

"At this point the commanding officer took a very lively interest and besides inviting suggestions from other officers, began himself to design a scullery which would have the following merits:

"1. Thoroughness in cleansing.

"2. Thoroughness in sanitary handling and scalding.

"3. Foolproof.

"4. Economical in use of fresh water.

"5. Economical in time required.

"6. All dishes, including knives, forks, and spoons to be kept at the scullery between meals.

"The first step in this reorganization was the design of a rack for the knives, forks, and spoons which fits in or attaches to the rack for the plates, and they receive the same cleansing as the plates. The second step was to take an adjoining office for the stowage of all mess gear between meals, without handling the dishes themselves. After numerous experiments, some accepted, many rejected, and many months taken in time, the following is the design now used on the *Texas:*

"The messman first scrapes the rough food into a slop bucket and racks the plates. He then gathers the knives, forks, and spoons, puts them in their racks and takes them with the plates to the scullery. He then returns and racks the cups and bowls and takes them also to the scullery, after which he cleans the compartment, and he can easily do this in the time allowed.

"At the scullery what takes place can best be described by reference to the photographs. (Not reproduced in the Bulletin.) In plate 3 is shown the rough washing machine with a man starting a rack of cups through. The water in this machine is received from the dip tank, and is hot and very soapy, but it also has a steam line

of its own. The water is pumped from the bottom of the machine by two electrical pumps which force two streams of water on top of the dishes and one on the side. Within the machine, under the track for the dishes, is a screen which collects particles of food, but the water keeps constantly in circulation. A rack of plates is also shown, with the knives, forks, and spoons, about to enter the rack for dipping.

"In the center of plate 4 is shown the dip tank and the conveying rack, holding 5 racks of dishes out of the water. The man has hold of an arm which lowers this long rack into the tank. The tank has hot soapy water kept as near the boiling point as possible, usually about 170° F. or over. As one rack of dishes is pushed in at the right another is pushed out at the other end and the dishes are dipped again, thus each rack of dishes is dipped usually four times, sometimes five, and when they work fast it takes 45 seconds to pass this stage. Above the man's head is shown a mechanism, which when completed in a few days will raise and lower the dishes into the tank by steam instead of hand, as shown in the picture. At the extreme left of the plate is shown the rinsing machine, which is the original dishwashing machine and they emerge through the door at the extreme left into the storeroom where they are kept until the next meal. The water in the dip tank is used for about three days without changing. The usual time required for washing the dishes when all the crew are aboard is about 45 minutes. In port, with dinner at 5.30, and liberty parties ashore, the dishes are finished by 6.10. The dishes come into the storeroom as fast as two men can stow them. It is intended ultimately to have a conveyor which will take the racks at their entrance into the washing machine and convey them throughout the process, giving them a uniform speed, and placing them properly.

"The food containers are washed separately, and this has not been quite satisfactory.

"The entire work was done on board by the ship's force, and it is not shown as a finished product, but the results show that dishes can be thoroughly washed and thoroughly scalded in a rapid and practical method. Dishes in various degrees of soiling may be watched throughout the process, a little coming off with each dipping, but eventually they arrive at the storeroom, thoroughly sanitary, and in a satisfactory condition. The tendency of the men in the scullery as they become more proficient is to speed up the process, and in so doing to shorten the time in each step, to push the rack beyond its proper place, and cause rough handling. The latter is not so important, as the dishes are made to stand rough usage, but

the former should be controlled, and hence the necessity of a conveyor to place each rack at its proper place for a uniform time.

"To summarize: Originally six objects were in view in this new design. Five have been attained, but No. 4 is questionable. A liberal supply of water is necessary for cleanliness, and though no less water may be used, none is wasted. The percentage of sick for this ship for the months of December, 1923, and January, February, March, and April, 1924, since the improved type of dish-washing has been tried and experimented with, and that of a year ago are as follows:

December, 1923	0.84	December, 1922	0.85
January, 1924	.62	January, 1923	1.35
February, 1924	.62	February, 1923	2.15
March, 1924	.76	March, 1923	1.46
April, 1924	.48	April, 1923	.81

"This means a saving of 997 sick days in five months. In comparing the above, consideration must be taken into account that a year ago the ship stayed north in Bremerton Navy Yard, with a number of influenza cases on board, and this winter was south in the Carribean, together with questions of exposure and immunity; but comparison is made only for what it is worth. In 1923 the *Texas* had 6 cases of scarlet fever, 160 cases of mumps, 24 cases of measles, 90 cases of influenza, and 190 cases of tonsillitis. In the first four months of 1924 we have had 1 case of measles, 2 of mumps, 24 cases of tonsillitis, and 31 of catarrhal fever (common cold).

"The report of the improved scullery conditions on board the U. S. S. *Texas* was made in May, 1924. The results for the year, as given below, exceed even those given for the first few months in the above-mentioned report.

"Before discussing the statistical data, a brief mention as to what constitutes a sick day will be made. Article 854, Manual of the Medical Department, United States Navy, 1922, has been strictly complied with during 1924 and all men excused from duty for 24 hours or longer, have been regularly admitted to the sick list. Patients on the venereal list have been admitted for record only and have been discharged on the same day under treatment. Three junior medical officers served on the U. S. S. *Texas* during 1924 and held sick call. They had no instructions and only the best interests of the patient and the service were their guide as to who should or should not be admitted.

"Prior to 1924, or at least before the undersigned joined the U. S. S. *Texas*, men were put on the binnacle list and excused from duty without admitting for record, but whatever error would arise

from this practice in the following comparisons would only emphasize the favorable reports for 1924.

"The U. S. S. *New York* is chosen for comparison because she is a sister ship, the cruise for the year has been similar, and by courtesy of her medical officer and being in the same port, her records are available. Moreover, the same custom of complying with article 854, Manual of the Medical Department, United States Navy, 1922, has been practiced on the *New York*. During the first two or three months of 1924 the *New York* was operating under an order to retain on the sick list all venereals, while the U. S. S. *Texas* had no such order. The method of handling the mess gear on the *New York* is to have it washed by hand in the compartment, then taken to the scullery and dipped in a small tank of hot water and stowed.

"Below is given the number of sick days for each month of the year and the number transferred to hospital for the U. S. S. *Texas* for the year 1923; the U. S. S. *Texas* for the year 1924; and the U. S. S. *New York* for the year 1924.

	U. S. S. Texas, 1923		U. S. S. Texas, 1924		U. S. S. New York, 1924	
	Sick days	Transferred to hospital	Sick days	Transferred to hospital	Sick days	Transferred to hospital
January	675	33	271	12	391	9
February	417	51	245	6	449	11
March	582	20	302	13	378	27
April	380	13	196	14	681	43
May	280	10	191	17	365	33
June	223	21	90	1	271	1
July	378	2	173	0	266	0
August	500	12	337	2	436	8
September	594	27	108	2	286	8
October	1,015	8	98	8	195	23
November	383	7	72	13	150	47
December	367	6	64	16	134	28
Total	5,794	210	2,156	104	4,002	238

"The U. S. S. *Texas* for the year 1924 has 3,638 sick days and 106 transferred to hospital less than for the year 1923, and 1,846 sick days and 134 transferred to hospital less than the U. S. S. *New York* for the year 1924. In other words the *Texas* for the year 1924 has only 37 per cent of the sick days for 1923 and 54 per cent of the U. S. S. *New York's* for the year 1924.

"Further analysis, by classes, of the records of the U. S. S. *Texas* for the years 1923 and 1924 is as follows:

	1923		1924			
	Admissions	Sick days	Admissions	Sick days	Increase in sick days	Decrease in sick days
Class II	5	87	2	4		83
Class III	21	97	36	216	119	
Class V	21	105	21	14		91
Class VI	10	14	5	3		11
Class VII	10	79	11	49		35
Class VIII (A)	213	2,250	4	67		2,183
Class VIII (B)	223	1,116	146	563		553
Class X	4	23	3	4		19
Class XI	2	6	3	76	70	
Class XII	159	246	410	289	43	
Class XIII	29	203	27	132		71
Class XIV	4	63	7	73	10	
Class XV	0	0	5	9	9	
Class XVI	36	350	27	170		180
Class XVII	5	12	2	5		7
Class XVIII	3	21	6	21		
Class XIX	7	23	7	25	2	
Class XX	6	34	1	0		34
Class XXI	29	58	14	23		35
Class XXII	10	34	14	57	23	
Class XXIII	0	0	3	3	3	
Class XXVII	2	1	0	0		1
Class XXVIII	0	0	1	2	2	
Miscellaneous	9	46	0	0		46
Injuries	97	926	66	356		570
Total	1,005	5,794	821	2,156	281	3,919

"Tonsillitis acute was transferred from Class V to Class VIII (B), where it is in 1924.

"The great decreases of sick days occurred in Class VIII (A), 'Communicable diseases transmissible by oral and nasal discharges'; Class VIII (B), 'Common infectious diseases of the respiratory tract' and injuries.

"Under Class VIII (A) and Class VIII (B) the following admissions were made on the U. S. S. *Texas* for the years 1923 and 1924 and on the U. S. S. *New York* for the year 1924:

	U. S. S. Texas, 1923	U. S. S. Texas, 1924	U. S. S. New York, 1924
	Number of admissions	Number of admissions	Number of admissions
CLASS VIII (A)			
Cerebrospinal fever	0	2	0
Chickenpox	1	0	2
Diphtheria	1	0	0
Diphtheritic paralysis	0	0	0
German measles	17	0	24
Glanders	0	0	0
Influenza	96	0	9
Measles	27	0	1
Mumps	163	2	40
Pneumonia:			
Broncho	2	0	0
Lobar	1	0	22
Poliomyelitis, anterior, acute	0	0	0
Scarlet fever	5	0	0
CLASS VIII (B)			
Angina, Vincent's	1	2	3
Bronchitis, acute	25	20	25
Catarrhal fever, acute	0	60	69
Tonsillitis, acute	197	60	160

"In making comparisons on the basis of total sick days alone or admissions for infectious diseases alone between two ships, or between the data of the same ship for two years, the validity of the conclusions reached might be affected by a short epidemic of disease, but the 1924 figures for the U. S. S. *Texas* show that for 12 consecutive months the percentages of sick have been less month by month than during corresponding months of 1923, and less than the monthly percentages of sick on board the U. S. S. *New York* during 1924. An epidemic of mumps occurred on board the *Texas* in October, 1923, and the percentage of sick rose on board the *New York* in April, 1924, after the receipt of an infected draft from Newport, R. I. The percentages of sick increased on both ships in August, 1924, during the practice cruise for midshipmen, largely because of inability to transfer a few chronic cases to hospital. Eliminating the epidemics which occurred in October, 1923, and April, 1924, it appears that the health of the *Texas* was consistently better than that of the *New York* for other months of the year, and better for the *Texas* than during the previous year. It is interesting to note that the percentage-of-sick curve of the *Texas* was at a lower level every month than that of the *New York*, and that the two curves paralleled one another except in April, when the *New York* received the infected draft from Newport, R. I.

"The statistics referred to would seem to indicate that clean mess gear decreases the morbidity rate. The absence of any epidemic on board the *Texas* in 1924 and the admission of only two cases of mumps and two cases of cerebrospinal fever, despite the presence

of foci of infection on board, opens up the question as to how much influence sterilization of mess gear has in preventing or limiting the spread of communicable diseases. Only the accumulation of data over a number of years, including periods during which epidemics are liable to occur, will answer this question. It is hoped that the question will be decisively answered in time. Meanwhile, proper attention to mess gear is believed to have a material influence on health conditions, especially on board ship.

"A question has been raised as to the necessity for using soap in the final dip or rinsing stage. It has been our experience on board the *Texas* that a certain amount of soap is absolutely necessary to give satisfactory results with respect to the appearance of the mess gear after drying."

In accordance with a suggestion made by the Bureau of Medicine and Surgery, the Bureau of Construction and Repair in a letter to the commanding officer of the U. S. S. *Texas* informed him of the results of certain experiments which have been conducted under the direction of that bureau during the past year in an endeavor to develop satisfactory equipment for sculleries on board ship, and invited any suggestions which might seem pertinent in view of his experience with the apparatus developed on board the *Texas*.

The Bureau of Construction and Repair reviewed and discussed the subject briefly as follows:

"The present and proposed arrangement of the experimental dishwashing installation on the *Texas*, shown on Norfolk plan No. 30398 (C. & R. No. 120650), was first brought to the attention of the bureau by the commandant of that yard and subsequently by the commander, Scouting Fleet, in reference (*a*) [The circular letter printed above.] These experiments are particularly interesting to the Bureau of Construction and Repair as steps have been taken to develop a thoroughly satisfactory dishwashing equipment for naval purposes. Reports indicated that very few of the 'dip' type machines previously used were in operation. The electrical equipment has been permitted to get out of order and the tanks, if used at all, were used merely for rinsing, the washing having been done by hand at the mess tables which was unsanitary and sloppy.

"Tests conducted at the New York yard on a machine of the spray type indicated that where a sufficient number of jets are employed and plenty of water handled under adequate pressure dishes were thoroughly washed. It was only necessary to provide means for insuring sterilization external to the washing machine. Tests conducted by the Bureau of Medicine and Surgery indicated that immersion in boiling water for not less than one minute insured sterilization. In order to complete the tests on the spray type of machine, a machine was issued to the *West Virginia* for service

test after certain modifications had been made on it by the New York yard.

"As stated in reference (*a*)—the memorandum report printed above—the requisites of a satisfactory dishwashing equipment may be summarized as follows: These specifications include additional requirements added by the bureau:

"(*a*) Thorough cleaning (at the washer).
"(*b*) Sterilization (by immersion).
"(*c*) Fool proof (simplicity).
"(*d*) Economical use of fresh water.
"(*e*) Economy in time.
"(*f*) All dishes and cutlery to be stored in scullery.
"(*g*) Economy in space.
"(*h*) Fore and aft installation to avoid surging of water when ship rolls.
"(*i*) Trolley tracks and other appliances for handling hot dish baskets.

"It is believed that the *Texas* installation fulfills requirements (*a*), (*b*), (*d*), (*e*), (*f*), *and* (*h*). If a better washer were employed there would be no necessity for soap in the sterilizing tank, nor separate rinsing machine after dishes leave the sterilizing tank. This would economize in space. It does not appear desirable to lift and lower all baskets in the sterilizer tank every time a basket is passed in or out. This process may assist in washing but retards sterilization. The steam-operated rack is ingenious and is economical, presuming that the exhaust steam is used to assist in heating water. It would seem better if the sterilizing tank were wide enough to take two lines of baskets so as to allow baskets to remain submerged for a longer period. A hand-chain hoist possibly with differential purchase should suffice for lowering baskets from washer into tank. A continuous moving chain belt might be used to move the baskets through the tank and another chain hoist, possibly power operated, provided at the delivery end for lifting baskets out of tank where they could be hooked on to trolleys. An overhead track, making a circuit from the delivery end of tank to and along all storage racks thence back to tank with several trolleys, would be necessary for handling the hot baskets.

"The bureau would be pleased to have the above suggestions considered and comment submitted with a view to improving the present arrangements provided generally for the washing and sterilization of crew's mess gear. If any of the suggestions made are concurred in by the commanding officer and are within the capacity of the ship's force to perform, it is suggested that the changes be made and the bureau furnished with a further report on operation. The reports received will be considered in connection with reports on the experimental installation on the *West Virginia*."

NOTES OF PUBLIC HEALTH INTEREST FROM THE UNITED STATES NAVAL TRAINING STATION, NEWPORT, R. I.

There were no epidemics of communicable diseases occuring at this station during the year. A study of the public health reports shows that in the various States from which the station obtains recruits communicable diseases were present in large numbers during the entire period covered by this report. The diseases reported as being prevalent among the civilian population were chickenpox, diphtheria, measles, German measles, scarlet fever, mumps, and pneumonia. The diseases present to a less prevalent degree were: Typhoid fever, encephalitis epidemica, cerebrospinal fever, poliomyelitis, influenza, and whooping cough. With this formidable array of communicable diseases prevalent among the civilian population it was anticipated that the appearance of some or all of them at this station would be very probable. The extent to which the training station was affected by epidemiological conditions in civil life is reported in the following table of the occurrence of communicable diseases during the past year:

Cerebrospinal fever (meningococcus)	0
Chickenpox	0
Diphtheria	1
Encephalitis epidemica	0
German measles	20
Influenza	3
Measles	3
Mumps	4
Pneumonia	2
Poliomyelitis	0
Scarlet fever	21
Typhoid fever	1
Hiccough epidemic	19

Diphtheria occurred in one case which was transferred under the clinical diagnosis of tonsillitis acute. The diagnosis of diphtheria was made at the naval hospital, Newport, R. I., upon the results of a laboratory examination.

German measles occurred in 20 cases, 10 of which developed in the month of January. Mumps occurred in but 4 cases. Scarlet fever developed in 21 cases during the months of March, June, July, August, and November.

Typhoid fever. One case of this disease occurred in a recruit soon after he reported at the station. The diagnosis was established at the naval hospital, Newport, R. I. Infection in this case occurred prior to his enlistment. Epidemic hiccough occurred in 19 cases during November, 1924, at a time when this condition was epidemic among the civilian population. There were no cases of cerebrospinal fever at this station during 1924.

Measures adopted for the prevention and control of communicable diseases.—Ventilation of buildings; 21 days' segregation of recruits; antityphoid inoculation; sterilization of mess gear; head-to-foot sleeping in all barracks; routine instruction to all recruits in personal hygiene; and the issue of sanitubes. Instruction was given to all recruits regarding the dangers of "droplet infection" from coughing and sneezing. The control of epidemic diseases was effected, in addition to these measures, by early recognition and isolation of cases; quarantine of all contacts; burning of mouth pieces of the sanitary scuttle butts; thorough ventilation; the airing of bedding and the propagation of bulletins of instruction to all company commanders. The laboratory of the medical department has been of increasing service in preventing the occurrence of communicable diseases. All incoming recruits were examined for meningococcus carriers at the naval hospital, Newport, R. I., until July 1, 1924, when the development of the laboratory at this station permitted this work to be done here as a routine measure for the prevention of cerebrospinal fever. In September this work was broadened to include laboratory examinations for carriers of diphtheria and scarlet fever. Several carriers of the meningococcus and the streptococcus hemolytica have been detected and isolated within 30 hours after arriving at the station. It is evident that these procedures have been largely instrumental in preventing the occurrence of cerebrospinal fever and in limiting the number of scarlet fever cases. The use of the Dick test in connection with limiting the period of quarantine of contacts with scarlet fever cases was first practiced in November, 1924.

The study of conditions in connection with the continued appearance of scarlet fever from time to time among the apprentice seamen quartered in barracks "B" and "C" resulted in the belief that the source of infection might be in the mess hall of barracks "B," which was used in common. Investigation showed that the manner of sterilizing mess gear was at fault. Upon the recommendation of the medical officer a large steel tank lined with steam coils was installed in the scullery of barracks "B" for the effective sterilization of the mess gear. This tank was placed in operation in the early autumn, and excellent results have followed its use. The efficacy of limiting the spread of communicable diseases by sterilization of mess gear is a well-recognized principle at this station. All mess gear is thoroughly cleansed in dish-washing machines before being effectively sterilized in boiling water after each meal. The reduction of the total number of tonsillitis acute cases from 465 in 1923 to 171 in 1924 demonstrates the value of effective measures for the sterilization of mess gear.

The clothing is generally satisfactory with the exception of the jersey, which is too loosely knit and is found to be lacking in durability.

The ration has been of excellent quality, well balanced, and properly prepared for human consumption. The proposed menu is viséed by the medical officer each week before final approval by the commanding officer.

Recruiting has been uninterrupted during the month of December; a total of 245 recruits were received for this period. With the understanding that selective recruiting for quality was to be the rule, the recruits received during December were found to be disappointingly low in general average. In general physique, with certain exceptions, they were very good. Nine men, however, were awarded inaptitude discharges upon the recommmendations of the board of review. Three recruits with epilepsy and one with dementia praecox were transferred to the naval hospital for further disposition by boards of survey. Seven recruits deserted and 14 were discharged as undesirable. The average intelligence determined by the Stearns test was found to be below the median rate for the past 10 months. The above statements regarding the incoming recruits are the most adverse that have been issued from this office during the past two years.

The morale of the station is maintained by the encouragement of indoor athletic sports, moving pictures, amateur nights, choral singing, library and writing facilities, regular liberty, leaves of absence, educational opportunities, and church services.

STATISTICS RELATIVE TO MENTAL AND PHYSICAL QUALIFICATIONS OF RECRUITS

The following tables were constructed with figures taken from monthly reports submitted by boards of review at naval training stations:

All naval training stations

CUMULATIVE DATA FOR NOVEMBER AND DECEMBER, 1924, AND JANUARY, 1925

	Number	Per cent of recruits received	Per cent of recruits reviewed
Recruits received during the months	4,123		
Recruits appearing before board of review	158	3.83	
Recruits recommended for inaptitude discharge	126	3.06	79.75
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	32	96.94	20.25

United States naval training station, Hampton Roads, Va.

JANUARY, 1925

	Number	Per cent of recruits received	Per cent of recruits reviewed
Recruits received during the month	339		
Recruits appearing before board of review	8	2.36	
Recruits recommended for inaptitude discharge	8	2.36	100.0
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	0	97.64	0

United States naval training station, Great Lakes, Ill.

JANUARY, 1925

Recruits received during the month	507		
Recruits appearing before board of review	31	6.11	
Recruits recommended for inaptitude discharge	24	4.73	77.42
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	7	95.27	22.58

United States naval training station, San Diego, Calif.

JANUARY, 1925

Recruits received during the month	604		
Recruits appearing before board of review	12	1.99	
Recruits recommended for inaptitude discharge	10	1.66	83.33
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	2	98.34	16.67

United States naval training station, Newport, R. I.

JANUARY, 1925

Recruits received during the month	390		
Recruits appearing before board of review	7	1.79	
Recruits recommended for inaptitude discharge	7	1.79	100
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	0	98.21	0

HEALTH OF THE NAVY

This report is based on figures received from ships and naval stations for the month of March, and upon statistical data compiled from Form F cards covering admissions to the sick list during the month of January, 1925. Communicable disease reports from ships reaching the bureau not later than the 15th day of the current month are available for study in connection with this summary. Reports from 60 of 75 ships listed as comprising the Battle Fleet were received without delay. Of 71 vessels assigned to the Scouting Fleet, 65 forwarded reports in time for use.

Morbidity reports already are beginning to reflect the approach of seasons more favorable to health. So far as the acute respiratory infections are concerned, there appears to have been a lower incidence in March than in February, among forces afloat, and at shore stations in the United States attack rates were no higher than during the previous month. Ships of the Battle Fleet and Scouting Fleet notified 110 cases of influenza. The expected incidence for the average number of ships reporting, based on the median experience of the past five years, would be from 175 to 200 cases. Of the 110 cases reported by ships, 52 occurred on board the U. S. S. *Seattle*. There was nothing noteworthy regarding the prevalence of acute tonsillitis, acute bronchitis, and catarrhal fever. Four cases of pneumonia were notified by ships, as compared with an expectancy of seven or eight.

Mumps has been more or less prevalent this winter among forces afloat, but admissions in March amounted to less than half the expected number. This, apparently, is not a measles year in most American cities. Only 4 cases were notified by ships, and 26 by shore stations in the United States. Twenty-four of the 26 cases occurred at the naval training station, Hampton Roads, Va., among men in trade schools who were on a regular liberty status and presumably were exposed in Norfolk, Va. No case of diphtheria, typhoid fever, or smallpox was reported in March. With the exception of eight cases of scarlet fever at the United States naval training station at San Diego, Calif., this disease was not reported in significant numbers.

The following table shows provisional admission rates per 1,000 per annum, entire Navy, for the principal communicable diseases for January, 1925, together with corresponding median rates for the same month, 1920 to 1924, inclusive.

	January, 1920–1924	January, 1925
Cerebrospinal fever	0	0
Diphtheria	1. 45	1. 02
German measles	.38	.10
Influenza	40. 11	28. 60
Malaria	13. 88	17. 16
Measles	14. 36	.92
Mumps	10. 45	4. 60
Pneumonia	5. 58	4. 18
Scarlet fever	3. 20	1. 43
Smallpox	.19	0
Tuberculosis	4. 04	1. 12
Typhoid fever	.10	0

TABLE No. 1.—*Summary of morbidity in the United States Navy and Marine Corps for the month of January, 1925*

	Forces afloat	Forces ashore	Marine Corps	Entire Navy
Average strength	76,964	40,504	20,695	117,468
All causes:				
Number of admissions	3,633	2,589	1,140	6,222
Annual rate per 1,000	566.45	767.04	661.06	635.61
Disease only:				
Number of admissions	3,260	2,381	1,053	5,641
Annual rate per 1,000	508.29	705.41	610.61	576.26
Communicable diseases, exclusive of venereal disease:				
Number of admissions	1,185	1,228	750	2,413
Annual rate per 1,000	184.77	363.82	434.82	246.50
Venereal diseases:				
Number of admissions	1,098	308	202	1,406
Annual rate per 1,000	171.20	91.25	117.14	143.63
Injuries:				
Number of admissions	368	183	87	551
Annual rate per 1,000	57.38	54.22	50.45	56.29
Poisoning:				
Number of admissions	5	25	0	30
Annual rate per 1,000	.78	7.41	0	3.06

TABLE No. 2.—*Deaths reported, entire Navy, for the month of March, 1925*

	Navy (strength, 96,773)	Marine Corps (strength, 20,695)	Total (strength, 117,468)
Meningitis, cerebral	1	0	1
Malaria	1	0	1
Pneumonia, lobar	3	0	3
Tuberculosis, chronic pulmonary	1	0	1
Malignant growths	1	0	1
Other diseases	11	0	11
Drowning	2	0	2
Accidents and injuries	9	0	9
Poisoning	1	0	1
	30	0	30
Annual death rate per 1,000, all causes	3.72	0	3.06
Annual death rate per 1,000, disease only	2.23	0	1.84

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Washington, March 20, 1907.

This UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

Owing to the exhaustion of certain numbers of the BULLETIN and the frequent demands from libraries, etc., for copies to complete their files, the return of any of the following issues will be greatly appreciated:

Volume VII, No. 2, April, 1913.
Volume VIII, No. 1, January, 1914.
Volume VIII, No. 3, July, 1914.
Volume VIII, No. 4, October, 1914.
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PREFACE

The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April, 1907, as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, reports from various sources, historical essays, notes and comments on topics of medical interest, and reviews, or notices of the latest published medical books.

The bureau extends an invitation to all medical officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit, the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit and will recommend that copies of such letters be made a part of the official records of the officers concerned.

The bureau does not necessarily undertake to indorse all views or opinions which may be expressed in the pages of this publication.

E. R. STITT,
Surgeon General, United States Navy.

NOTICE TO SERVICE CONTRIBUTORS

Contributions to the BULLETIN should be typewritten, *double spaced*, on plain paper, and should have wide margins. Fasteners which will not tear the paper when removed should be used. Nothing should be written in the manuscript which is not intended for publication. For example, addresses, dates, etc., not a part of the article, require deletion by the editor. The BULLETIN endeavors to follow a uniform style in headings and captions, and the editor can be spared much time and trouble, and unnecessary changes in manuscript can be obviated, if authors will follow in these particulars the practice of recent issues.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received two months prior to the date of the issue for which they are intended.

The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustrations, if not original, should be accompanied by a reference to the source and a statement as to whether or not reproduction has been authorized.

The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc. All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.*

U. S. NAVAL MEDICAL BULLETIN

VOL. XXII JUNE, 1925 No. 6

SPECIAL ARTICLES

PERNICIOUS ANEMIA

By J. B. POLLARD, Lieutenant Commander, Medical Corps, United States Navy

Whereas pernicious anemia has in all probability been an affliction of mankind for thousands of years, it was not until comparatively recently that Addison clearly described the condition and for want of a better term called it idiopathic anemia. The best definition of the disease is that of Cabot, who described it as a chronic and usually fatal malady of unknown origin, producing, especially in elderly men, paroxysms of intense anemia and usually degeneration of the spinal cord.

That pernicious anemia exists as a separate and distinct disease entity there can be no doubt, for, if we eliminate the severe anemias of known origin, there is still left quite a large percentage of cases with a very definite pathology but for which we can find no causative agent. There are good reasons to believe that the disease is not very uncommon, that it is not confined to any particular race or locality, and that it is not hereditary. Its prevalence no doubt depends in a large measure upon the special training of members of the medical profession in its recognition.

ETIOLOGICAL FACTORS

Age.—In Cabot's collection of 1,200 cases it was strikingly demonstrated that the vast majority occurred between the third and sixth decades, the actual figures showing only 129 prior to and 922 after the thirty-fifth year. At least 50 per cent of all cases occurred between the fortieth and sixtieth years. One hundred and seventeen cases analyzed by Panton, Jones, and Riddoch showed an average age of 48 with extremes of 20 and 68, respectively.

Sex.—The best available statistics show the disease to be twice as common among men as among women, one authority claiming that out of 1,157 cases 723 were males and 434 females.

Before entering upon a discussion of the pathology of the disease it might be well to consider some of the supposed etiological factors. Pregnancy and the puerperal state are frequently implicated and during these periods a very grave anemia may develop, but it seems

only reasonable to infer that the hemolysis is a result of a definite toxemia originating during pregnancy and manifesting itself not only in this manner but also in nephritis, eclampsia, or pernicious vomiting. Again, if we accept the age and sex incidence of pernicious anemia, pregnancy and the puerperal state are obviously eliminated.

Syphilis and malaria at times produce a pernicious type of anemia, but here again we have a definite cause and a group of clinical manifestations which are entirely different from the cryptogenetic cases.

Atrophy of the gastric tubules, chronic diarrhea, and nervous shock have been considered as causative agents, but, in view of the fact that these conditions are frequently associated with well-recognized cases of pernicious anemia, it is more tenable to hold that they are results rather than causes of the disease.

Small hemorrhages extending over a long period of time will present a clinical picture quite suggestive of pernicious anemia, but a study of the blood will invariably show changes quite at variance with those found in that disease.

PATHOLOGY

The pathological findings as demonstrated at autopsy give evidence of the action of some powerful poison upon the body tissues, with special predilection for the blood, spinal cord, heart, liver, and kidneys. As a result of the hemolytic action of the poison upon the blood there is a compensatory effort on the part of the bone marrow to supply the much-needed red cells, which in turn produces degenerative changes whereby the fatty portions of the marrow are largely supplanted by active blood-forming tissue which strongly resembles the fetal type. Besides this evidence of hemolysis there is a very striking accumulation of iron pigment in the liver, spleen, and lymph glands. Sclerotic changes are present in the spinal cord in at least 80 per cent of all cases. These degenerations are confined chiefly to the posterior columns of the cervical region of the cord. Fatty degeneration is always present in the heart, liver, and kidneys, and is strikingly characteristic in the heart, particularly in the papillary muscles, where the surface is covered with yellow spots the size of a pinhead. The bone marrow shows typical megaloblastic degeneration and macroscopically presents a bright red color, while in consistency it is very soft. At the same time that megaloblastic changes are in progress there is an associated leukoblastic activity, with a striking increase in number of the nongranular, mononuclear, basophilic cells and to a lesser degree of the granular myelocytes and polynuclears. The spleen is small and sclerotic and remarkably

poor in cells, particularly red corpuscles. Pigment is abundant and can sometimes be seen with the naked eye. Due to the fact that the pathological changes are so pronounced and characteristic in the blood, we are prone to think of pernicious anemia as purely a blood disease; but, as Cabot points out, this is untenable, since the spinal cord frequently shows evidence of degenerative changes, more pronounced and occurring earlier than those of the blood. The fatty metamorphosis of the heart, liver, and kidneys is not to be explained as a result of the anemia. It is much more likely that the anemia, the spinal lesions, and the fatty changes are coordinate manifestations of the same unknown poison. The general symptoms, weakness, dyspnea, etc., do not always get better as the blood improves nor worse as the blood deteriorates.

SYMPTOMS

In 95 per cent of all cases the onset is extremely insidious and as a general rule the individual is unable to state with any accuracy when he was first taken ill. The subjective symptoms occur in the following order: Muscular weakness, dyspnea, palpitation, headache, vertigo, tinnitus, anorexia, and edema. These symptoms, however, are not solely confined to the pernicious type of the disease, and may and do occur in other forms of anemia. There are, however, certain symptoms which are more or less peculiar to pernicious anemia, such as gastrointestinal crises, steady or paroxysmal diarrhea, sore mouth, and those referable to disease of the spinal cord, such as numbness, tingling, and other abnormal sensations in the hands and feet. In some cases a spastic gait develops, with increased reflexes and a certain degree of paralysis, while in others there is an ataxia with diminished reflexes showing a marked resemblance to tabes. Occasionally there is in evidence a condition simulating a diffuse myelitis, with complete paralysis of the extremities and loss of sphincter control. Mental symptoms as a rule are not prominent and there is very little psychic disturbance. A number of cases, however, have been reported suffering from delusions, hallucinations, and dementia, but no doubt if a careful history were taken it would become apparent that the mental disturbances were in evidence prior to those produced by the anemia. Gross hemorrhage is rather infrequent but does occur in about 20 per cent of cases; on the other hand, retinal hemorrhage is quite frequent, as are also small petechiæ on the serous surfaces.

Addison, in his monograph, gives perhaps the best description of the disease to be found in literature, and the following is a literal quotation from his paper. "It makes its approach in so slow and insidious a manner that the patient can hardly fix a date to the

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earliest feelings of that languor which is shortly to become so extreme. The countenance gets pale, the whites of the eyes become pearly, the general frame flabby, rather than wasted, the pulse perhaps large, but remarkably soft and compressible and occasionally with a slight jerk especially under the slightest excitement. There is an increasing indisposition to exertion, with an uncomfortable feeling of faintness or breathlessness in attempting it; the heart is readily made to palpitate; the whole surface of the body presents a smooth blanched and waxy appearance; the lips, gums, and tongue seem bloodless, the flabbiness of the solids increases, the appetite fails, extreme languor and faintness supervene, breathlessness, and palpitation are produced by the most trifling exertion or emotion; some slight edema is probably perceived about the ankles; the debility becomes extreme, the patient can no longer rise from bed; the mind occasionally wanders, he falls into a prostrate and half torpid state and at length expires; nevertheless to the very last and after a sickness of several months' duration the bulkiness of the general frame and the amount of obesity often present a most striking contrast to the failure and exhaustion observable in every other respect."

DIAGNOSIS

From a diagnostic standpoint a case such as described above presents very little difficulty, but, on the other hand, unless one is on the lookout for the disease, it is quite possible to miss absolutely the diagnosis in the early stages, and it is during this period that so many mistakes are made, due chiefly to the fact that the physician failed to study the blood picture, thereby missing the key to the whole situation. If a patient presents himself complaining of muscular weakness, dyspnea, vertigo, palpitation, and headache, our attention should be immediately centered upon some circulatory disturbance. If upon a physical examination the skin presents a lemon tint, the tongue appears sore around the tip and edges or shows an atrophy of the papillæ, if there is no wasting of the body tissues, but an unlooked-for preservation of the subcutaneous fat, a pallor of the lips and conjunctiva, an achylia, and a history of digestive disturbances, usually a diarrhea, pernicious anemia should at once be suspected and a study of the blood by a competent pathologist undertaken in order to establish the diagnosis. Other symptoms, such as hemic murmurs, unusual vascular pulsations, particularly in the carotids, and edema are frequently present and aid in making a diagnosis, but it is only through the blood findings that the pathognomonic features are indicated.

Blood.—In studying the blood of pernicious anemia cases, Haldane and Smith were the first to note the decrease in the total quantity of blood in the body. In making a puncture for blood study it is observed that the drop is highly colored, due to the relative increase in hemoglobin, and that there is an abnormal fluidity. As the relative hemoglobin content is high the color index is above 1, except during periods of remission, when it may go below 1. Dr. A. F. Hurst, of London, states that "The most characteristic features of the blood in Addison's anemia are now recognized as being the great inequality in the size of the red corpuscles—the anisocytosis—due to the presence of microcytes and megalocytes and the increase in their average size, in spite of the presence of some cells far smaller than the smallest cells found in normal blood."

Polychromatophilia and stippling are frequently present, but are not absolute diagnostic features, as they are also found in other diseases, particularly lead poisoning. Megaloblasts and normoblasts are present in at least 90 per cent of all cases. The red blood cells vary from 5,000,000 to 143,000 per cubic millimeter, the latter being the lowest count on record. The white blood count is normal or subnormal. A differential count shows a relatively high percentage of lymphocytes and a low polynuclear percentage. Megalocytes are frequently present and blood platelets are usually very low.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis must of necessity be made by exclusion if we hold to our original premise of an unknown causative agent, and we must exclude all of the anemias due to well-recognized causes.

I. Anemia due to intestinal parasites. Examine stools for ova of hookworm and the broad Russian tapeworm.

II. Secondary anemias such as occur in gastric cancer, chronic hemorrhage (piles), malaria, dysentery, etc. These conditions as a rule can readily be eliminated through a blood examination. The color index is lower, the red cell count is higher, and the red cells are smaller and paler; the nucleated red cells are of the normoblastic rather than the megaloblastic type.

III. Aplastic anemia. The course of the disease is acute; it occurs much more frequently in females and, as a rule, in early adult life; there are no remissions and an early fatal termination may be expected. Hemorrhages occur more frequently and are more profuse, the blood shows a low color index, an absence of nucleated red cells, and a lymphocytosis ranging from 80 to 90 per cent.

TREATMENT

Treatment should be directed toward the removal of all possible sources of infection and the application of broad therapeutic principles in which *rest* under the best hygienic surroundings plays a most important rôle. Good, nutritious, and easily digested food is of paramount importance. Drugs are of very little value, but the time-honored idea of administering arsenic in some form is to be commended, as it apparently has some alterative action which appears to be beneficial. Transfusion has been tried in a great many cases with indifferent results and the best that can be said for it is that improvement following its use is temporary and that it can only be looked upon as a palliative measure.

During the past 10 years splenectomy has received considerable attention and at present there are a number of men who advocate this method of treatment. H. A. Giffin and T. L. Szlapka of Rochester, Minn., give the following summary in 50 cases operated upon between 1917 and 1921:

1. The operative mortality was 6 per cent.
2. Ten patients who recovered from operation lived three years or longer.
3. Five have survived more than four and one-half years and are still living.
4. Splenectomy produced immediate remission and prolonged life in at least 20 per cent of the cases.
5. We can not satisfy ourselves that any particular preoperative characteristics of the disease are indicative of favorable results following splenectomy. However, in the type of case in which there is evidence of active hemolysis, the patient shows a more marked immediate improvement.
6. Splenectomy may be recommended in pernicious anemia where, in view of all the circumstances, personal as well as medical, the possibility of the prolongation of life appeals to the family and to the patient. Occasionally the operation may be performed to bring about an immediate remission.

CASE REPORT

C. J., white, male, age 53.

Family history.—One brother died of carcinoma of throat; one sister living, but is a sufferer from Bright's disease; otherwise family history is negative.

Past history.—Had the usual childhood diseases, but no complications. Had always considered himself a very healthy individual except for occasional digestive disturbances. No history of venereal infection; no nycturia nor frequency.

Present illness.—As nearly as the patient is able to remember, his present illness began in March, 1922, with headache, chilliness, dizziness, blurring of vision, and fever. These symptoms persisted for three or four days and were followed by diarrhea and marked prostration and he was confined to bed for two months. The diarrhea persisted for two weeks and the stools were blood tinged. During the past four months there has been no diarrhea, but he has been getting progressively weaker and gradually losing strength and energy. At present he complains of general weakness, dyspnea, cardiac palpitation, and tinnitus.

Physical examination.—The patient presents a typical picture of pernicious anemia. He appears ill, but you are immediately struck by the fact that there is no apparent loss of weight. There is marked pallor of the skin and mucous membranes and the former is lemon tinted, but pupils are equal, regular, and react to light and in accommodation; the scleræ present a pearly white appearance, and there is a slight puffiness of the lower lids. There is no pathology in the nose and throat; the teeth are bad, and there is quite a severe gingivitis. The tongue shows marked degenerative changes, with atrophy of the papillæ and an inflammatory line around the tip and edge. The muscles are soft and flaccid, and there is an abundance of subcutaneous fat. The lungs are negative; the heart sounds are weak and distant, but no murmurs can be detected; the area of cardiac dullness is slightly increased in all diameters. There are apparently no arteriosclerotic changes, blood pressure is systolic 104, diastolic 60; slight edema of ankles is present. Temperature normal, pulse 106, respiration 20. Reflexes are normal, and there is no evidence of psychic disturbance.

Laboratory findings.—Urinalysis, normal; red blood count, 1,300,000; hemoglobin, 65 per cent; color index, plus 2; poikilocytosis, anisocytosis, polychromatophilia, marked; a few megaloblasts and normoblasts are present; white blood count, 3,700. Blood Wassermann, negative. Achylia not present. Free HCl, 30 degrees. Stools negative for parasites and ova.

Treatment.—Treatment consisted of rest in bed, nutritious diet, and sodium cacodylate, grs. 2, daily for eight days; this was supplemented by Fowler's solution t. i. d. for a period of two months, and removal of focal infection (teeth). During the time of observation and treatment, covering a period of 10 months, the patient gradually improved, and from March 21 to May 23 the red-blood count was persistently above 5,000,000 and hemoglobin from 80 to 90 per cent. From this time on until he returned to duty, November 3, 1923, the red cells averaged 4,000,000 and the hemoglobin 80 per cent.

THE BIOLOGICAL EFFECT OF RADIATION

By G. U. PILLMORE, Lieutenant, Medical Corps, United States Navy

There has been a revival in radiophysiology since the construction of X-ray apparatus with which it is possible to force more penetrating rays into the tissues. Heretofore, with the inability to force sufficient therapeutic rays into the deeper structures, investigations have been confined largely to the practical limits of superficial treatments. The chief dependence for therapeutic effect in treating superficial cancer has been placed upon the idea of caustic rather than of selective dosage. More recent results obtained in treating deep-seated malignancy without the caustic destruction of everything in the path of the rays, has brought forth anew the biological investigation of radiosensitivity of cells and the physiological ramifications of the subject.

There are about as many hypotheses advanced concerning the action of radiation upon the living cell as there are investigators of and writers upon the subject. It seems to be difficult at times to dig out logical information concerning the subject from many writers who have expatiated freely and daringly about something concerning which, from a biological standpoint, they have made no special investigations. They have obtained results by using the new form of deep therapy, as has everyone who has applied it as correctly as his knowledge permits, and consequently many writers have been heralding their results as the "Hax Pax Max" of the medieval wizard when describing the biological effects which have taken place in tumors irradiated.

Some X-ray clinics in this country were set agog when deep-therapy machines were first installed, because of reports from Europe of results heretofore never attained with the use of the X rays. There was a quick reaction, however, when some of the effects upon the patient were noted.

The physical characteristics and the measurement of dosage of the short rays held chief attention and, at present, the estimation of the dose is fairly accurately measured for practical purposes.[1] Just how much to give and what the biological effects on the living cell are, seem to be the most difficult problems. As these biological effects have become better appreciated, we are arriving at the realization that the problem is not so simple as the conception "lethal dose" has led some to believe. It is impossible to say that a certain percentage of an erythema dose should be administered to this or that type of tumor. There are certain bodily reactions which radiation produces that are out of proportion to any set lethal dosage and which have a most decided influence.

[1] See "Deep X-Ray Therapy," Pillmore, U. S. Nav. Med. Bulletin, November, 1923.

It seems to be the general opinion that surgery has reached its highest point in the treatment of cancer. Therefore, the biological effects following radiation warrant exhaustive study in the hope of increasing our effective measures against cancer.

The physiological chemist in his expert field, searching for the chemical processes within living organism; the pathologist with his vast knowledge of cancer; the physicist accurately determining quality dose administration; the clinician with his general knowledge concerning the phases of cancer in the body; the surgeon with his technical skill and judgment; and the biologist with his knowledge of the activities of living organism, together must solve the problems of radiation. This investigation so intricately involves the power of analysis of each specialist that the combination is inseparable. The situation does look brighter, however, for we are now in a better position to treat cancer than ever before. There are indications that along the lines of radiation much advance is to be looked for.

It is of interest to know what numerous investigators are doing in this field of work and to what stage the work has advanced for practical purposes. However, it is a ponderous task to delve into the great mass of literature and bring forth the conspicuous points for digestion unless one has a more or less general knowledge of radiation, physics, etc. With a view to relief from such difficulties, it is believed that a nontechnical sketch of the most important investigations may be of interest to the naval surgeon busy in other activities.

Cancer is one of the most common causes of death, and this problem must receive more of our attention than heretofore because naval hospitals have been opened to veterans. As time goes on and as age brings these individuals to the threshold of greater susceptibility to cancer, so will the cancer problem increase in the service.

What is the action of radiation upon the living cell and how does it take place? This question is the foundation of the biological investigations.

Regaud, in his studies of the action of radiation upon the testicles of mammals and in cancer, has contributed notable evidence in regard to radiosensitivity of cells. Testicles, varying in size from those of a rat to those of a ram, were treated by radiation in such a manner that the action was limited to the spermatogones in the seminal tubules. (The spermatogones are described as the ancestors of all the seminal cells.) The other tissues in the testicle were not injured. When radiation was not sufficient, some spermatogones survived and after several months the seminal tubules were repopulated.

The chromatin of the spermatozoids showed no morphological changes but the hereditary substance therein was injured by the rays. Eggs fertilized by these spermatozoids resulted in abortion or production of monsters.

Spermatogonia were extremely radiosensitive in an individual in full spermatogenic activity but refractory in the immature individual.

The conclusions from these observations were that: "There really exists, not only between different organs, between different tissues of the same organs, between different cell types of the same tissues, but also between different physiological phases of the same cellular species, differences in radiosensitivity."

He confirmed the proofs of other observers that "The time of cellular division is the moment of greatest radiosensibility of cell." The difference in radiosensitivity between cellular species and cells in the process of division was emphasized as the fundamental basis on which destruction of cells by radiation was most important.

It was important to destroy only the cells that reproduced the germ cells. The more penetrating the rays became, just so much selective effects were to take place instead of necrotizing effects. It was the greater penetrating power of the gamma rays of radium which accounted for better results in some tumors of low radiosensibility. The sensitive cells in the tissues responded as if the rays acted directly upon them.

Selective radiation of an ovary and a thymus produced, histologically, no trace of a vascular lesion or sclerosis of connective tissue. The same rule would apply to cancer. Caustic doses, not selective in character, would damage blood vessels and fine network connective tissue. Leucocytes appeared in an area treated only to remove the débris subsequent to the death of cancer cells. Unless the mother cells in a cancer were selectively destroyed, the cancer would continue to grow. There was a difference in sensitivity among the mother cells of the same cancer, because like cells passed rhythmically through periods of sensitiveness or resistibility. He deduced from this fact that the duration of the treatment of a tumor had an important bearing upon the cure.

No anatomical element was absolutely resistant to radiation. The least resistant anatomical elements were those that preserved the capacity for reproduction. Muscular, nervous, and connective tissue were more resistant. Plasma, fluids, bone, and cartilage were not changed in form, but underwent a biochemical change. Radiation to excess would cause necrosis in all the above groups.

There was a progressive decrease in radiosusceptibility of tissues as a result of nonsterilization doses. The single protracted dosage with radiation was the best. Regaud believed strongly in the War-

ner hypothesis which states that: "The susceptible cells are not directly acted upon by the rays, but that they are poisoned." This poison by radiation was liberated from the plasma or the substances in which the cell rested.

The life peculiarities of a particular tumor should receive dosages accordingly. Treatment was most effective if continuous and extended over 6 to 10 days. The proper selective action of X rays upon cancer called for more penetration from higher voltage machines and higher potential tubes.

Mavor has presented an extensive study of the effect of radiation upon the chromatin of the nucleus. He used the fruit fly in his investigations.

The resistance to radiation of the fly at various stages of its life was first determined, the unit being the dose sufficient to kill 50 per cent of the flies within five days. The resistance increased with the age of the fly.

At the time of emergence of the adult fly, resistance to death from radiation was nineteen times as great as at the time of the larval period. The resistance gradually increased between the larval and adult life periods. This substantiated the theory that actively growing tissue was most sensitive to the effects of radiation. Different temperatures had no effect on the results.

The spermatozoa were most susceptible at the time that the chromosomes (bodies from the chromatin as a result of cell division and reproduction) became arranged in pairs previous to the first maturation (growth period). The same applied to the chromosomes of the ovum. Virgin female fruit flies treated with minute doses produced a few offspring at the beginning of the reproductive period and then became sterile for five or six days.

From a study of the chromosomes of the ovum and the spermatozoa, Mavor was able to determine when a male or female offspring would develop. Application of the X rays at different periods of arrangement of the chromosomes had a specific effect on the hereditary development of the flies which was permanent and was transmitted through successive generations. This consistent influence of the X rays might possibly influence heredity in the human by means of an external agent.

Murphy, in his investigations at the Rockefeller foundation, presents experiments which decrease some of the confidence held in the sensitiveness of cancer cells to Roentgen rays. Mouse tumors irradiated for long periods *in vitro* when transplanted into normal mice grew as well as nonirradiated controls, whereas if they were transplanted into the skin areas which had been previously irradiated they failed to grow. The cancer cells implanted in a treated area of

skin showed a series of degenerative changes identical with the frequently described stages of cancer cell degeneration following direct radiation which is generally interpreted as proof of the direct action of radiation on the cells. Apparently the conclusions were that the main effect of radiation of tumors was due to the reaction set up in the surrounding healthy tissues rather than to any direct effect upon the tumor cells.

Murphy at first used transplanted cancer in his mice and later used spontaneous malignant growths. These were very virulent growths. In his article he does not give the exact measurement of dosage used in these experiments. The work of Mavor and Regaud outlined above showed that the estimate of dosage was vital in what they found to be the sensitiveness of certain cells to radiation. Of course the chromosomes of Mavor's flies and the spermatogones of Regaud's testicle investigations are of an entirely different type of cell organization from that of the cancer cell in Murphy's mice experiments. Murphy must necessarily have had to use a much different X-ray technique.

Ewing points out that radiation acts in three ways; an autolytic effect most conspicuous in the embryonal forms of tumors; a caustic or destructive effect which can be compared to the removal of a growth by surgery; and a restraining effect where the tumor cells are replaced wholly or in part by connective tissue. Murphy could not use the first two effects. He had to work only with the last upon which are pinned the hopes of many investigators. One can see the necessity in such a situation of having an expert physicist estimate what is being delivered and a biologist investigate why irradiated cancer cells transplanted in tissue previously irradiated do not grow and do grow in tissues not irradiated. What cell chemistry was upset in normal tissues irradiated so that cancer cells previously irradiated could not find the proper nourishment there to flourish? Did these cancer cells die as a result of toxic agents liberated from normal tissue following radiation? Was death of the cancer a combination of results from poisons liberated from both cancer and normal tissue after radiation?

"Theory is the flower, not the root of experience," said Hippocrates. "In both is embodied the reaction of practical reason against shallowness and theoretical excess. Both, in the midst of obscurity, morbid speculation, and fruitless hypercriticism, stand for the golden mean in thought leading to naked truth." In this light let us weigh theories advanced concerning the ultimate biological effects that take place in a cell following radiation.

Dessauer advances the theory of "heat points" as a result of radiation. He discards the theory that radiation acts through electrons by a process of sensitization and the theories that a catalytic

action or electrolysis takes place. Calculation showed that but a few gram calories of radiation energy is needed to kill a man. A short time after absorption of X rays the energy was transformed into heat.

The body is made up of electrolytes, colloids, and membranes. Rays striking these materials caused them to emit electrons and caused the materials themselves to become positively charged. Some of the energy of the rays was therefore retained. Biological effects occurred at the points where sufficient energy was absorbed. This energy was transformed into heat and motion with consequent changes in the chemical composition of the molecules in the cell. A few changes in molecules were sufficient to alter the entire makeup of the cell. If sufficient change took place the cell would be destroyed; if insufficient, it would recover its activities. The theory explained the reason for the latency and sensitization to radiation. Calculation showed that the destruction of 0.01 to 1.0 per cent of the molecular substance of a cell is dangerous to its life.

Sustained radiation was most important because the continual bombardment of energy did not give the damaged cell molecules time to react for the maintenance of the biochemic combination of the life of the cell. The gamma rays of radium and the short waves from the powerful X-ray machines so closely approaching gamma rays were the most efficient in the destructive action.

The particles struck were distributed irregularly throughout the irradiated zone. Some cells depending upon their reaction were struck once or hundreds of times during any radiation. The number of unaffected cells decreased after prolonged radiation of carcinoma, but the unaffected cells did not entirely disappear.

There is sufficient evidence in the investigations of the above-named men, as there is in the work of most of the leading investigators, to bring an individual to the conclusion that in administering radiation, a biological unit is the desirable factor but that the skin unit dosage now most commonly in use is inadequate.

A particular factor in treating malignancy which, before the introduction of deep radiation, did not receive proper consideration is the effect of radiation upon the normal tissues of the body. It was not so long ago that so-called radiation sickness was excused by some as being of psychological origin or due to the effects upon the patient of the atmosphere in the treatment room being charged with high-tension currents. Deaths following massive radiation before caustic degeneration could be found histologically in the tumor treated forced a change in the common belief concerning radiation sickness in general.

The following questions are presented as being significant of the trend of investigative thought at the present time: What effect has

radiation on the chemical alteration of the secretions of the body? What is the explanation of blood changes in leukemias and Hodgkin's disease following treatment, and why do these conditions respond to a manifold variety of techniques? In the treatment of lymphosarcoma, why do the glands located at a distant point decrease in size as observed by Vaughn and others? What can be the explanation for the response of malignant disease to radiation in one instance and a total failure in another case presenting identical clinical and histological features? Why do stimulating doses over the spleen increase coagulability of the blood? Why does a patient suffering from cancer cachexia improve after the injection of the blood of a patient irradiated for a malignant tumor? Why does the susceptibility to cancer behave as an inherited recessive character as Wells has supported the inference? Why does Roentgen sickness often occur in patients treated for almost anything indicated, with an administration ranging from only 25 to 100 per cent of an erythema dose? Since malignant disease behaves differently under radiation, are the favorable cases due to characteristics assembled in the host, or are these inherent peculiarities in the cancer cells? Can the regression of tumor tissue under radiation increase local or general immunity against cancer?

Here indeed is a field for thought and investigation disclosed by an agent which has not yet revealed all of its physical secrets and its biological effects upon the tissues of mankind.

The above questions would not have a potent existence if certain practical results were not being accomplished by radiation. Clinical evidence shows indeed that in radiation an agent exists other than the knife, the cautery or the caustic chemical and unknown up to the beginning of the twentieth century, which has contributed a great deal to the aramentarium against the advance of cancer. There are great hopes that it shall reach a secure foundation based upon effects more beneficial than those of the knife, the cautery, or the chemical agent.

At present, according to Ewing, tumors may be classified in order of radiosensitiveness as follows: (1) Lymphoma, lymphocytoma, lymphosarcoma, myeloma; (2) embryonal tumors, carcinoma of testis and ovary, basal cell carcinoma; (3) cellular anaplastic adult tumors, round cell carcinoma, diffuse carcinoma; (4) desmoplastic tumors, carcinoma simplex, fibrocarcinoma, squamous carcinoma: (5) adenocarcinoma, adenoma of the uterus, intestine, breast, etc.; (6) fibroblastic sarcoma, osteosarcoma, neurosarcoma.

It is not difficult to distinguish James Ewing, the pathologist, in any notable group of individuals assembled for the purpose of discussing cancer, be it among the surgeons, the biologists, or any other group. With his vast knowledge of pathology and the bio-

logical effects of radiation, he plunges fearlessly into the discussions; encouraging here, violently upsetting wrong and unscientific observations there; sweeping aside the hopeless entanglements of narrow vision, the result of ultraspecialization; masterful, tactful, and courteous, he stands out in any discussion of cancer, for there are few that know better than he the ravages of this stalking spectre of death.

It is fitting that a portion of Ewing's analysis of radiation therapy in cancer should conclude this attempt to present a few of the notable present-day efforts being made in experimentation with and in the theory of the biological effects of radiation and its practical application in malignancy.

"Observations indicate that radiation is capable of restraining the growth of tumor cells without causing either autolysis or necrosis, and of transforming functionless, lawless cell growths into more organized and functioning tissues. This action is exerted also on proliferating connective tissues and on a wide variety of simple inflammatory and functional hyperplasias and forms the basis of radiotherapy in many diseases outside the realm of tumors. If these deductions are correct, then this property of radiation is an extremely important addition to therapeutics. For the first time in the history of medicine we are in possession of an agent which will control the growth of connective tissue. This tissue is the main element in the lesion which underlies many chronic and practically irremediable diseases, so that the search for such an agent has been the faint hope of pathologists for many decades. Aside from the practical question of its successful application, this property of radiation is of very great scientific interest. From this property we may safely conclude that its action is both specific and selective. Normal tissues and organs are distinctly less sensitive than neoplastic and hyperplastic. Even normal lymph nodes resist radiation when inflammatory hyperplasias yield readily. We may also claim that its action is *secundum naturum* in that when properly employed it inhibits that reaction in excess which Weigert emphasized as the significant physiological element in productive inflammation and which exists also in many neoplasms."

With the proper dosage of radiation applied to basal cell carcinoma of the skin, the lesion has in many cases disappeared without leaving a scar and with no recurrence. The basal cell group in general respond in this manner. Lymphoid tumors likewise respond readily, although fibrosis later makes them resistant. Those tumors related to the lymphoid group, such as endothelioma of lymph nodes, etc., yield as well. Those tumors derived from embryonal cells and retaining embryonal characters are particularly susceptible. Rapidly forming cellular tumors are also most susceptible. Tumors de-

rived from adult cells such as squamous carcinoma, neurosarcoma, osteosarcoma, many adenomas and other benign tumors are very resistant to radiation.

Microscopic examination of irradiated tumors shows vacuolation and swelling with solution of nuclei and cytoplasm. There are hyperemic changes in the stroma surrounding, and it is noted that the leucocytes are not so numerous. The stroma appears to be stimulated rather than destroyed. Autolytic degeneration seems to take place in the tumor cells. The chemistry with ionization and the activation of intracellular ferments has not been determined. There is nothing else known that duplicates the action of radiation upon the tissues. Often, unfortunately, surrounding stroma must be destroyed with some tumors.

Results are so uniform in dealing with basal cell carcinoma of the skin and squamous carcinoma of the accessible mucous membranes that the methods are standardized. The danger of stimulating the growth of tumors by present methods of radiotherapy is not great. Killing doses often result in such an absorption of the products of decomposition that death of the individual may occur. Administration of doses, with the knowledge in mind that injury to tumor cells combines with the defensive reaction of normal tissues, is the hopeful method.

No uniform carcinoma or sarcoma dose can be established. After the disappearance of a tumor following radiation there may follow a fatal cachexia. These cases show degeneration of bone marrow, reduction of blood-forming tissue, extensive fibrosis, draining of white cells and destruction of red cells.

The destruction of many suspicious or precancerous lesions may be accomplished by simple radiation. There is still professional antagonism, but recognition of the new therapy is becoming world wide.

MENTAL TESTS AT THE UNITED STATES NAVAL TRAINING STATION, NEWPORT, R. I.

By G. L. Wickes, Commander, Medical Corps, United States Navy

For many years the importance attached to the accurate determination of the mental measurement of feeble-minded individuals in all grades and classes of social environment has been appreciated by a limited number of specially trained men of science. And for many years investigations into this subject, involving so much that belonged to the abstract, were conducted without arriving at any result upon which a scientific method for the measure of the intelligence quotient of an individual could be founded. This problem in psychology was eventually so successfully solved by A. Binet

that he was instantly accorded the enthusiastic plaudits of his co-workers and the greater honor of the sincere imitation and following of his teaching. Briefly, the Binet system operates through a series of carefully graded tests from which the mental age of an individual is determined. The mental age may be above, below, or on a parity with the chronological age, and hence the individual may be found to be superior, feeble-minded, or of normal intelligence as the result of a Binet test.

Followers of the Binet system in this country have revised the tests somewhat, as it was demonstrated in practice that the original system did not, in all cases, show an accurate balance between the mental age grade of the test and the chronological age of the normal individual. Tests originally designed to meet the normal intelligence of six years were found to be too difficult and have been placed among the tests for seven and eight years. Several similar changes have been made as a result of the Stanford investigation conducted under the direction of Prof. Lewis M. Terman, of Leland Stanford, jr., University. This test for graded mental measurement is now in general use under the name "The Stanford revision of the Binet Simon test."

The value of an accurate gauge of intelligence is immediately apparent to those who have given thought to the problems of sociology. The various authors on this subject lay stress upon the application of mental tests in schools and among the delinquents met with in houses of correction, reformatories, and similar institutions. Terman states further that "The time is probably not far distant when intelligence tests will become a recognized and widely used instrument for determining vocational fitness."

The value of intelligence tests to the naval service in relation to the recruiting office has been vigorously expressed on not less than three occasions. (Goddard, H. H., Poppen, J. R., and Stearns, A. W., in the United States Naval Medical Bulletin.)

It is assumed that these reports were written with the idea of directing greater attention to the mental assets of the applicants in recruiting stations before accepting them for enlistment. If this assumption is correct, it will become apparent from a further perusal of this article that considerable progress has been made in that direction. The writer has no information that mental tests are in routine use in any recruiting station, but observation upon the recruits received at this training station indicate that a higher average intelligence quotient is found among the recruits of 1924 than existed in the recruits of 1923.

Following the suggestions evoked after reading the Stearns report in the United States Naval Medical Bulletin of February, 1924, the medical officer of this station made routine mental tests of each re-

cruit upon the day of arrival. The mental tests employed were those recommended by Stearns with the exception of the Healy code.

This intelligence test of the incoming recruits was commenced in March, 1924, and has been continued uninterruptedly to the present time. During this period of eight months, intelligence tests have been given to 3,020 recruits. The analyses of the results obtained are reported in the following paragraphs:

No mark awarded due to educational defects	4
No mark awarded due to language defects	3
Intelligence quotient between 1 and 10 per cent	8
Intelligence quotient between 11 and 20 per cent	55
Intelligence quotient between 21 and 30 per cent	135
Intelligence quotient between 31 and 40 per cent	275
Intelligence quotient between 41 and 50 per cent	388
Intelligence quotient between 51 and 60 per cent	507
Intelligence quotient between 61 and 70 per cent	555
Intelligence quotient between 71 and 80 per cent	533
Intelligence quotient between 81 and 90 per cent	402
Intelligence quotient between 91 and 100 per cent	155
Total number of recruits examined	3,020

In this tabulation of results the most striking point is found in the large number of recruits of average and of high-grade intelligence compared with the small number at the lower end of the scale.

If the intelligence quotient of 30 per cent is selected as representing the dividing line between average and low-grade intelligence, then the total number of recruits of low-grade intelligence is found to be 205, which is 6.8 per cent of the number examined. Although this number is relatively small, it appears very high when it is considered that during a period of eight months 205 feeble-minded recruits have been enlisted for service in the Navy from this recruiting district. Such a condition, if founded on facts, would necessitate action by the board of review in all these cases, and would represent a serious loss to the service in money and personnel. Experience gained from the continued use of the test, however, exposed various sources of error affecting the final estimate of mental measurement, particularly relating to the group that failed to secure a rating of 30 per cent. The greatest and most frequent deterrent to the full expression of mental capacity was found to be the retarding influences produced by the sudden change from civil to military environment. The recruit is in receipt of many new impressions during his first day at the training station. His surroundings are novel; he is reexamined physically and vaccinated; his hair is cut short and he is bathed; his teeth are charted; he undergoes his first contact with military order and discipline; he receives a lecture on personal hygiene and the dangers of drug addiction; and he is alone among strangers. At about this time he is given an intelli-

gence test, and a certain proportion of recruits react poorly under these conditions and fail to do themselves justice. The errors thus arising do not indicate emotional instability but represent the reaction to normal emotions. The retarding of mental capacity due to sudden change of environment has been proved by reexaminations conducted at later periods when the recruits have become oriented to their surroundings.

Another source of frequent error is found to be the inaptitude of the examiners. Terman has emphasized the importance that trained examiners only shall conduct mental tests. The Stearns test is designed for general use, and assistants are easily trained in directing it. However, it has been found that, given two equally well-trained assistants, the personal equation enters and diverging results are obtained from examinations of the same individuals.

Another interference with accuracy of the tests is "cribbing," which occurs sometimes despite efforts to prevent it. Mistakes are more frequently copied than are correct statements, and hence "cribbing" is included among the causes of low intelligence manifestation in the tests.

A frequent cause of low or reduced grading of the intelligence quotient is failure to attempt or weakness in attempting to perform the cancelation test. This test consists, when performed perfectly, of crossing out 51 E's in a given paragraph of the test. Very few persons perform this test perfectly, and the large majority either fail or accomplish only a mediocre performance. The cause of this failure by individuals who perform the other tests well is believed to be the sudden change of environment and the natural apathy of youth.

The weight given these sources of errors was sufficient to cause the medical officer to take no action in the cases of recruits determined solely by the tests to be of low intelligence. It was and is still believed that low-grade intelligence, feeble-mindedness, and moronism when present will be manifested openly during the course of intensive instruction at a naval training station. The curriculum embraces much that is in advance of what is taught in the sixth grade of grammar schools and which would prove the undoing of a moron or feeble-minded individual who attempted to learn or memorize it. It has been considered much safer, in the interest of the service, to have the intelligence tests serve in a secondary rôle to the knowledge gained of recruits by daily contact and observation. The writer has no intention of disparaging the value of intelligence tests, but admits frankly that the group plan of giving Stearns tests is faulty and is not productive of the most accurate results.

The application of intelligence tests to the enlistment requirements has been suggested often; but, from knowledge gained at this station

by experience, it appears to be a measure of doubtful value. The same sources of error encountered at the training station, Newport, R. I., would be found present in recruiting stations, and the opportunity for reexamination, age-grade examination, etc., would be lacking. It is also possible that overenthusiasm of proponents of mental tests might easily produce local damage to the recruiting service.

The study of the forms upon which the mental tests were given produces considerable data irrelevant to the tests, but which may be of interest to the service in general. These data have been classified and are presented in the following tables.

1. 205 recruits with intelligence quotients below 30 per cent:	
High school 1 year	2
High school 2 years	2
History of arrests	2
Inmates of houses of correction	5
Inmate of reformatory	1
Sentenced to jail	1
History of alcoholism	1
Inmates of orphan asylums	7
History of having formerly been a gangster	1
Deserted while at this station	4
Received undesirable discharge	1
Inaptitude discharges at this station because of physical unfitness	3
Inaptitude discharge from this station for other causes	1
2. 275 recruits with intelligence quotients between 30 and 40 per cent:	
High school 1 year	7
High school 2 years	3
High school 3 years	1
History of arrests	2
Inmates of houses of correction	6
Inmates of orphan asylums	6
History of chronic alcoholism	1
Inaptitude discharge at this station because of constitutional inferiority (mental)	1
Undesirable discharge from this station	1
3. 388 recruits with intelligence quotients between 40 and 50 per cent:	
High school 1 year	29
High school 2 years	11
High school 3 years	4
High school 4 years	1
Inmates of houses of correction	5
Inmates of reformatories	3
Sentenced to jail	3
Inmates of orphan asylums	4
History of arrests	8
History of epilepsy	1
History of enuresis	2
Deserted while at this station	7
Transferred because of insanity	1
Discharged for being under age	1
Inaptitude discharge for drug addiction	1
Inaptitude for physical unfitness	4
4. 507 recruits with intelligence quotients between 50 and 60 per cent:	
High school 1 year	63
High school 2 years	19
High school 3 years	7
High-school graduate	1
College 1 term	1
College 1 year	1
College 3 years	1

4. 507 recruits with intelligence quotients between 50 and 60 per cent—Continued.

Trade schools	4
Inmates of houses of correction	7
Inmates of reform schools	2
Inmate of orphan asylums	1
Sentenced to jail	1
History of arrests	6
Deserted while at this station	3
Discharged from this station as undesirable	2
Inaptitude discharges because of physical unfitness	2
Inaptitude discharge for drug addiction	1

5. 555 recruits with intelligence quotients between 60 and 70 per cent:

High school 1 year	84
High school 2 years	66
High school 3 years	20
High school 4 years	8
Inmates of houses of correction	1
Inmates of reform schools	3
Inmates of charitable houses	2
Inmates of orphan asylums	6
History of arrest	1
Deserted while at this station	5
Discharged for under age	1
Discharged as being undesirable	2
Inaptitude discharge because of physical unfitness	0

6. 533 recruits with intelligence quotients between 70 and 80 per cent:

High school 1 year	117
High school 2 years	66
High school 3 years	28
High school 4 years	26
College 1 year	2
College 2 years	1
Inmates of houses of correction	3
Inmates of reform schools	3
Inmates of charitable homes	2
Inmates of orphan asylums	6
History of chronic alcoholism	1
History of arrests	2
Deserted while at this station	2
Discharged as undesirable	5

7. 402 recruits with intelligence quotients between 80 and 90 per cent:

High school 1 year	74
High school 2 years	58
High school 3 years	30
High school 4 years	24
Graduated from high school	7
College 1 year	6
College 2 years	5
Graduated from college	2
Education terminated in fourth grade of grammar school	1
Inmates of reform schools for truancy	5
Inmates of orphan asylums	2
History of arrest for stealing	1
Inaptitude discharge for physical unfitness	1
Inaptitude discharge for other causes	1

8. 155 recruits with intelligence quotients between 90 and 100 per cent:

High school 1 year	32
High school 2 years	29
High school 3 years	22
High school 4 years	14
Graduated from high school	9
College 1 year	3
College 2 years	3
College 3 years	2
Grammar school, eighth grade	34
Grammar school, seventh grade	4
Inmates of reform schools	2

8. 155 recruits with intelligence quotients between 90 and 100 per cent—Continued.

History of sentence to jail	1
Inmates of charitable homes	3
Transferred because of dementia precox	1
Inaptitude discharge for being a purveyor of drugs	1
Desertions	0

Two recruits only performed the tests perfectly and attained the maximum mark of 100 per cent.

The first of these recruits gave his former occupations as being an "investigator" and "soldier." He had had 11½ years of education, in public schools (2 years), high school (7 years) and university (2½ years). He enlisted as a seaman, second class, and stated that he used alcohol moderately as a beverage.

The second recruit to attain the maximum mark gave his former occupation as truck driver. His education terminated after one year at high school. He enlisted as hospital apprentice, first class, and stated that he used alcohol moderately as a beverage.

The arrests recorded in the preceding paragraphs were due, in the majority of instances, to truancy. The jail sentences were found to have been incurred from a variety of causes including theft, petty larceny, grand larceny, and burglary.

That change of environment is a cause of retardation of mental activity has been stated in a previous paragraph of this article. This point is illustrated in the cases of 11 recruits selected at random that were given mental tests on the day of arrival and retested after a lapse of one week at the training station.

	Intelligence quotient from test given on day of arrival	Intelligence quotient from second test given one week after arrival
	Per cent	*Per cent*
Case 1	6	35
Case 2	22.5	41
Case 3	29	44
Case 4	22	45
Case 5	24	44
Case 6	30	63
Case 7	31	36
Case 8	41	48
Case 9	43	45
Case 10	39	81
Case 11	56	81

The desertions recorded in the preceding tables occurred from this station among recruits under training that were found to have intelligence quotients falling below 80 per cent. There were no desertions or undesirable discharges among the group of recruits attaining mental measurements above 80 per cent. The study of the relation undoubtedly existing between men of low and mediocre intelligence quotients on the one hand, and desertions and undesirable discharges

(delinquency) on the other, is a subject that can not be fully discussed in this report for obvious reasons. The recruits spend but eight weeks of a four-year enlistment period at the training station and it is recognized that the delinquencies manifested during this brief and early period are no more than the beginning of a long series that is to follow. If mental tests are given to all recruits at training stations; if care is exercised to secure accuracy in mental measurement; then, through cooperation with the office of the Judge Advocate General of the Navy, a much-needed light may illuminate this subject after the completion of mental tests extending over a period of several years.

The questionnaire used in connection with the tests has been of great value in securing information regarding the former health, education, and social status of the recruits. The queries as to habits, former diseases, injuries and surgical operations, the history and character of delinquency, the history of enuresis and the existence of epileptic conditions have been freely answered. The information obtained by the use of the questionnaire has been used in connection with the work of the board of review and in determining the adaptability of recruits for selection for special training and instruction at the trade schools in some cases. Information derived from the questionnaire has in some instances first directed attention to conditions which subsequently proved to be causes of improper enlistments. Inasmuch as such information is as easily obtained at the recruiting stations as at training stations, the use of the questionnaire at the former is clearly indicated. Through the use of the questionnaire, attention has been directed to many disqualifying physical defects that were apparently not observed at the recruiting stations. Among such conditions occurred epilepsy, enuresis, flat feet with symptoms, chorea, underage, fraudulent enlistments, chronic alcoholism, congenital defects, drug addicts, purveyors of drugs, fractures of skull, gangsters, and the histories of many varieties of juvenile delinquency.

The value of mental tests to the naval service is believed to be most fully expressed at the training stations. The use of the tests at recruiting stations is not practicable in the opinion of the writer for reasons that have been previously stated. The adoption of a questionnaire for use at recruiting stations, similar to that recommended by Stearns, appears to be a necessary measure if the department desires to exclude certain undesirable types of recruits having histories of forms of delinquency.

In concluding this article, Terman is once more quoted: "The time is probably not far distant when intelligence tests will become a recognized and widely used instrument for determining voca-

tional fitness." To which might be added, appropriately, that this instrument is highly delicate and should be intrusted only to trained and skillful hands.

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PERICARDITIS WITH EFFUSION

By J. Buckley, Lieutenant Commander, Medical Corps, United States Navy

The fact that but seven cases of pericarditis were included in the last Surgeon General's report and the occurrence of three well-marked cases of pericarditis with effusion in a comparatively small medical service prompted this report. It has often been stated that there is no condition more frequently overlooked than pericarditis. The disease is classified as acute (dry, plastic, or fibrinous); pericarditis with effusion (serous or purulent); and chronic or adhesive pericarditis. These conditions usually represent progressive steps in the progress of the same infection, but the inflammation may subside and the parts return to normal at any time. The first and last forms are extremely difficult to diagnose. This report has to do with the second form, that is, pericarditis with effusion.

The causes of pericarditis are usually classified as primary and secondary. The occurrence of a primary pericarditis is extremely rare and is assumed to be practically always the result of trauma. Of the causes of secondary pericarditis, rheumatism in its various forms is the most common. Other causes are pneumonia, pleurisy, acute infections, nephritis, and the purpuras. There is nothing definite as to the bacteriology of the disease, various organisms having been recovered.

The clinical history and the course of the disease are varied. It can appear in almost any condition and the diagnosis rests entirely on physical signs and the X ray. While fever, dyspnœa, cyanosis, pain, and a rapid pulse occur in nearly all cases, these symptoms may also occur as a consequence of the primary infection.

The physical signs in pericarditis with effusion are those of a greatly enlarged pericardial sac. The normal cardiac outline is changed, in that the fluid naturally gravitates downward and the area of cardiac dullness is increased to the left and right and extends

upward to the base of the heart, giving the characteristic pear-shaped area with the stem of the pear upward. Changing the position of the patient may change the limits of dullness. Inspection may show the absence or displacement of the apex beat; bulging of the pericardium may be noted. On palpation the absence of the apex beat is noted frequently. Percussion shows the area of cardiac dullness increased. It is usually found considerably extended to the right and left, and usually upward over the heart, giving the above-mentioned classical pear-shaped area. It has been demonstrated that the breadth of the area of dullness at the base of the heart is wider when the patient is recumbent than when he is erect. The area of dullness usually extends beyond the apex beat. The occurrence of Rotch's sign, the demonstration of the obliteration of the cardio-hepatic angle, is always mentioned as one of the most characteristic signs of pericarditis with effusion. This sign is stated to be found most often in beginning effusion. It is rarely demonstrated in well-marked effusions. On the contrary, the acuteness of the angle may be increased. In well-marked effusion it may assume the form of a right angle, always, however, being pushed beyond the right sternal border. On auscultation the heart sounds are found usually to be distant and muffled, or even inaudible at the apex; at the base of the heart the sounds may also be distant. Frequent murmurs or friction rubs are sometimes heard at the beginning of the appearance of the fluid and are usually best heard at the third left interspace. The demonstration of the extension of the relative dullness in the first and second interspaces when the patient is recumbent and the narrowing of this area when the patient is erect is an exceedingly important sign.

There are other associated changes in the physical findings in the lungs. The one most commonly mentioned is an area of dullness, posteriorly, at the angle of the scapula. Over this area vocal fremitus is increased. There is also an area of impaired resonance in the left axilla and this area at times gives forth a decided tympanitic note.

Left-sided pleurisy with effusion and cardiac dilatation must sometimes be differentiated. In pleurisy with effusion there is not the change in the normal sounds of the heart nor does the percussion note change from dullness to resonance so sharply as in pericarditis. To differentiate cardiac enlargement it is noted that the cradiac impulse can usually be seen and felt and the heart sounds heard without much difficulty. The outer limits of dullness correspond closely to the area of the maximum cardiac impulse.

The X-ray and fluoroscopic studies are by far the most certain methods of diagnosis.

Once the diagnosis of pericarditis with effusion is established it is of course important to distinguish between a serous fluid and a purulent one. This is by no means easy and requires careful judgment. The physical signs would be the same. The occurrence of rigors, chills, a persistent high leucocytosis, and great prostration point towards a purulent fluid. The only absolute way to determine this is by paracentesis.

CASE REPORTS

Case 1.—B. B., age 23, Filipino. Admitted August 22, 1923 with the diagnosis of broncho-pneumonia. Previous history negative, except for an attack of German measles two years ago. Patient had been sick about two weeks prior to admission. On admission temperature 103°, pulse 90, and respirations 25. Patient did not appear ill. He had no complaints and stated that he suffered no pain. White blood count was 22,000, 83 per cent polymorphonuclears and 12 per cent lymphocytes; urine was normal, and there was no cyanosis and no dyspnea. Physical examination showed an increase in the area of cardiac dullness to the left and slightly to the right. There was a decided tympanitic note in the lower left chest in the axillary region. Posteriorly over the left lung at the angle of the scapula there was an area of dullness and increased fremitus with tubular breathing. The quality of the pulse was good. The heart sounds were of good quality. The white blood count remained between 17,000 and 20,000; urine was clear. At this time, however, the apex beat could not be felt or seen, and there was an epigastric pulsation. On auscultation the heart beats at the apex could be heard, but not distinctly. On August 24, 1923, roentgenogram of the chest was taken and disclosed a greatly enlarged pericardial sac. This picture (Fig. 1) was a surprise, as such an extensive enlargement was not anticipated either from the physical signs or from the clinical symptoms. The cardiac area was carefully percussed to demonstrate the changes in outline. Rotch's sign could not be demonstrated. An increase in the area of cardiac dullness in all directions could be made out. No change was noted on shifting the position of the patient. The patient's condition gradually improved, the temperature soon dropped to normal, and the cardiac sac diminished in size and the white blood count returned to normal. At no time was the pulse over 100. The patient never appeared ill and never complained of pain. At no time was there the slighest difficulty in breathing nor was there any cyanosis. No murmurs ever appeared. He was finally returned to duty. Treatment consisted of absolute rest and quiet and a course of digitalis. This is a case in which the diagnosis could very easily have been overlooked had it not been for the X ray.

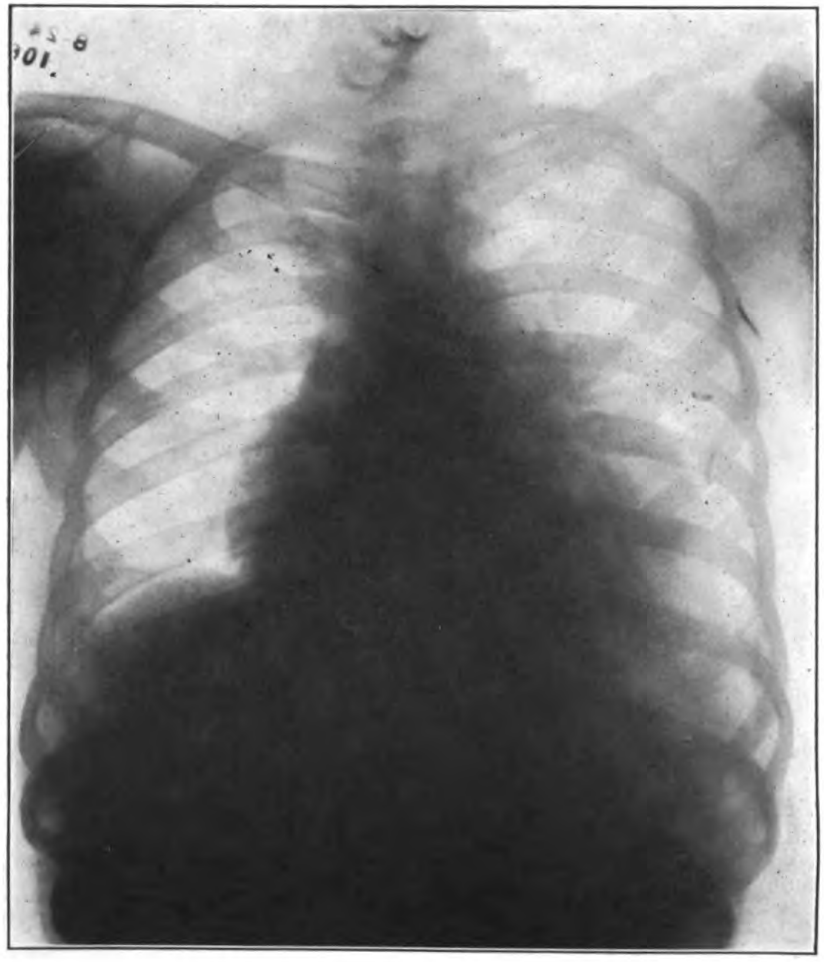

Fig. 1.—Case I, on admission

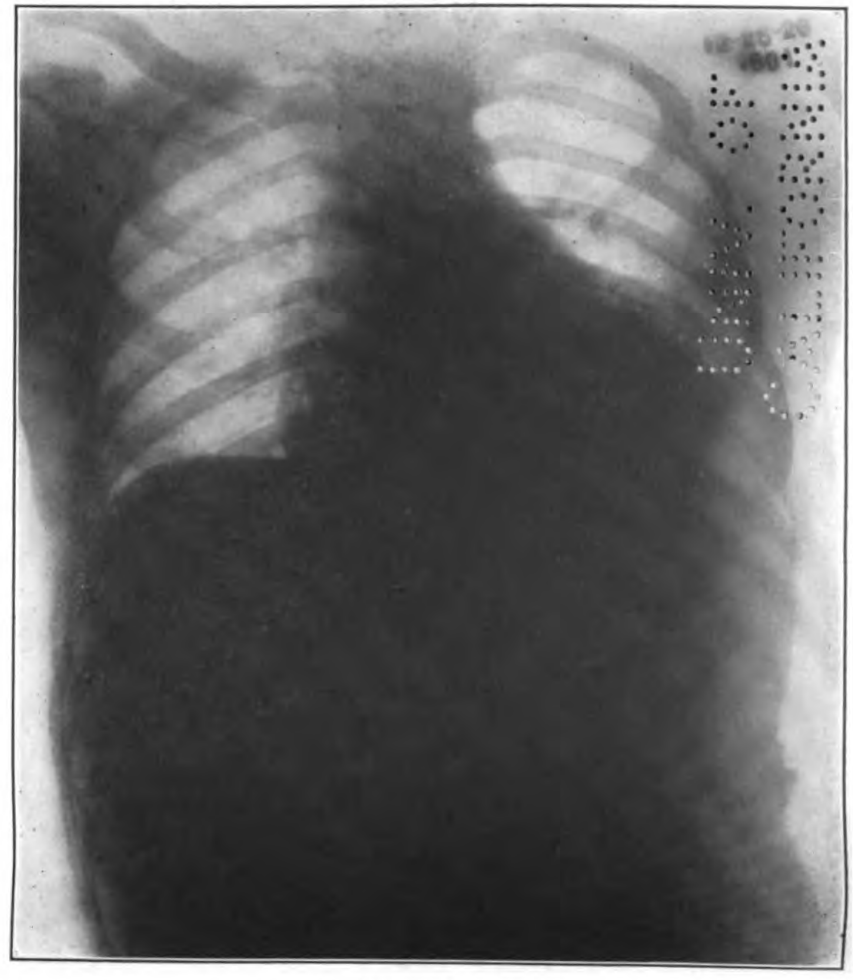

Fig. 2.—Case II, on admission

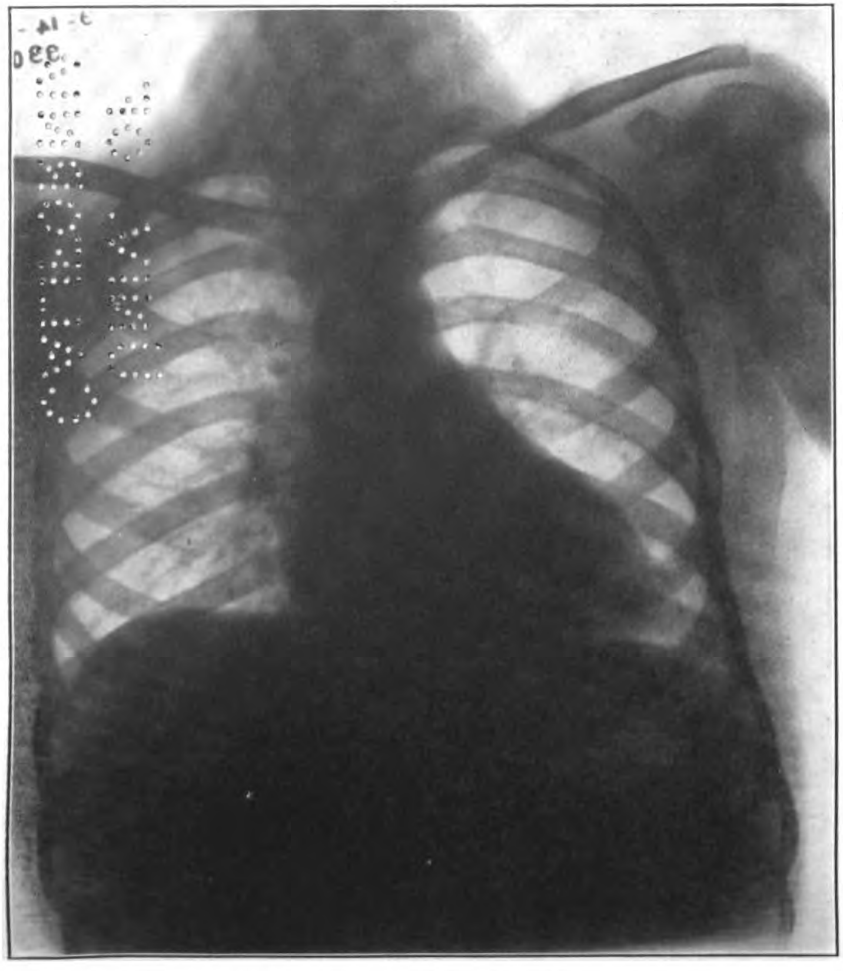

Fig. 3.—Case II, at time of discharge

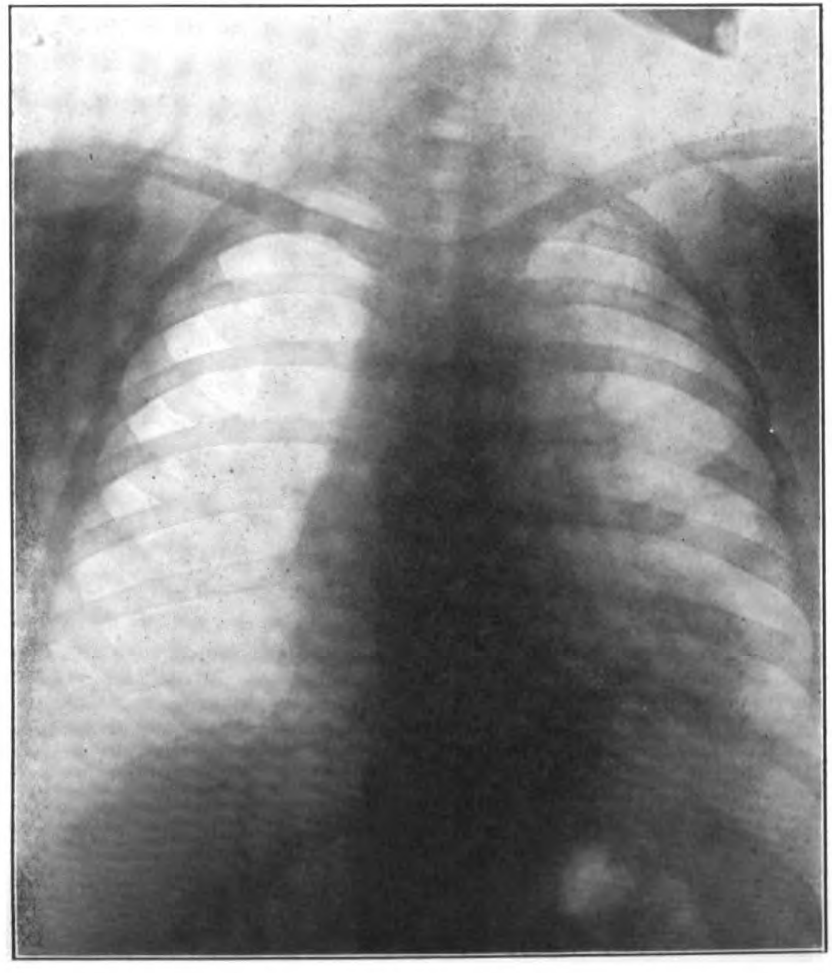

Fig. 4.—Case III, on admission

Case 2.—W. E. M., seaman, second class, age 19. Admitted December 22, 1923. Diagnosis: Rheumatic fever, acute. Previous illnesses, none. Patient had been ill about two weeks prior to admission. He complained of pain in ankles, wrist, and shoulders. There was some swelling of ankles and wrists. No venereal history. Tonsils were not involved and teeth were in good condition. On admission temperature was 103°; pulse, 110; respirations, 35; white blood count, 16,000. Patient appeared very ill. He was quite dyspneic and had a mild degree of cyanosis. On examination the heart outline was increased and extended to the left of the nipple line; dullness was also increased to the right. There was no obliteration of the cardio-hepatic angle. The apex beat could not be felt and on auscultation the heart tones at the apex were distant and muffled; no friction rubs were heard. Posteriorly in the left lung at the angle of the scapula there was an area of dullness with increased fremitus and bronchial breathing. There was a tympanitic note in the left axilla. On December 25, 1923, X-ray examination showed an extended pericardial sac and an area of fluid or consolidation in the lower left chest. (Fig. 2.) This patient was extremely ill. Paracentesis was seriously considered. However, his condition gradually improved, temperature dropped to 99°, pulse remained around 110, respirations improved, and dyspnea was not so marked. On January 27, 1924, the area of cardiac dullness was greatly diminished. The pulse rate remained high for some time. His chest was aspirated twice, but no fluid was ever obtained. Treatment consisted largely of doses of salicylates, and digitalis was given for a time. During his acute illness morphine was freely given to obtain rest. He was finally surveyed from the service and at the time of his discharge his general condition was good. (Fig. 3.)

Case 3.—L. D., quartermaster, second class, age 26. Admitted April 4, 1924. Diagnosis: Bronchitis, acute. About six weeks prior to admission, patient was in a brawl and received a stab wound in the fifth left interspace, just anterior to the middle axillary line. He was treated in an emergency hospital. His health record stated that he was very ill for a few days with the diagnosis of pneumothorax. The wound healed rapidly and the patient was returned to duty. He was ill about two weeks; there was no other history of importance. On admission to this hospital the patient stated "that he had felt a little under the weather" and had "had a cough for a few days" but felt fairly well. Temperature was 100°, pulse 142, respiration 25, white blood count 12,000. Physical examination showed the lungs to be negative. The area of cardiac dullness was increased. It extended to the right of the sternum and to the left of the nipple line. The base of the heart and the area of dullness

extended slightly beyond the sternal border, but narrowed when the patient assumed the sitting position. This sign could be demonstrated nicely. Rotch's sign could not be demonstrated. The apex beat was not visible and could not be felt. On ausculation, the heart sounds at the apex were very distant and muffled, in fact they were almost inaudible. No friction rubs or murmurs could be heard. On April 6, 1924, X-ray examination was made and showed a greatly enlarged pericardial sac. (Fig. 4.) A blood culture was negative; urine was normal. The patient was given catharsis and a short course of digitalis. The condition subsided very rapidly. On April 7, 1924, the temperature dropped to normal and on April 12, 1924, the pulse rate dropped to normal. Pictures taken on April 15, 1924, showed the cardiac outline to be greatly reduced. Later the patient was returned to duty. In this case no definite signs could be made out in the base of the left lung posteriorly. There was some dullness and some interference with breathing found in the axillary region but no tympanitic note ever developed.

COMMENTS

These cases are considered unique in that each one had a distinct etiology. One, rheumatism; another, apparently broncho-pneumonia; and the third was probably due to extension of infection from a stab wound. In the matter of diagnosis, the increase of cardiac area, as a rule, was quite well made out and the associated changes in the lung signs were quite constant; but the often-mentioned sign, that of obliteration of the cardio-hepatic angle, could not be made out. On searching the literature it was found that this sign occurs only in the beginning of effusions, and by some its existence is doubted. It is felt that the most positive means of diagnosis lies with the X ray. As to treatment, rest in bed and quiet are of the most importance. Drugs are of slight value. Digitalis was given, although it is realized that this is condemned by some as useless and even as actually harmful. Paracentesis is to be used only in extreme cases to relieve pressure and to establish the character of the fluid. If a purulent fluid is found the proper procedure is free drainage of the pericardial sac. The mortality rate in this condition is quite high.

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MERCUROCHROME INTRAVENOUSLY ADMINISTERED IN GONOCOCCUS INFECTION

By L. H. WILLIAMS, Lieutenant Commander, Medical Corps, United States Navy

There has appeared recently in the current medical journals considerable discussion of the merits of mercurochrome intravenously administered for gonococcus infection. Enthusiastic supporters of the method have been answered by others equally pessimistic concerning its effectiveness. Between these two extreme views lies the truth, and truth well worth striving for.

Gonococcus infection is such a prevalent source of disability and sick days in the military service, as well as in civil life, that any method, wholly successful or only partly so, of eradicating the disease in the individual or lessening its devasting effects on his health is worthy of every consideration and thorough trial before being discarded.

Whitman has reported 10 cases of gonococcus infection of the urethra cured by this method in a very short time and is highly enthusiastic over its effectiveness. Lavandera, on the other hand, is extremely pessimistic as to its value. He reported four cases unimproved after intravenous administration of mercurochrome, with intense reaction characterized by stomatitis, abdominal cramps, and diarrhea. His conclusion that "mercurochrome failed to exhibit any therapeutic effect in the cases reported is self-evident. Equally inefficient has been this therapeutic agent in my routine treatment of gonorrhea and its sequelæ. Until the weight of evidence proves the contrary, Mercurochrome–220, Soluble, will be found of no value against the gonococcus."

Since October, 1924, 20 cases of gonococcus infection of the urethra and adnexa have been treated by the intravenous administration of Mercurochrome–220, Soluble, at the naval training station, Hampton Roads, Va. The method was introduced because of dissatisfaction with the established methods of treating gonococcus infection of the epididymis. Mercurochrome–220, Soluble, was used in freshly prepared 1 per cent solution in distilled water. Ten c. c. was established as the minimum amount to be administered at one injection. No attempt was made to regulate dosage according to body weight, as only adults were treated and experience has shown that the reaction resulting depends more on the individual than the amount introduced, provided it is within the limits of safety. No more than 13 c. c. was given at a time. Six cases of epididymitis were treated in this manner. Four were in acute infections of gonococcus, first infections. Each was accompanied by profuse urethral discharge, swelling of epididymis, pain, and fever. The injections were given at varying periods of development of epididymitis. All had reactions characterized by a rise in temperature, pain in abdomen,

(*d*) Place the required quantity of acid in each of two burettes, and attach both burettes to an apparatus stand (50-mil burettes are of sufficient capacity for rooms of 3,000 cubic feet and less).

(*e*) Transfer to an evaporating dish a large excess of dry chlorinated lime, 30 to 50 grams, and place this dish under both burettes.

(*f*) Direct a current of air from an electric fan towards the dish containing the chlorinated lime.

(*g*) Having placed the patient in the room, open the stopcocks on both burettes, regulating the flow from one burette so that it will deliver its contents within 3 to 4 minutes, and letting the second burette deliver drop by drop during the period of treatment.

Because of special chlorine ejectors now on the market for the administration of the chlorine treatment, it may be well to state that, by comparison, the method described herein is in no way a makeshift. It works within the variation of accuracy of special chlorinators; it requires no unusual apparatus, no skill in chemistry, and its convenience of application is not surpassed by chlorine ejectors of various types carrying chlorine under pressure in special tubes.

A good grade of chlorinated lime is required; there is no scarcity of such, however, and a product of satisfactory quality may be selected without the necessity of analysis, the physical appearance of chlorinated lime being a reliable index to its quality. A dry product is almost sure to be of full chlorine strength, or nearly so, while, on the other hand, the presence of moisture in any degree is a sign of deterioration; moist chlorinated lime is therefore likely to be unfit for use. The stoppers on bottles of chlorinated lime issued by naval medical supply depots are capped with a resinous seal; experience has demonstrated that the chlorine strength of a good grade of chlorinated lime is maintained in this type of container for a considerable period of time, even under unusual and severe service conditions. The pharmacopœial grade of hydrochloric acid is required; this is the only kind issued by naval medical supply depots. This acid is used in the preparation of a standard hydrochloric acid solution, which, as already noted, is nothing more than a 1 in 10 dilution of U. S. P. hydrochloric acid. While the dilution of U. S. P. acid to the standard 1 in 10 strength should be carefully made, it is by no means necessary to standardize the strength by analysis. Carefully measure in a cylinder jar 50 mils U. S. P. hydrochloric acid and make up to 500 mils with distilled water. Mix well. This quantity of standard hydrochloric acid should be sufficient for at least five treatments when given in a room of average size.

It is not to go amiss to make special note here of the distinction between the standard solution of hydrochloric acid employed in liberating the chlorine gas, as outlined herein, and the official dilute hydrochloric acid. The latter contains approximately 10 per cent absolute hydrochloric acid by weight, while the standard employed in our method of chlorination contains 3.712 grams HCl in 100 mils.

Having calculated the cubic capacity of the chlorinating room in feet, the quantity of standard hydrochloric acid that would release the necessary chlorine from an excess of chlorinated lime to give a chlorine concentration of 0.020 mg. per liter is determined by the formula, cubic feet $\times$ 0.0158.

Example.—Room measuring 10 by 12 by 14 feet has a cubic capacity of 1,680 cubic feet; 1,680$\times$0.0158=26.54 mils standard acid will release the required chlorine to give 0.020 mg. concentration in 1,680 cubic feet of air space.

Mark two burettes with thin strips of adhesive plaster at a point from which the burette when fully drained will deliver the quantity of acid necessary for the room. For example, if previous calculations show that 26.5 mils of standard hydrochloric acid are required to release the proper volume of chlorine gas for the size of the chlorinating room, measure into the empty burettes (stopcock closed) 26.5 mils distilled water and place the strips of adhesive plaster at the meniscus; when fully drained from this point the burette will deliver 26.5 mils.

Fill both burettes to the mark with standard hydrochloric acid solution; clamp both burettes to one apparatus stand. Place in an evaporating dish, or other shallow open vessel, a large excess of chlorinated lime, from 30 to 50 grams. Place an electric fan near; run this at a slow or medium speed, directing the current of air toward the dish containing the chlorinated lime. Bring the tip of both burettes down below the edge of the dish containing the dry chlorinated lime. After placing the patient in the room, start both burettes, the one being adjusted to drain its contents in three to four minutes, and the second being adjusted to empty drop by drop during the period of treatment. The rapid-flowing burette will give the desired chlorine concentration and the slow-flowing burette will maintain that concentration which would otherwise soon be lowered on account of loss through breathing, seepage, etc. The slow liberation of a supplementary quantity of chlorine to make up losses due to various causes is called for under any other method of chlorination, as well as under this method. Burettes are used, not because of their greater accuracy over ordinary measuring apparatus, but because they offer a convenient means of transferring the acid to the dish containing the chlorinated lime.

In special cases where it is desired to give a chlorine treatment at a lower concentration than that of 0.020 mg. per liter, the amount of standard acid required can readily be calculated as follows: First determine the amount of standard hydrochloric acid solution necessary to liberate chlorine for a 0.020 mg. concentration, then multiply that figure by the concentration desired times 50. The result will be the quantity of standard hydrochloric acid required for the desired concentration.

Example.—A concentration of 0.015 mg. per liter is desired. Room measuring 10 by 12 by 14 feet (same as example above) requires 26.5 mils standard acid to give a concentration of 0.020 mg. per liter; $26.5 \times 0.015 \times 50 = 19.9$ mils standard acid to liberate required chlorine for a concentration of 0.015 mg. per liter.

Variations in the strength of hydrochloric acid within the pharmacopœial limits, together with such errors as may be introduced through the use of rough measuring apparatus in diluting this acid, would certainly never have any practical significance. Even allowing that the total error would in the end reach 10 per cent, which from a theoretical viewpoint seems large and unreasonable, this would mean that a nominal value of 0.020 mg. per liter would have a corrected value in the range of 0.019 to 0.021 mg. per liter. Bearing in mind that by no practical method is it possible to maintain an exact adjustment of chlorine during a period of treatment, this extreme variation would be of no consequence.

The method just described has been tried at the naval medical supply depot, Brooklyn, N. Y., where analytical checks demonstrated that the actual concentration of chlorine approximated the standard concentration very closely.

The acid factor (0.0158) is based on the following constants: 1 cubic foot=28.316 liters; 0.57 mg. chlorine per cubic foot is equivalent to a concentration of 0.020 mg. per liter; 100 mils U. S. P. hydrochloric acid (116 grams, average strength 32 per cent[1])= 37.12 grams absolute hydrochloric acid; 37.12 grams absolute hydrochloric acid is the equivalent of 36.10 grams chlorine; 1 mil, 1–10 dilution U. S. P. hydrochloric acid will liberate 0.036 gram chlorine from chlorinated lime; 0.036 gram chlorine (1 mil, 1–10 hydrochloric acid) will give 0.020 mg. chlorine concentration in 63.1 cubic feet; $\frac{1}{63.1}=0.0158$.

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[1] U. S. P. HCl contains not less than 31 per cent nor more than 33 per cent absolute HCl.

CLINICAL NOTES

TWO MASTOID CASES OF UNUSUAL INTEREST

By P. M. ALBRIGHT, Lieutenant, Medical Corps, United States Navy

CASE 1

W. E. C., white, seaman, first class, United States Navy, age 22, was admitted as an emergency stretcher case to the United States Naval Hospital, Brooklyn, N. Y., on June 12, 1924, with diagnosis undetermined, complaining of bleeding from left ear, with pain in that ear, severe headache, and nausea.

Past history.—No history of any previous ear trouble. Had a nose injury one year ago, which produced slight swelling and soreness of the nose at that time, but which soon passed away. Other past history was negative and had no bearing.

Present illness.—Patient has been on duty at the receiving ship, New York. He had been feeling as well as usual until the afternoon prior to admission, when he had a slight frontal headache which gradually grew in intensity but which was not severe enough to interfere with the performance of his duty. After his evening meal he washed some clothes and then turned in early as he had a morning watch. He is emphatic in his denial of having had any injury, fight, or fall. He did not swing his hammock but laid his mattress on the deck and slept on it. States that he was sleepy and soon fell asleep and recalled nothing until he was awakened a little before 4 a. m. to go on watch. He then noticed considerable blood coming from his left ear, felt nauseated, and had a severe headache. He was able to go up on deck without aid but was excused from duty because of the bleeding. He was seen by the medical officer and was sent to the hospital. He said that he vomited twice before arriving there.

It was afterwards learned that the patient was late in reporting on deck for duty and a messenger was sent for him. When he arrived, the officer of the deck stated that he noticed bleeding from his left ear, and he also thought it had been coming from his nose, as there was dried blood around it. He further stated that the patient appeared confused and he immediately sent him to the sick bay.

Status on admission.—Patient was dull and apathetic, though he could easily be aroused to answer questions and to answer them intelligently. Memory was apparently good. Temperature was subnormal, pulse 72, and respiration 20. Blood pressure, S. 116 and D. 66. There was no evidence of any external bruise or injury on head or body. There was considerable bleeding from the left external auditory canal, with some dried clots on the neck and face. The left canal was filled with fresh blood and required rapid sponging in order to see the drum. By using Valsalva's method of inflation it was noticed that the whole anterior rim of the drum was torn from its attachment and bleeding was quite profuse. There was no evidence of intranasal injury or hemorrhage. General physical, neurological, and eye-ground examinations were negative.

White blood count, 22,300; neutrophiles, 87 per cent; lymphocyte, 10 per cent; large mononuclears, 1 per cent; and transitionals, 2 per cent.

A sterile gauze wick was placed lightly in the external canal and patient kept under observation.

During the day the patient slept most of the time, though he could easily be aroused. His temperature in the afternoon rose to 100° F., with pulse 90 and respiration 20.

On June 13 his condition of lethargy had slightly improved; in fact, his state of "well being" was such that he asked to be placed on the liberty list. There was still a thin, serous, slightly blood-tinged discharge from the left ear. General physical, neurological, and eye-ground examinations remained negative. His pulse, temperature, and respiration were normal in the morning with a slight rise of temperature in the afternoon. White blood count, 14,250; neutrophiles, 85 per cent; lymphocytes, 9 per cent; large mononuclears, 2 per cent; transitionals, 3 per cent; and eosinphiles, 1 per cent. Stereoscopic X-ray examination of skull showed no evidence of fracture. A spinal puncture was done. The pressure appeared to be normal. The fluid contained so much fresh blood that it was considered at the time to be due to contamination. Smears and culture of the spinal fluid were negative. Urinalysis showed the faintest trace of albumin, with a few granular casts, excessive mucus, excessive renal cells, and a few leucocytes and a few erythrocytes per field.

On June 14 the patient's only complaint was headache, which he described as being all over. Temperature, pulse, and respiration were normal in the morning but were slightly elevated in the afternoon. There was still a slight blood-tinged discharge from the ear, which did not appear to be infected. White blood count, 15,600. Neutrophiles 75 per cent, lymphocytes 22 per cent, large mononuclears 1 per cent, transitionals 2 per cent. Urine showed the faintest

trace of albumin with a few leucocytes and moderate amount of squamous epithelium.

On June 15 discharge from the ear had become infected and the patient had an acute otitis media, with temperature ranging from 99° F. in the morning to 101° F. in the evening. He complained of pain in his left ear with generalized headache, which he described as throbbing.

On the 17th and 18th his general condition remained about the same. Discharge from the ear was profuse and thin and watery in character. There was slight mastoid tenderness. A second X-ray examination on the 17th for fracture of the skull was negative. White blood count on the 18th was 10,850. Neutrophiles 73 per cent, lymphocytes 19 per cent, large mononuclears 3 per cent, eosinphiles 1 per cent. Another spinal puncture on the 18th showed fluid not under pressure, but containing macroscopic blood, which was not thought to be due to contamination. Globulin and cell count not made because of blood content. Sugar reduction (Benedict's) normal. Smear, no bacteria found, many red cells present and 3 plus cells. Culture at end of 18 hours was negative for bacteria. Wassermann negative in all dilutions. Lange's colloidal gold 0012211000. Xanthochromia present. This report on the spinal fluid was received on the 19th.

On the 19th his condition was worse, due to mastoiditis. There was a profuse aural discharge, serosanguineous in character and under pressure. There was marked sagging of the posterior superior wall and also of the anterior medial wall, so that it was impossible to see the drum. There was marked impairment of hearing in the affected ear with auricular displacement and loss of the posterior auricular sulci. Palpation showed tenderness over the anterior and posterior zygomatic ridges and also directly anterior to the tragus.

His temperature ran between 100° and 101° F., white blood count, 11,000. Neutrophiles 66 per cent, lymphocytes 27 per cent, transitionals 5 per cent, large mononuclears 2 per cent.

Xanthochromia in spinal fluid being positive and as he had stupor with symptoms of concussion upon admission, with the course and findings as above described, it was felt certain at this time that he had a fracture, though X-ray examinations had been negative.

Given an acute mastoiditis with, most likely, a fracture of the skull, the question of immediate operation was to be considered. The patient's condition of possible fracture had existed for a week, during which period it was presumed that he had walled off chances of infection, for he had as yet no meningeal symptoms. Would walled-off areas be opened and broken down by operating, thus endangering a meningitis, or would this area wall off more securely after a few

days, or would it be more likely to be broken down if not operated upon? The decision was operation rather than waiting.

Operation.—October 20, 1924. Ether anesthesia. Usual mastoid incision. Periosteum was slightly thickened but not adherent. Upon elevating the periosteum a fracture was found, involving the posterior canal wall and extending upwards and backwards across the posterior zygomatic ridge and upon the squamous portion of the temporal bone. The line of fracture was separated and a scalpel blade could easily have been inserted. The cortex was thin. Mastoid was of pneumatic type, with very large cells containing pus under pressure and pulsating.

There was a tendency to coalescence of cells with marked necrosis around the antrum and posterior zygomatic cells. Entire mastoid cleaned and tip removed. An opening about one-half inch long was made into the antrum. The posterior zygomatic cells, which were necrotic, extended into the line of fracture. The posterior canal wall, which was fractured loose, was removed. Antrum and mastoid cavity were packed with iodoform gauze as was also the line of fracture. Mastoid wound was not closed but left wide open. Smear and culture from mastoid showed streptococci. Following operation his temperature dropped to normal but ascended the following day to 102° F. This, however, was temporary, as it again reached normal the next day. Convalescence was long because of treating wound by the open method, but was uneventful with good recovery. Patient has a marked conduction deafness remaining, though his hearing for conversational voice is fair.

This case shows the following points of interest:

1. A fractured skull in which there was no history of an injury, nor could any later information as to an injury be determined by a board of investigation.
2. A fractured skull in which there was no evidence of any bruise, cut, or any other form of injury.
3. A fractured skull of the extent noted, producing such slight general symptoms, which can be explained by the free drainage of blood through the antrum and middle ear.
4. Repeated negative X-ray examinations in a widely separated fracture. This, too, can be explained by the line of fracture overlying the petrous portion of the temporal bones and being obscured by the density of the latter on the plate.
5. A fractured skull complicated by an acute mastoiditis.

Case 2

C. S., white, age 29, veteran, was admitted to the New York Naval Hospital August 21, 1924, for treatment, with diagnosis of double purulent otitis media and possible brain abscess. Patient walked

into the hospital, having come a distance of over 100 miles that day by train.

The chief complaint on admission was discharge from both ears, with severe frontal and right parietal headache, constipation, and marked dizziness.

Family and social histories.—Negative.

Past personal history.—Frequent attacks of tonsilitis until two months ago when tonsils were removed. Influenza in 1918. Was sick in bed for two weeks at that time. Abscess on hip in 1919.

Present illness.—Started in 1918 while in France. Two weeks after discharge from hospital with influenza, while he was on duty at the front, he had pain in his right ear. He went to the dressing station and the doctor removed some wax from the right ear. This did not relieve the pain, and in several days both ears began discharging. They continued discharging periodically for four or five months. He received treatment at the dressing station, consisting of irrigations, and these relieved him so that he was able to carry on.

He was discharged from the Army in March, 1919. At that time neither ear was discharging, and they did not bother him until nine months later (December, 1919), when both ears again began discharging and he had pain in the left one. This time they both discharged continuously for one year but stopped around January, 1921.

In the summer of 1921 he began having dizzy spells. This continued several weeks until the ears began discharging, after which the dizziness disappeared. He went to a civilian physician and was under his care for almost a year. During this period the discharge from the right ear was slight, but the discharge from the left ear was profuse and accompanied by severe pain.

In July, 1922, he had a mastoid operation on the left side at the Hartford City Hospital. He was in the hospital one month when he was discharged. At the time of discharge the mastoid wound had healed, but there was still a discharge from the ear. Eight days following discharge, the mastoid wound broke down with two discharging sinuses. He then reported to the Veterans' Bureau at Hartford, Conn., where he was under treatment for nine months. During this period both ears discharged and he thought his condition was gradually becoming worse, because he was unable to work due to headache and dizziness. He would work because of economic pressure, for a week or so, but would then have to discontinue.

This continued until three weeks prior to admission to this hospital, when he became ill. It started with a severe pain at the top of his head, and he became so dizzy that he was unable to walk. Vomiting was severe, and he states that he was unable to retain anything. This was accompanied by chills, followed by severe sweating. He was taken to the New Britain General Hospital, where he was a bed

patient for two weeks, until the condition subsided. He was then transferred to this hospital by the Veterans' Bureau.

Examination.—Patient appeared somewhat apathetic and somewhat dull. He answered questions slowly and with hesitancy. Too much reliance, however, could not be placed on these findings because of his inability to express himself in English.

Eyes.—Ocular muscles appeared normal. There was no nystagmus. Pupils were equal in size and reacted to light and in accomodation. There were no distinctive fundus changes.

Neurological examination.—Showed a slightly positive Rhomberg. Reflexes were normal. There were no tremors nor any areas of anesthesia or hyperesthesia.

General physical examination was negative.

Ears.—Right. There was a muco-purulent discharge with a very fetid odor. The posterior canal wall was boggy and swollen, so that only the anterior part of the drum could be seen, and it was difficult to tell whether this was the drum or middle ear. There was no swelling over the mastoid, auricular displacement, or loss of post auricular sulci. There was also no tenderness over the mastoid, even with heavy knuckle percussion.

Left. There was a postauricular scar with a small pinpoint discharging fistula directly over the antrum. A probe could be passed through this fistula directly into the antrum and middle ear. There was a muco-purulent discharge from the canal, which had a very offensive odor. There was a marginal perforation high up anteriorly. The rest of the drum appeared thickened and opaque. There was no swelling or tenderness over the mastoid.

His temperature on admission was 99° F., with pulse 88 and respiration 20. White blood count was 10,850, with 74 per cent neutrophiles, 25 per cent lymphocytes, and 1 per cent large mononuclears.

On the 22d and 23d patient's general condition remained the same. On both of these days his temperature was normal in the morning, but showed an elevation to 100° F. in the evening. He was kept a strict bed patient.

Neurologically the only symptoms he showed were absence of the cremasteric reflexes and a slightly positive Rhomberg.

There was an increased swelling of the posterior canal wall of the right ear. It appeared edematous and boggy. The possibility of a ruptured subperiosteal abscess along the canal was thought of and the swelling was incised down to the canal wall, but no pus was found.

The condition of the left ear remained the same. Neither mastoid showed swelling nor could tenderness be elicited, even by knuckle percussion.

X-ray examination on the 22d showed: Mastoid on the left had been operated upon. No cells could be seen and mastoid was cloudy and sclerosed. The plate of the right mastoid was very interesting. It was first thought that the plates had been incorrectly marked, as there was marked rarefaction and the mastoid cells and middle ear appeared to be one cavity. It gave the appearance of a mastoid that had been operated upon.

Spinal puncture showed a slight increase in pressure with a cell count of 10 and a differential of about 80 per cent lymphocytes. There was a slight reduction of Benedict's solution and a very slight increase of globulin. Lange's colloidal gold test was negative.

Both blood culture and culture of the spinal fluid showed a gram negative, nonmotile bacillus. This at the time was considered due to contamination, which was later proved.

From the 23d until the 30th the patient was kept in bed under observation. During this period his temperature, pulse, and respiration remained normal. His general condition was markedly improved. He no longer had any headaches nor did he complain of dizziness. He perspired freely and was constantly constipated. His right ear had practically stopped discharging and the swelling of the canal wall had subsided, showing a large perforation involving the posterior half of the drum. His left ear discharged slightly.

Blood culture was negative. White blood count was 9,850 with 69 per cent neutrophiles, 29 per cent lymphocytes, 1 per cent transitionals. Culture of the discharge from the mastoid sinus showed staphylococcus albus and a Gram negative bacillus. Wassermann test was negative.

On the 30th, as his condition was so markedly improved, he was allowed up and about. After eating his dinner he vomited and complained of severe headache and dizziness. His temperature was 102° F., with pulse 110 and respiration 22. At 6 o'clock that evening his temperature was 103.4° F., with pulse 124 and respiration 22. He had no distinct chill, though he complained of a chilly sensation and perspiration was profuse. There was no pain nor swelling of either mastoid, nor was there any tenderness or edema. Jugulars were not palpable. There was a slight horizontal nystagmus (spontaneous). Neurological examination was negative. White blood count that evening was 15,600 with 89 per cent neutrophiles and 11 per cent lymphocytes.

On August 31, 1924, his temperature was 101° F. There was marked drooping of the posterior canal wall on the right with tenderness at the tip of the mastoid. White blood count was 14,600 with 78 per cent neutrophiles and 22 per cent lymphocytes. Blood cul-

ture taken the previous day showed no growth. Spinal puncture showed fluid apparently not under pressure. There was a cell count of 15 with a differential of about 80 per cent lymphocytes. There was a slight reduction of Benedict's solution and a very slight increase of globulin. Culture and Lange colloidal gold test were later reported as negative.

Urine showed a trace of albumin.

It was decided to operate immediately.

Operation.—Mastoidectomy. Ligation of jugular and incision of sigmoid sinus. Usual curvilinear postauricular incision. Periosteum was slightly thickened but not adherent. Cortex was very hard and thickened. Upon removing portion of cortex a whitish membrane was noted. In perforating this with a probe it was found thickened and, with each pulsation, thickened pus, resembling small worms, exuded. After complete removal of the cortex no cellular structure was found, but the entire mastoid cavity, antrum, and middle ear formed one cavity, filled with this encapsulated mass of broken-down, organized tissue, resembling Rocquefort cheese and having a very foul odor. After removal of this mass it was found that the bony plate over the vertical limb of the lateral sinus was gone. The dura of the sinus was covered with thickened exudate and granulations. An exposure from a point beyond the sinus knee to a point as close to the jugular vein as possible was made. The sinus was fairly firm and the presence of a thrombus was evident. At this point the jugular vein in the neck was exposed. The external jugular was first encountered and found markedly enlarged, being about one-half an inch in diameter. The internal jugular was flat like a ribbon and contained practically no blood. No thrombus was found in the jugular or its tributaries, and as the patient had had a negative blood culture it was assumed that he must have an aseptic thrombus, possibly in the region of the bulb at the beginning of the jugular. On this assumption only, ligation of the jugular was done close to the clavicle. The neck wound was closed except at the lower end. The lateral sinus was then opened. A disintegrated thrombus was found. By means of a curette this was removed. Free hemorrhage could not be established from either end of the vessel, though it was curetted, posteriorly, to the torcular and, anteriorly, to the jugular bulb. Sinus was packed with iodoform gauze, as were also the middle ear and mastoid cavity. Wound was not sutured but left open for drainage. Culture from mastoid later showed pneumococci. Following operation there was considerable shock, but patient responded well. His temperature, pulse, and respiration reached normal the following day and convalescence was uneventful.

Interesting features of the case are:

(1) The prolonged history of ear trouble.

(2) The existence of a lateral sinus thrombosis which apparently had existed for a month or more and which produced comparatively few diagnostic symptoms at the time of admission. This can be explained by the formation of an aseptic clot at the distal end of the sinus and the causative organism being a pneumococcus.

(3) Such marked pathology within the mastoid, producing so few local symptoms and signs. This, too, can be explained by the thickened cortex of the patient and the general state of euphoria so frequently present in these cases.

COLONIC IRRIGATION AND BACILLUS ACIDOPHILUS MILK IN DIARRHEA

By H. V. Hughens, Lieutenant, Medical Corps, United States Navy

The *Bacillus acidophilus* milk has been used by mouth in infant feeding in health and in disease. There are many advocates of its use in constipation and intestinal autointoxication. It has been used to advantage in constipation (1), mucous colitis, and the diarrhea of tuberculosis (2).

N. Philip Norman, M. D., New York City, was the first to implant the *B. acidophilus* culture directly into the colon by way of the rectum.

According to authoritative research (3) the *B. acidophilus* is nontoxic and in the intestinal tract establishes a simplified flora which is beneficial to the human system. In order to maintain the growth of the acidophilus bacilli in the intestines it is necessary to administer lactose in the form of sweet milk or the U. S. P. lactose. Taking the above into consideration, the writer decided to try the implantation of the *B. acidophilus* milk culture directly into the colon *per rectum* in cases of diarrhea. Norman colonic drainage technic (4) and the writer's apparatus was used (5).

Not having laboratory facilities for cultural work, and as there was no intention at the time these cases were treated of making a report of the results, no effort was made to identify the causative organism. The laboratory work done was limited to the examination of feces for ova and ameba and in some cases white and differential blood counts were made.

Twenty cases of diarrhea, which were diagnosed colitis acute, were treated by direct implantation of 500 c. c. milk cultures of the *B. acidophilus* into the colon *per rectum*. Colonic irrigation, using 1 to 2 gallons of warm water, according to Norman's technic (4) (5), preceded the implantation. Milk cultures of *B. acidophilus*, 1,000 c. c., were given by mouth daily. Besides the acidophilus and irrigation therapy, the patients were put to bed and their diets restricted to liquids.

Thirteen cases had the typical symptoms of acute colitis, temperature ranging from 100° F. to 104° F., tenesmus, frequent bowel movements consisting of a small amount of blood mixed with mucus, and in some cases nausea. Seven cases were of subacute type, having no fever but all the other symptoms complained of by the acute cases. Three of the acute cases required a second irrigation before the temperature and bowels became normal, and three of the subacute cases required two irrigations before their bowels became normal. The other 14 cases had normal temperatures on the day following their only irrigation. The acute cases averaged four and a fraction sick days per patient and the subacute averaged three and a fraction sick days per patient. There were no recurrences.

CONCLUSIONS

1. All workers have reported that when 1,000 c. c. of the *B. acidophilus* milk is taken by mouth daily about two weeks is required to establish this organism predominantly in the intestines. It would appear that with the instillation of the live culture directly into the colon there is at least an immediate temporary change of flora.

2. The results obtained in this series of cases certainly indicates the superiority of this treatment over the usual treatment used.

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POSTOPERATIVE URINARY RETENTION AND ITS MANAGEMENT

By L. D. Carson, Lieutenant (Junior Grade), Medical Corps, United States Navy

Although acute urinary retention and bladder atony follow major operations comparatively frequently, especially operations upon the rectum and in the pelvis and lower abdomen, as well as minor operations involving prolonged general anesthesia and preoperative narcotization, yet in the usual case this possibility is given little or no thought before operation, and it is only after a postoperative

case fails to void for from 14 to 20 hours that attention is paid to this rather embarrassing emergency, and catheterization is reluctantly done.

The attitude of the profession toward catheterization in postoperative cases seems to have undergone some change during recent years. Formerly indications for the use of the catheter were ill defined. Some men were accustomed to free use of the catheter whenever there was any complaint of distention in the lower abdomen from any cause, while others, fearing to set up a cystitis, avoided its use except in very obvious cases of overfilling of the viscus. Development of an aseptic technique represents an attempt to safeguard this procedure. Occasionally irrigations of the bladder or instillations were employed, but usually with no clearly defined indications or scientific basis for the practice. More emphasis was placed upon the possible carrying in of infection by the catheter, and upon trauma to the bladder by such procedure, than was directed toward a much more important factor in the etiology of postoperative cystitis, namely, previously existing abnormalities of the bladder or lower urinary system, chief among which is the presence, in a great many cases, of a residual urine. Its presence before operation was rarely looked for and postoperative retention was expected in a considerable number of cases. Then, when failure to void occurred these cases were catheterized as a routine measure, either at regular time intervals or at irregular intervals, until the patient was able to void without assistance. Once the patient was able to do this, no further attention was directed toward the bladder or the possible presence of residual urine or other abnormality.

Acute cystitis occurring at any time is almost always bacterial in origin. The exciting cause is bacterial invasion upon a favorable soil (an irritated or congested mucous membrane). Eighty per cent of all bladder infections originate from the kidneys and, hence, most of them are chronic.

The three main predisposing factors are first, retention, especially chronic partial retention or "residual urine"; second, congestion of the bladder mucosa, which is favored by the first factor, by such things as exposure to cold and dampness, concentration and saturation of the urine with various salts, alcoholism, acute abdominal conditions, or pelvic conditions in the neighborhood of the viscus, etc.; and, third, traumatism, under which may be grouped foreign bodies, such as tumors of the baldder, stone in the bladder, instrumentation, and injury to the bladder wall during surgical operations, particularly gynecological and genitourinary and rectal operations, hysterectomy, in which the cervix uteri is stripped away from the neck of the bladder, catheterization which is roughly or carelessly done, pelvic fractures, and obstetrical manipulations and instrumentations.

Ralph G. Mills, in a paper summarizing and classifying the incidence of postoperative catheterization in a series of 2,254 patients in the Johns Hopkins Hospital, states: "The frequency of postoperative urinary retention has not been investigated as fully as its importance would justify." Arthur H. Curtis, in a large series of major operations on women in his gynecological service, discovered a definite relationship between the presence of residual urine and the bladder symptoms which led to catheterization. It was found that less than 1 per cent of the patients who were not catheterized for signs of retention had residual urine, while over 64 per cent of those repeatedly catheterized had a residuum of more than an ounce. The bladder usually returned to normal in from four to eight days, but recovery was delayed considerably by the presence of infection which was limited to the bladder in all but a few cases.

The position of catheterization in the list of causes of postoperative cystitis has been very generally misunderstood. In the Wertheim operation for carcinoma of the uterus, in which there is extensive dissection of the bladder wall, cystitis is a frequent and often serious complication. Cystitis in a series of Wertheim's own cases occurred in patients who were not catheterized as well as in those who were. Special care was then employed in his clinic to perfect the aseptic technique of catheterization as well as to minimize trauma, but these precautions failed to influence appreciably the results. Wertheim's conclusion was that the presence of residual urine was the most important factor, a condition which was made possible by the paretic condition of the bladder walls, the residual urine favoring the development of bacteria. At this point one might point out that the reaction of the urine in these cases of cystitis is an index to the type of infection. Colon, tubercle, typhoid, and gonococcal forms of bacteria usually cause an acid cystitis, while staphylococcal, streptococcal, and proteus forms are usually the causes of an alkaline reaction.

There is no doubt that a great many cases which have no urinary symptoms, no obstruction, no tenesmus, and few if any laboratory findings in the urine, neverthless have a moderate amount of residual urine. In male patients this is probably most often the result of prostatic hypertrophy, possibly of only mild degree. In female patients it may be due to a variety of pathological or physiological conditions, such as uterine malpositions, relaxed perineum after childbirth, operations for repair of the perineum, cystocele, etc.

In cases of operations on abdominal organs, catheterization was found necessary in four times as great a percentage of female patients as of males.

Urinary retention is favored by shock and the consequent low blood pressure with decrease in output of urine, pain, nausea, vomiting, packing, plugs, and any mechanical factors within the rectum

which may cause pressure upon the perineum, as, for instance, the use of a large plug following hemorrhoid operations, and, to a considerable extent, by the presence of a neurotic temperament, having some relation to race and sex activity, according to Mills's statistics.

Taussig states "the danger of infection lies less in the technique or frequency of catheterization than in the presence of urinary stagnation in the bladder." Again, "some of my most serious infections occurred in women in whom I had ceased prophylactic measures as soon as they began to void spontaneously."

It is Curtis's belief that observance of rigid asepsis in the technique of catheterizaton exerts but moderate influence in diminishing the number of infections, and he also calls attention to the fact that, in cases where it is unsuspected, it is frequently found that after voiding even comparatively small amounts of urine catheterization will disclose a residual urine of an ounce or more. His belief, and that of a great many others, is that discontinuance of the use of the catheter immediately the patient begins to be able to void his urine following operation is a serious error; that following voidance the catheter should be employed as a diagnostic procedure to determine the presence or absence of residual urine. He has found that in patients with normal bladder and normal position of the bladder placing them in bed upon their backs makes it impossible in many cases for the bladder to empty itself completely by voluntary urination.

The part played by gravity in emptying the bladder and in the production of residual urine has been insufficiently emphasized. Barringer and Mackee in a series of experiments found by means of X ray that the bladder normally appears as funnel-shaped and that the apex corresponds with the urethra. They injected a bismuth suspension into the bladder for diagnostic purposes and found that they were unable to wash it out so long as the patient was lying down but that it could be done easily with the patient in the sitting position. The observation that many cases show complete control of bladder function coincident with the date when they are first allowed to sit up in bed is here noted. Several men have observed that cystitis developed less often in cases which were out of bed early than in cases which were longer confined.

Curtis advocates use of the catheter for the diagnosis of impaired bladder function and uses the catheter himself freely to determine this point in his cases. He follows each voluntary urination by catheterization. If residual urine is found, then each voluntary urination is followed by catheterization until complete restoration of bladder function. With this procedure he uses copious lavage of the bladder.

The conclusion reached by Mills in his very interesting article is that the use of the catheter is indicated before operation for the diagnosis of possible residual urine or to facilitate the procedure, and after operation for the same purpose immediately following the first voluntary urination. Then, if residual urine be found, catheterization should be continued as long as it is present. In such a case treatment for an anticipated cystitis should be instituted immediately the diagnosis is made.

Due to the fact that so many cases are recorded in which postoperative urinary difficulties necessitating catheterization were found to show the presence of more or less residual urine in the bladder, it is felt that such a course of procedure as outlined by Curtis, Mills, and others who have made a thorough study of these cases should be followed. It is felt by the writer that cases of postoperative cystitis which have developed in this hospital should have been investigated in this manner and the presence or absence of residual urine or stricture, of prostatic enlargement, or any of the many other causative factors of partial retention of urine determined so far as possible prior to any operation which was going to keep the patient long reclining in bed. Even in the absence of any evident preoperative disturbance, once postoperative catheterization is resorted to, it is believed that it should not be discontinued immediately upon voluntary urination, but should be used as a diagnostic measure.

REPORT OF A CASE OF SCARLET FEVER OF UNUSUAL ETIOLOGICAL INTEREST

By G. L. Wickes, Commander, Medical Corps, United States Navy

F. V. F. S., apprentice seaman, United States Navy, reported at the receiving building of this station on November 13, 1924, and in accordance with routine procedure in the case of new recruits he was vaccinated and cultures were made from his throat to determine whether or not he was a carrier of the organism recently identified as the etiological factor of scarlet fever. This culture was made on blood agar media and proved to be negative for the presence of *Streptococcus hemolytica*. The vaccination resulted in a severe primary reaction, which caused him to be admitted to the sick list on December 23, 1924, with vaccinia. On December 25, 1924, his temperature was again normal, but the vaccinated arm remained inflamed with involvement of the axillary glands. On December 31, 1924, his temperature rose suddenly to 103° F. and his vaccination showed evidences of infection. Examination at this time showed a generalized hyperemic eruption of vivid scarlet hue involving the skin of the arms, face, thorax, and thighs. The tongue was heavily

coated and presented a typical "strawberry" appearance. As this case presented a clinical picture of scarlet fever, he was isolated and cultures were taken from the throat, although examination showed no inflammation to be present. Cultures from the throat were negative for two successive days and then a culture was taken from the vaccination lesion which proved positive for the *Streptococcus hemolytica*. The isolation of this organism from the vaccination lesion not only verified the diagnosis of scarlet fever but, of far greater interest, it definitely established the vaccination lesion as the point of infection of the disease. This fact throws a new light on the causes of skin eruptions complicating vaccinations that have often been described as being caused by the vaccinia alone.

In just what manner the infection of scarlet fever was introduced into the vaccination lesion in this case has not been determined, although it is believed that the infection was carried by the man's own hands. There is no reason to suspect the vaccine, as vaccination is practiced daily without similar infection. There were no other cases of scarlet fever present on the station when this case was infected. The entire complement of hospital corpsmen were tested and found not to be carriers of the disease.

In considering the unusual point of infection in this case one recollects that G. F. and G. H. Dick reported that the first transfer of scarlet fever from one individual to another by inoculation of *Streptococcus hemolytica* was produced "by swabbing on the tonsils and pharynx a pure culture of a hemolytic streptococcus isolated from a lesion on the finger of a nurse who acquired the disease while caring for a convalescent scarlet fever patient."

It appears probable that the infection in the Dicks' case occurred by way of the lesion of the finger.

POISONING BY METHYL SALICYLATE—REPORT OF CASE

By. J. L. Emenhiser, Lieutenant (Junior Grade), Medical Corps, United States Navy

M. V., pharmacist's mate third class, was admitted December 10, 1924, suffering from acute methyl salicylate poisoning. He complained of shortness of breath, roaring in the ears, dimness of vision, nausea at times, feeling of heat, and profuse perspiration.

Present illness.—At 4.30 a. m. on the day of admission, while on night duty, patient took 1 ounce of methyl salicylate, thinking it to be magnesium sulphate, in solution. He stated that his nose was so obstructed by a cold that he did not notice his mistake until he had swallowed the drug. He immediately took an ounce of magnesium sulphate and a glass of water. There was no report made to the medical officer, as he did not realize he had made a serious

mistake. Vomiting occurred about 6 a. m. At 7 a. m. patient ate breakfast. An hour or so later, when off duty in Hospital Corps' quarters, the other corpsmen noticed that he was acting queerly and could not walk straight; but, thinking the patient to be drunk, did nothing. Shortly after he became unconscious and had convulsions. The medical officer on duty was called and the stomach was thoroughly emptied. At 10.30 a. m. the patient was admitted to the ward.

Respirations were rapid and deep, perspiration free, and temperature 96.6. Pulse was of good quality and the pupils were dilated. During the next three hours the patient continued to have rapid respirations. Vomiting occurred three times, the vomitus being golden yellow in color and containing portions of prunes eaten for breakfast. After this the pupils contracted to normal and the patient passed off into natural sleep, except for increased respiration. The findings of further history and of physical examination were unimportant.

Treatment consisted of forcing liquids by mouth, 2 per cent sodium bicarbonate by proctoclysis, and blankets to increase elimination by free perspiration.

On the afternoon of December 11 the patient began to complain of pain in the right renal region. Two hundred and fifty cubic centimeters of urine were passed at 8.30 p. m., the first to be voided. Laboratory examination showed albumin 3 plus, some epithelial casts, 7 erythrocytes per low power field, specific gravity of 1.035, and no salicyluric acid. At 9.15 the patient was screaming with urethral pain. Morphine sulphate, gr. ¼, was administered. At 6 a. m., December 12, 300 c. c. of urine were passed—albumin, 2 plus; specific gravity, 1.022; salicyluric acid positive; abundant renal epithelium; no red blood cells.

On December 13 urine output for the 24 hours was 500 c. c. This was negative for albumin, casts, and red blood cells, but positive for salicyluric acid. On this date the patient suffered from slight epistaxis. On December 15 the urine was negative in all respects, at which time practically all of the symptoms had disappeared. The patient was kept under observation for about one week and then returned to duty, apparently well, free from symptoms.

The symptoms caused by salicylates are quite indefinite, vary greatly, and depend upon the idiosyncrasies of the patient. It is common to get disorders of hearing due to congestion of the tympanum or cells of the nervous mechanism of the ear. Usually the disturbance is temporary, but cases of permanent impairment have been reported. Dimness of vision is due to vascular or retinal changes in the eye. Vessels of the skin are dilated. This results in increased

heat loss and excessive perspiration. The latter may also be explained by increased activity of the sweat centers. Very large doses produce a slow, weak, dilated heart, probably due to direct toxic effects upon the cardiac muscle. Blood pressure is lowered, partly perhaps from the depression of the vasoconstrictor center, but mainly from the cardiac action of the drug. The respiratory center is excited by moderate doses and depressed or even paralyzed by larger doses. This feature is usually responsible for death, as the heart continues to beat for a time after respiratory failure has occurred. The central nervous system is comparatively slightly affected unless a special idiosyncrasy exists. The convulsions sometimes noted prior to death are probably due to asphyxia and not to cerebral excitation. No part of the brain is especially depressed, except the medulla oblongata in some cases. Then the respiratory, the vasoconstrictor, and probably the vasodilator centers seem to be first stimulated and then depressed. The drug is excreted chiefly by the kidneys in the form of salicyluric acid, which is an oxidation product of sodium salicylate. Slight diuresis is likely to be present from primary irritation of the renal epthelium. This may be followed by an acute nephritis with the appearance of albumin, blood, and casts in the urine. Metabolism is markedly altered, as indicated by an increase of 10 to 12 per cent in the nitrogen and sulphur and as much as 100 per cent in the uric acid of the urine. This indicates a considerably augmented decomposition of the proteins of the body. It is not known if there is an accompanying proportionate increase in oxidation.

The case in question is especially interesting from the following standpoints:

1. The fact that a hospital corpsman who is trained to administer drugs to patients swallowed 1 ounce of methyl salicylate, a hot, burning, volatile oil with a penetrating odor.
2. The early pronounced involvement of the central nervous system.
3. The severity of the renal symptoms.
4. The early complete recovery.

NOTES AND COMMENTS

MEDICAL OFFICER IN BATTLE

The following is a translation of an article dealing with the impressions of a ship's medical officer during battle and with the difficulties encountered at such a time which appeared in Annali di Medicina Navale e Coloniale, Anno XXX—1924—Volume II, Settembre-Ottobre. It gives a very vivid description of what may be expected in any naval battle.

Auf See unbesiegt (Unconquered at Sea) is the title of a series of war episodes published in two volumes by Lehmann, of Munich, Bavaria, under the supervision of Vice Admiral von Mantey and narrated by his companions in arms in a simple manner without details of a technical character and with little recourse to literary embellishments.

In this collection, which is of great documentary value, Lieut. Commander Robert Amelung, of the Medical Corps, briefly describes in concise terms the impressions received by him during the battle of Jutland on board the *Seydlitz*, the flagship of the German battle-cruiser division.

From his description, together with the report published by the chief naval constructor of the division in the same collection of documents, we find that the battle dressing stations were arranged in the following manner: In compartment No. 6 was the forward dressing station in charge of the third medical officer; the fifth compartment was set apart for the dead, and many a man was taken there directly during the action. In the fourth compartment, beneath the gun deck, on the port side, was the principal dressing station, under the direction of the chief surgeon, and on the starboard side the auxiliary station, under the direction of the second medical officer, in a separate room but communicating with the principal station; in the third compartment was the receiving station for the wounded.

The chief medical officer of the division superintended the transportation of the wounded, many of whom he placed with his own hands on the operating table of Doctor Amelung, who exclaims: "Oh, how often during drills in peace time I have been enraged at the indifference and lack of care shown by some of the seamen and

stokers, and even some of the petty officers, when I was instructing them in the fundamental principles of first aid and the rules for bandaging and carrying the wounded. And behold, when it is no longer a case of supposed wounds, indicated by a tag, and the blood is flowing in reality, the fruits of instruction and practical exercises patiently persevered in become apparent."

The two paymasters of the ship and the chaplain were also at the disposition of the medical officers.

Drums and bugles sound battle stations at 5 p. m. The period of waiting is full of anxiety. Amelung goes out on the bridge for a moment, but he is no sooner there than the firing begins. He returns to his station and once more we wait. The ship is shaken by the thunder of the artillery. Amelung issues his orders by signal, all sounds of the voice being drowned by the deafening roar of the battle.

The first enemy shot to strike the ship explodes in casemate No. 6 and destroys the forward dressing station. The water-tight doors open for an instant and the third medical officer, the barber, and the chaplain, who has his head bandaged, take refuge in the principal station. The remainder of the personnel of the forward station are dead.

The wounded flow in. It is not possible to examine them carefully one by one. And while Amelung is quickly applying first-aid treatment he sees a flash and the room is filled with a dense cloud of smoke and gas produced by the explosion of an enemy projectile in the rooms above. Everyone puts on his mask. The heat is suffocating and prevents all work. Amelung therefore tears off his mask, finds that he can breathe, and goes on with his treatments. Meanwhile, a fire having broken out in turret C for the 280 mm. guns, compartment No. 3 becomes a lake. The wounded are then deposited in the auxiliary station, where the two subaltern surgeons take turns while one assists Amelung, who has not left the operating table.

There is but little ventilation. The temperature is above 40° C. during the entire progress of the battle. The supply of fresh water is interrupted. That on hand in the sick bay is distributed to the wounded who are parched with thirst and to the firemen who come asking for a drink. The surgeons wash their hands in contaminated water but dry them on sterilized fabric, of which, fortunately, there is an abundant supply.

Coal dust settles on everything. Splotches of blood are seen everywhere. Every little while the fire hose is passed through the dressing station and soils everything. Each pause in the battle is taken advantage of to clean things up a little and change the blood-soaked dressings. It is impossible to perform any major operations. There

is no time. It would be too complicated to administer anesthetics. Asepsis is a myth; infection will therefore be certain. The rolling of the ship, which even causes the wounded to fall from the table, makes it impossible to guide the instruments with precision, and the vibrations extinguish the electric lights at every instant, so that recourse is had to candles. By midnight the electric mains are entirely demolished.

Extensive use is made of morphine. Fractured limbs are vigorously pulled into position and splints quickly applied. Serious hemorrhages are checked by a pressure dressing and sometimes by the temporary application of a tourniquet, direct scientific ligation being out of the question.

A fifth of the wounds consist of painful burns, for which everything available in the shape of oil, unguents, and powders is used up, the supply on hand being very inadequate to the needs. Morphine is scarcely able to sooth the terrible suffering of the burned. During the night Amelung, after long meditation, decides to resort to hypodermoclysis, but this is given up as it would not save the three most seriously burned who die before dawn.

When the auxiliary dressing station is full, the wounded are left in the principle station, where there is scarcely room to move around the operating table. Two are placed in compartment No. 3, raised above the water. One of them is rendered unconscious by the explosion of a shell and the other sustains an additional very serious wound. Another shot enters the room containing the dead. A third, from a 381 mm. gun, penetrating the armor abreast the dressing station, stops between the inner and outer skin.

The situation of these suffering men is terrible, crowded into a small space without light or air, buried alive in an oven, and not knowing what is taking place above them. When the ship inclines to one side they perceive it but do not know whether she is changing her course or is about to sink.

The commanding officer, to encourage his men, orders, in a loud voice, that the information be circulated throughout the ship that an enemy vessel has been sunk, then that the "*Queen Mary* has been blown up." Even the wounded feel reanimated, but the hours of anxious waiting drag along slowly in the dressing station. After a rather long pause the battle begins again during the night with renewed violence. The influx of wounded grows still greater. Suddenly a tremendous explosion throws everything into confusion. Everyone puts on his mask and rushes into compartment No. 5. But in the dim light a man appears before Amelung and stretches out his right arm minus the hand. Amelung quickly applies a medicated pad to the stump and fastens a tourniquet around the lower part of

the arm and then, as there is no fire, as the gas can be endured, he resumes his work at the operating table. A new explosion produces a shock which loosens the deck light and it falls on his head. He sinks to his knees, stunned, but quickly regains consciousness and gets up; he is not seriously hurt and goes on with his work.

Toward midnight the fighting finally subsides. The second barber succeeds in reaching the cook's galley and prepares tea, which is distributed to the wounded. Others procure wine and ice. Amelung is overcome with fatigue. He looks about in vain for a clear space where he can lie down without falling upon some wounded man. They offer him a piece of bread. A tenacious force of will enables him to proceed to a general inspection of the dressings.

By 1 o'clock the battle is ended. An hour later it seems as if it were about to recommence, but this proves to be a false alarm. The vessel, which is very much down by the bow because it has been struck by a torpedo during the battle, heads for port.

At dawn the wounded, under the leadership of the chaplain, intone a chant. At 5 o'clock, after 12 hours of continuous work, Amelung goes up on deck and proceeds to report to the commanding officer.

Seven of the wounded died during the night, two of them from serious internal abdominal lesions, and one probably from shock because there were no evidences of external lesions nor any symptoms of internal lesions. Apparently the casualties (dead and wounded) amounted to 11.7 per cent of the crew.

INHERITANCE IN TUBERCULOSIS

It is commonly assumed by many physicians and most laymen that tuberculosis, if not actually inheritable, at least predisposes the offspring to the disease. Doubt is cast upon this assumption by a study of tuberculosis in New York City made by G. J. Drolet, statistician, research service, New York Tuberculosis Association, and published in the American Review of Tuberculosis, November, 1924. On the contrary, the fact that one or both parents is a sufferer from the disease would seem to render the child less liable to tuberculosis and to increase its chance of recovery should it become infected.

Drolet's statistics are compiled from the records of cases observed at Bellevue Dispensary in the crowded east side of New York, where conditions are such that large numbers of the patients applying for treatment for various causes are victims of tuberculosis.

Drolet classified a total of 7,429 cases and found that 1,577 gave a history of tuberculosis in their parents or grandparents, while 5,852 were unaware of any such history.

Among the cases having a parental positive history of tuberculosis, 540 cases, or 34 per cent of the total, were found tuberculous; while among 5,852 with negative parental history there were 3,463 cases, or 59 per cent. In other words, among the people examined from the Bellevue district on the east side of New York City almost twice as much tuberculosis was found among those whose parents did not have tuberculosis as compared with those whose parents had tuberculosis. These results were duplicated to an even greater extent among the children in the special clinic for them at the dispensary.

Drolet shows that there was a much greater rate of recovery among tuberculosis patients who had a positive parental history than among those whose history was negative. In 1912 the comparison was 24 per cent to 13 per cent. In 1916 the percentage of cures was twice as high among those with a positive history.

"Right under our own eyes, therefore, we have had in New York City the spectacle of a diminishing incidence of tuberculosis being attained through stock which had been tuberculized previously. Just, as in Koch's phenomena, the course of a secondary infection from tuberculosis in animals tends to a greater rate of healing as compared with the sluggish reaction of a first infection, so in human stocks that have been already tuberculized there is a tendency toward a greater rate of recovery in tuberculosis. Also the implantation of tuberculosis infection upon a group which is practically virgin soil, such as are the children with a negative parental history of tuberculosis, produces at first a greater and more florid amount of tuberculosis than upon soil which, as in the case of people whose parents have had tuberculosis, has already yielded a tuberculosis crop, just as we should expect from the experience in the course of epidemics from other diseases in communities that have already been attacked."

The author recognizes the share played by the inheritance factor in tuberculosis, but is aware that it is a painful and expensive mode of acquiring immunity. He favors improving the environment, bettering living conditions, and education in personal hygiene as means of reducing the incidence of the disease.

Among the conclusions drawn by Drolet, the following seems to be well substantiated: "Children of tuberculous parents do not inherit even a predisposition to the disease, but an increasing degree of immunity to it instead."

NURSE CORPS

EXCERPTS FROM A PAPER READ AT THE CONVENTION OF THE AMERICAN NURSES' ASSOCIATION AT DETROIT, MICH., 1924, BY CHARLES D. LOCKWOOD, A. B., M. D., F. A. C. S.

The profession of nursing has been a natural outgrowth of scientific medicine. The introduction of aseptic surgery, with its exacting demands and infinite detail, called for trained and conscientious attendance, such as had been unheard of in medical practice. The science of bacteriology not only broadened the field of surgical practice but it also opened up the great domain of preventive medicine, and in these two fields the modern nurse has found her greatest opportunity.

In the early days of nursing there was a spirit of comradeship and good feeling between doctors and nurses akin to that existing between an elder brother and his younger sister. There was mutual confidence and esteem. The physician on his part welcomed the nurse as a valuable, new aid in his therapeutic armamentarium, and the nurse, with the exaltation of one who has found a new mission, took up her duties in the true spirit of service. The medical profession felt a sense of pride and proprietorship in this new addition to its ranks. In this formative period the nursing profession was more dependent upon the medical man for guidance and instruction, and so he came to look upon the training of the nurse as dependent upon the medical profession. Very many medical men still cherish the delusion that the education of the nurse is their prerogative and would deny to her the right of independent thought and action. It is unfortunate that so many medical men have failed to keep abreast of progress in the field of nursing and that a spirit of antagonism prevails in many hospitals between the schools of nursing and the medical profession. Medical men of the finest type, thoroughly conversant with the great strides made in every department of medicine, are still blind to the need of progress in nursing ideals and procedures and would limit educational opportunities for nurses.

It is perfectly obvious that the nurse must constantly widen her horizon if she is to keep pace with the growth of modern medicine. The growth of specialization in medicine has called forth greater specialization in nursing. Many physicians, demanding skill in

their particular field and who rely in large measure upon this skillful cooperation on the part of nurses for their success, are still decrying better education for the nurse. Training in observation and judgment, so essential to a good nurse, is dependent upon a broad knowledge of fundamentals, and it is absurd to think that anyone dealing with the problems of modern medicine can be too thoroughly grounded in these fundamentals.

Dr. William H. Welch in an address to the graduating class of the Johns Hopkins School of Nursing in 1916 said:

> There was a catchword at one time—one may possibly hear it to-day—that nurses were being overeducated. Now, I think nothing is more absurd than to talk even of the possibility of the overeducation of the trained nurse. That it is possible for a nurse to know too much, to be too highly qualified on the practical, scientific, and intellectual side of her profession, seems to be highly absurd. The great difficulty is that the education of the nurse has not been treated, as the education of doctors and college students has been, as a subject for endowment.

The nursing profession and the medical profession are distinct, although closely interwoven. The idea which still prevails among medical men that nurses should be subservient to the medical profession is entirely wrong. There should be the closest possible alliance between the two professions, with mutual understanding and cooperation, but each has its distinct field. Nursing has risen to the dignity of a profession, and it can be taught successfully to others only by those in the nursing ranks who have had practical experience and who are skilled as teachers.

The educated nurse has come to be an important factor in modern life, and her services can no longer be viewed in a purely personal light. She owes important obligations to the community, and much of the success of the health program of the future is dependent upon her skill and cooperation. Let me again quote Doctor Welch regarding the contribution of nursing to the treatment of disease:

> There is no improvement in modern medicine which outranks in importance, in its value in the prevention and cure of disease, the introduction of the system of trained nurses. One can put one's finger on great discoveries in medicine, the relation of bacteria, we will say, to the causation of disease, which is of the greatest interest in the progress of medicine, but so far as the treatment of disease is concerned the application of the system of trained nursing counts for as much, if not more, than any scientific discovery in medicine. So important is it that it is the main factor in the treatment and management of a number of important and prevalent diseases.

Farsighted and wise as were these words at the time they were uttered, in 1903, the phenomenal strides made in the past 20 years in medical science render them inadequate to express the importance of nursing in relation to present-day health problems. This is particularly true in the field of health education and preventive medi-

cine. Were it not for the aid of the nurse our whole program of social betterment and disease prevention would fall flat.

The fear expressed by some physicians and seriously discussed in some of our medical journals that the nurse, or the "supernurse" (whatever that may mean) will supplant the physician is to my mind ridiculous. Where such a condition arises it is because the physician has been too lazy and too indifferent to progress to command the confidence and respect of the community in which he works. It will only be in the field of public health and preventive medicine that such a situation might arise, and in such cases the physician will be supplanted because of his inefficiency and his inability to maintain leadership through superior knowledge and initative.

When we view broadly the field of nursing and consider the multiplicity of duties and responsibilities which fall to the nurse in her relations to the individual sick person and to the community we can not but realize the importance of a thorough education for her. I know of no other field in which such a variety and range of knowledge is required as in the profession of nursing. In her relation to her patient the nurse is responsible for an almost infinite number of things; among them is a knowledge of good housekeeping, sanitation, psychotherapy, and some appreciation of the æsthetic. In her relation to the community she plays an even more important rôle. She must be familiar with the problems of public health and work in harmony with all public and private organizations engaged in community service. She becomes the field agent of the health officer and establishes liaison between him and all agencies which have to do with health problems. She helps teach the individual, as well as the community, methods of preventing disease and improving health; she is enabled to do this in a most effectual way because of her direct contact with those most in need of health instruction. She has the opportunity of demonstrating in the home practical methods of hygiene and sanitation. Even the profession of teaching, so fundamental to American institutions, does not rank with the nursing profession in the matter of responsibility and community service. Does anyone think that those undertaking to meet these demands of society can be too well trained or too highly educated?

This is an age of health education. The startling revelations of the World War as to the physical unfitness of one-third of our male population for military service has awakened the public conscience and created a demand for better health, for greater protection

against disease, and for a higher type of citizenship. It behooves the medical profession to lend every possible aid to the cause of nursing education. In aiding the education of the nurse and improving the quality of her work the medical profession is broadening its own field and strengthening its claim to public confidence. Likewise the nursing profession, by availing itself of the knowledge and inspiration that will come from a better understanding of the medical profession and a greater loyalty to its ideals, will increase its usefulness and render inestimable service to mankind.

It devolves upon the physician to impart his knowledge to the nurse and imbue her with the spirit of scientific medicine. The keener her intellect, the better her preliminary education, the more readily will she receive this instruction, for it will be "seed sown upon good soil." The seed having taken root and sprung up will in due time bring forth fruit. This fruitage will manifest itself in a better understanding on the part of the lay mind of the truths of scientific medicine. There is no greater need on the part of the public to-day than a proper understanding and appreciation of the benefits that scientific medicine has to offer. Were it possible to utilize the knowledge we now possess in the prevention and cure of disease the average span of life could be increased 10 years, most infectious diseases could be eliminated, and untold suffering prevented. Ignorance, superstition, and failure on the part of the public to uphold high standards of medical education prevent the full enjoyment of the blessings science has to bestow. Even the most intelligent laymen, unless their associations have been with medical institutions or scientific physicians, are a prey to quackery; the medical profession speaks a language which is unknown to the public. Efforts on its part to oppose the cults, to defeat vicious legislation, and to maintain standards of education are ascribed to self-interest. Scientific medicine has no efficient mouthpiece, and until it can have such a mouthpiece to interpret its language to the people cultism and quackery will flourish.

In the well-educated nurse we find the ideal medium for conveying medical knowledge to the public. She has the ideal approach and, endowed with the knowledge and imbued with the scientific spirit, her message will prevail. Here, then, is the great field open to the medical profession for the spread of medical knowledge and for the betterment of mankind. It has been the boast of the medical profession that it is a humanitarian and an unselfish profession: that its purpose is to abolish disease, and in so doing it will undermine itself. This ideal, I believe, animates the best men in the medical profession, and it is to these that the nurse must look for help and guidance in nursing education.

Intelligent nursing, so essential in certain medical affections such as pneumonia, the infectious diseases and cardiac cases, and in the care of critical surgical conditions, such as brain injuries, hyperthyroidism, and intestinal obstruction, must rest upon a fairly sound, pathologic basis to attain its maximum efficiency. Successful nursing can not be done by rule of thumb any more than the successful practice of medicine. Mortality statistics from our various hospitals and clinics reflect not alone the skill of physician and surgeon but likewise the character of the nursing service.

A nation's greatest asset is the health of its citizens; moral and intellectual decay go hand in hand with physical decadence. In large measure the destiny of America lies in the hands of those of us who possess the knowledge and control the agencies which have to do with health and disease prevention. In all the chaos and confusion which envelop the world to-day, in all the misery and degradation which oppress the human spirit throughout the world, there is nothing so blighting as disease. It is the high mission of those of us who are trained in the prevention and treatment of disease to lead the way to happier and healthier lives. To accomplish these great ends we shall need all of our resources and the utmost unity of purpose. We shall need a revival of the spirit of service which lies at the foundation of the medical profession and the nursing profession. Each must contribute the best in its possession. Society expects of us the solution of the health problems that are confronting it; it will ultimately demand that the best knowledge science has to offer in the prevention and cure of disease shall be made available for the average man and woman. If we of the medical and nursing profession fail to assume this leadership and initiative which is ours by right of education and training, this leadership will pass from us and we shall become the servants of the State. In the spirit of mutual respect and just appreciation of each other's rights and responsibilities let us work for our common purpose, the betterment of health, and the welfare of mankind.

BOOK NOTICES

Publishers submitting books for review are requested to address them as follows:

The Editor,
United States Naval Medical Bulletin,
Bureau of Medicine and Surgery, Navy Department,
Washington, D. C.
(For review.)

THE MEDICAL ASPECTS OF CHEMICAL WARFARE, by *Edward B. Vedder, Lieutenant Colonel, Medical Corps, United States Army*, with a chapter on the NAVAL MEDICAL ASPECTS OF CHEMICAL WARFARE, by *Duncan C. Walton, Lieutenant Commander, Medical Corps, United States Navy*. Williams & Wilkins Co., Baltimore. 1925

It appears to be a generally accepted idea that the use of gas in war is barbarous. In the introduction to this book data is advanced to show that in some instances the use of gas is not so inhumane as some of the other weapons of war. The records of the Surgeon General's office and all the records from British, French, and German sources indicate that "there is seldom any permanent serious injury as the result of gassing." Furthermore, situations may exist where the tactical requirements demand a rapidly acting and nonlethal form of incapacitating gas in preference to a slow-acting lethal gas. Gas can be made as humane as desired and varied to suit the conditions.

While gas warfare has been known to exist in some form since the days of the ancients, yet the extensive use of this potent weapon was first employed during the World War, causing approximately one-third of the battle casualties occurring in the American Expeditionary Force.

In Chapter XIV of this book there is included a detailed list of articles required for the treatment of gassed cases at the following battle stations of the Medical Department:

1. Battalion and regimental aid stations.
2. Collecting stations.
3. Ambulance companies.
4. Hospital center.
5. Evacuation hospitals.
6. General hospitals.

Chapter XVI, written by Lieut. Commander Duncan C. Walton, Medical Corps, United States Navy, contains information of unusual importance to the Naval Medical Corps. This chapter outlines the probable types of gases which might be used in naval warfare, the naval methods of individual and collective gas defense, the defensive measures against toxic gases likely to be accidentally encountered aboard ship, and other information essential to the Naval Medical Department in connection with the possible use of gases in sea warfare.

When one considers that this book is practically a pioneer in this field of activity—having been written with little precedent to guide the authors—the conclusion appears justified that the book is the result of careful investigation and much expenditure of time and effort on the part of its authors. It should be read with interest and profit by naval medical officers.

FACIAL SURGERY. By *H. P. Pickerill, C. B. E., M. D., M. S., Surgeon in Charge of Facial and Jaw Department, Dunedin Hospital; Lieutenant Colonel, N. Z. M. C.; Membrè d'Honneur Société Belge de Stomatologie; late Surgeon in Charge of the New Zealand Section, Queen Mary's Hospital, Sidcup.* With an introduction by *Sir W. Arbuthnot Lane, Bart., C. B., M. S.* William Wood & Co., New York. 1924

During the war the British established the Queen's Hospital at Sidcup as a special hospital for facial and jaw injuries, to which all cases of this sort were sent. A description of the hospital and its work appeared in THE BULLETIN for January, 1920. The English, Canadians, Australians, and New Zealanders had separate sections and vied with each other in adapting old methods and developing new ones, as a result of which remarkable advances in surgery of the face were made. A large number of excellent articles and at least two very important books have been published by that group of workers.

Pickerill, who was surgeon in charge of the New Zealand section, has now produced a book, based on the work of his section, which will prove invaluable to those interested in this branch of surgery. No attempt is made to cover all the operations about the face; only those methods are described which he has found to be useful and satisfactory. Others are omitted because he has not found them satisfactory or because he is opposed to the principles on which they are based, and so has not used them. He emphasizes the fact that the appearance of the normal face is dependent on function, and any interference with the functions of mastication, speech, or the expression of emotions leads to loss of normal appearance.

He names as the cardinal principles of plastic surgery asepsis, absence of tension, accuracy of adaptation, and avoidance of raw surfaces. He considers grafting always better than stretching to

make good the loss of facial tissue. He is opposed entirely to the use of foreign substances or masks to replace lost tissue about the face, since they are unsatisfactory, and extensive loss of tissue is no bar to restoration by plastic surgery. Although every separate part of the face may be completely destroyed or lost, it can by means of suitable operations be restored to a not displeasing resemblance to the original part. This seems an overenthusiastic statement on Pickerill's part, but the reviewer had the privilege of observing the work of Pickerill and others at the Queen's Hospital for two months during their busiest period and is able to state from personal knowledge that the statement is not exaggerated.

The book describes the indications for and technic of skin grafts, the epithelial inlay, bone grafts, cartilage grafts, tube flap and tube graft, and muscle and fat grafts. Methods are described for treating loss of oral or conjunctival mucous membrane, loss of nose, lips, cheeks, chin, eyelids, and palate. Facial surgery in civil practice takes up about one-third of the book and deals in a practical way with malignant and benign growths, specific infections such as syphilis and lupus, burns and keloids, congenital and acquired deformities, facial paralysis and neuralgia, ankylosis, and resection of the jaws. Many cases are described in detail with numerous illustrations, and by the excellent method of handling the material the work is made very clear. The basic principles are first described, then the operations are given step by step, so that they can be easily followed.

It is a most valuable book and should be in the hands of all who are working in this field.

ROENTGEN DIAGNOSIS AND THERAPY, by *Arthur C. Christie, M. D., M. S., F. A. C. P., Professor of Roentgenology, George Washington University Medical College; Roentgenologist to the George Washington University Hospital; Colonel, Medical Officers' Reserve Corps, United States Army; formerly Captain, Medical Corps, United States Army, and Professor of Roentgenology and Operative Surgery, Army Medical School, Washington, D. C.* J. B. Lippincott Co., Philadelphia. 1924

It appears rather trite to say that a new textbook has filled a long-felt want, but no other expression is so apt in this case. The author has obtained a happy medium, in that there is a wealth of practical detail and a dearth of theory.

The average student, whether a beginner or a full-fledged expert, desires a book which explains the best method of obtaining results and how to interpret these results. The first five chapters are devoted to X-ray physics and apparatus. A short history of the discovery of the Roentgen ray and its gradual development is first given. Then follows a description of X-ray tubes and apparatus.

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Two chapters are devoted to Roentgen and dark-room technic. The author attempts to remove the various pitfalls besetting the beginner by explaining in detail the many causes of failure to obtain a satisfactory Roentgenogram. The various kinds of developing and fixing reagents are taken up and their purposes and advantages discussed.

The chapter on localization of foreign bodies is sensible. There is no effort to bewilder the reader with several different methods of arriving at the same goal, namely, the position of the foreign body. He gives a method which is practical and can be carried out without a complicated apparauts together with a method of rough determination of the approximate depth of the foreign body. Most textbooks make the reader feel much as the student does in the treatment of disease, that a multitude of remedies indicates their lack of value.

Four chapters are devoted to the Roentgen interpretation of disease; necessarily, only the higher lights are touched. The essential points of each disease are taken up with advice as to the best methods of obtaining suitable Roentgenograms and the limitations of interpretation. The subject of disease and its interpretation naturally occupies the greater part of the book as the student is primarily interested in this subject.

A short explanation of the new Graham test for gall-bladder technic is given.

Roentgenotherapy occupies two chapters—the first, general considerations; the second, treatment of specific disease. The author considers that all diseases amenable to X ray can be treated by one of three formulæ. Each of these formulæ, if given to its limit, produces slight erythema. The formulæ differ in that the first is of relatively soft rays without filter; the second is of the same rays but through a filter and for a longer exposure, while the third, the so-called deep therapy, is given with rays of deep penetration and with a heavy filter. Apparatus, protection, and dangers are explained in detail.

The various diseases amenable to X-ray therapy are next given, with recommendations as to additional treatment by surgery and electrotherapy.

HANDBOOK OF OPERATIVE SURGERY, by *Sir William Ireland deC. Wheeler, (Mod.) B. A., M. D. (Dub. Univ.), F. R. C. S. I., F. A. C. S. (Hon.), Surgeon to Mercer's Hospital and the National Children's Hospital, Dublin; Past President, Royal College of Surgeons, Ireland; Consulting Surgeon to the Ministry of Pensions Hospital, Blackrock; late Lieutenant Colonel, R. A. M. C.* Fourth edition. William Wood & Co., New York. 1925

The distinguished author is well known in this country, as he is a member of the editorial staff of Surgery, Gynecology, and Obstetrics, any many of his articles have appeared in American journals.

This new edition of his very practical manual is the first since the war and the new knowledge is very well digested. Minor operations, such as ligation of blood vessels and empyema, are well described, but the operations of greater gravity are so superficially treated as to be of little value to either student or practitioner. To the reviewer it seems poorly balanced, the subjects in which the author is interested being described in full detail while others of equal importance are skimped. However, this is a fault common to most books of its class. Aside from these minor criticisms, it is entirely praiseworthy.

LECTURES ON PATHOLOGY, by *Ludwig Aschoff, M. D., Professor of Pathologic Anatomy, University of Freiburg, Germany.* Paul B. Hoeber (Inc.), New York. 1924

A series of lectures delivered in the United States during the spring of 1924. The subjects are: "Reticulo-endothelial system"; "The pathogenesis of human pulmonary consumption"; "Concept of inflammation"; "Pathological fatty changes"; "The normal and pathological morphology of the suprarenals"; "Atherosclerosis"; "Ovulation and menstruation"; "The orthology and pathology of the extrahepatic bile passages"; "The origin of gallstones"; "The site of formation of bile pigment"; "Thrombosis"; "The relation of mucosal erosions to the development of ulcer of the stomach"; "The goiter problem"; "Renal secretion and renal diseases."

LABORATORY DIAGNOSTIC METHODS, by *John A. Kolmer, Professor of Pathology and Bacteriology in the Graduate School of Medicine of the University of Pennsylvania and Pathologist to the Medico-Chirurgical and Polyclinic Hospitals,* and *Fred Boerner, Associate in Bacteriology in the Graduate School of Medicine of the University of Pennsylvania.* D. Appleton & Co., New York. 1925

As described by its authors, "A manual for physicians, medical students, and laboratory technicians." Incorporated in the section on clinical pathological methods is the revised text of Pepper and Klaer's Manual on Clinical Pathology, a little book that has proved its usefulness to many students. The technique of most of the better-known laboratory tests is given in a clear and concise manner without any attempt to state the relative value of the various tests. The old Wassermann and Noguchi techniques are replaced by the new Kolmer quantitative and qualitative tests, which are described so clearly as to render them capable of easy performance by anyone familiar with serological procedures. The Kahn test is also given in full. Alternate pages are left blank for the convenience of those who care to make notes. Altogether a valuable book for those for whose use it is intended.

ANAESTHESIA FOR NURSES, by *Col. William Webster, D. S. O., M. D., C. M., Professor of Anaesthesiology, University of Manitoba Medical School.* The C. V. Mosby Co., St. Louis. 1924

"Anaesthesia for nurses," by Col. William Webster, fulfills its mission to a great extent if, as he says, the book is for nurses whose opportunities have been limited in so far as the art of anesthesia is concerned. It is worth reading from the student anesthetist's point of view, but as a practical textbook for use in this country is not recommended. In the opinion of the writer, the technique of ether anesthetizing is not dealt with sufficiently; especially is this true in the case of the open drop method, which is considered by far the safest in the hands of an amateur.

The chapter on the history of anesthesia is quite interesting. It is our opinion that, if Colonel Webster were an American, the facts of the discovery of the anesthetic properties and the demonstrations of ether by Doctors Long, Wells, and Morton would have been more elaborated upon. Ether has always been the favored anesthetic in this country, just as chloroform is more extensively used abroad. This probably accounts for greater stress being laid upon the use of chloroform in this book.

An interesting feature is the chapter on physiology. The important points on metabolism and resuscitation as relating to anesthesia are clearly explained. The ways and means of anesthesia and the causes of narcosis are stated in simple, concise, and comprehensible language. The stages of ether anesthesia as described are not typical, as we find them in the Navy, because of the routine administration of a preliminary hypodermic dose of morphine and atropine. However, this is touched upon in a chapter on medication.

Especially interesting and of practical value is the chapter on preoperative and postoperative care of patients.

Colonel Webster writes understandingly from the viewpoint of surgeon, patient, and anesthetist. Taken as a whole, the book is valuable for reference, well written, and decidely worth reading.

MATERIA MEDICA FOR NURSES, by *A. L. Muirhead, M. D., late Professor of Pharmacology, Creighton Medical College,* and *Edith P. Brodie, A. B., R. N., Instructor in Materia Medica and Therapeutics, Washington University School of Nursing, St. Louis.* Second edition. The C. V. Mosby Co., St. Louis. 1924

From a hurried glance, the book appears to be somewhat elementary and rather brief, but with closer observation of its contents good material is found for both the nurses and the hospital corpsmen. The busy ward nurse, who has little or no time for the more complicated problems, will find that pages 17 to 55 contain much helpful material. For the average ward work, the book gives the

necessary information about the drugs it mentions, information such as dosage, action and use of the drugs, symptoms of poisoning, and treatment for it. These drugs are on the Navy supply table and are used in the Navy hospital wards. Of course, there will always be some drugs on hand for which information will not be found in a book of this size and type. The book will make a handy reference for ward work. The necessary information about the common drugs is concise. It is possible for the hospital corpsmen to obtain much valuable knowledge from its pages.

THE PRINCIPLES OF ORTHOPEDIC SURGERY FOR NURSES, by *James Warren Sever, M. D., Assistant Orthopedic Surgeon, Children's Hospital, Boston; Instructor in Orthopedic Surgery, Harvard Medical School.* The Macmillan Co., New York. 1924.

Doctor Sever has presented this subject in a very clear, concise, and readable style, and by the addition of many fine illustrations he has made it more interesting and instructive. With the exception of chapter 6, the subject matter treats of deformities, and congenitial deformities in particular, so that, aside from its interest, the book has little practical value for the nurses and hospital corpsmen in the Navy. This book should be of value as a textbook in schools of nursing and as a reference book to nurses in general.

CHEMISTRY AND CHEMICAL URANALYSIS FOR NURSES, by *Harold L. Amoss, M. D., formerly Chemist, Hygienic Laboratory, United States Public Health Service; Physiological Chemist, United States Bureau of Chemistry; Instructor in Physiological Chemistry, George Washington University Medical School; Assistant in Preventive Medicine, Harvard Medical School, etc.* Third edition. Lea & Febiger, Philadelphia, Pa. 1925.

It is believed that this little book will be a welcome addition to the medical libraries of naval hospitals. While the chapters on uranalysis, *et cetera*, are short and do not cover much ground, the procedures given are explained with unusual clearness. The bulk of the book is devoted to those aspects of chemistry which are of particular use to nurses. The subject is presented in a graphic, up-to-date manner which can not fail to arouse and hold the interest of any student who, while not well grounded in this science, seeks accurate information upon the chemical foundation of various phases of her work.

The paragraphs on digestion of proteins, fats, and carbohydrates, also the chapters on sugars and those on water, are of special interest.

The book will fill a real need of the nurse of to-day for convenient reference matter on the subject of chemical properties and reactions.

THE DIVISION OF PREVENTIVE MEDICINE

Lieut. Commander J. R. PHELPS, Medical Corps, United States Navy, in charge

NOTES ON PREVENTIVE MEDICINE FOR MEDICAL OFFICERS, UNITED STATES NAVY

EPIDEMIOLOGICAL REPORT OF AN OUTBREAK OF FOOD POISONING WHICH OCCURRED IN THE FIRST BATTALION, SIXTH REGIMENT, UNITED STATES MARINES, IN CAMP AT THE UNITED STATES NAVAL STATION, GUANTANAMO BAY, CUBA

By H. B. LA FAVRE, Lieutenant, Medical Corps, United States Navy

On February 1, 1925, while this camp was under quarantine for an epidemic of diphtheria, an outbreak of food poisoning occurred, affecting 92 men and necessitating the admission of 25 to the sick list with a total of 87 sick days. The conditions and circumstances were as follows:

I. The men were segregated in their individual bunk houses in accordance with quarantine regulations then in effect against diphtheria. Only a small amount of police work was being done about camp, while other activities were limited to those essential to the welfare and comfort of the command. The epidemic was widespread; not limited to any particular group or groups, except that none of the officers were affected.

II. The suspected food was meat which was served in the general mess in the form of roast, fried beefsteak, and hash on January 31, February 1, and February 2, 1925, respectively. The officers' mess did not serve any of this meat except on January 31, 1925.

Menus for the general mess on these days follow:

January 31, 1925	*February 1, 1925*	*February 2, 1925*
BREAKFAST	BREAKFAST	BREAKFAST
Fresh beef hash.	Boston baked beans.	Fresh beef hash.
Tomato catsup.	Tomato catsup.	Tomato catsup.
Egg omelet.	Corn bread.	Egg omelet.
Apples.	Oranges.	Bread, butter.
Bread, butter.	Bread, butter.	Coffee.
Coffee.	Coffee.	

DINNER	DINNER	DINNER
Beef pan roast.	Fried beefsteak.	Pan roast.
Brown gravy.	Brown gravy.	Brown gravy.
Bread dressing.	Mashed potatoes.	Boiled potatoes.
Creamed peas.	Creamed corn.	Creamed Lima beans.
Bread.	Tapioca pudding.	Bread pudding.
Ice water.	Bread.	Bread.
	Ice water.	Ice water.
SUPPER	**SUPPER**	**SUPPER**
Vegetable stew.	Cold corned beef.	Beef loaf.
Macaroni and cheese.	Potato salad.	Brown gravy.
Corn fritters.	Bean salad.	Bread dressing.
Rice pudding.	Pickles.	Succotash.
Bread.	Fruit salad.	Apricots.
Iced tea.	Cake.	Bread.
	Bread.	Iced tea.
	Iced tea.	

III. Cases began reporting on the evening of February 1. They continued during that night, but it was not until sick call at 8.20 a. m., February 2, 1925, that a large number came in. All during that day they continued, and a few reported on the day following. All patients were questioned regarding the time of onset, and many stated they had begun to feel sick during the night of February 1.

Hash was served for breakfast on January 31, 1925, and again on February 2, 1925. But from an analysis of cases it appeared that the hash served on the latter date was not responsible for all the cases, inasmuch as many presented symptoms before breakfast time on that date. It is therefore presumed that part of the poisoning occurred on January 31 or February 1.

Among articles of food served on these two days the meat seemed the most suspicious, as findings, later recorded, seemed to uphold. The beef served was all Cuban. The hash both mornings was prepared at 3 a. m. and baked in the oven from 4 to 6.30 a. m., when it was served for breakfast. Thus no period of incubation was allowed between preparation and consumption.

No suspicion attached to any of the canned goods used on these days. The stock was all good, so far as could be determined, and none of it was allowed to stand in the cans after opening. The mess sergeant and cooks were carefully questioned on this point. The potatoes were fresh, wholesome, and unsprouted. The beans were good. The medical officer ate of them himself without being affected. The corned beef was not allowed to stand in the opened cans and was reported as being of good taste, odor, and color.

The fruit used in the fruit salad consisted of a mixture of canned fruits and oranges and bananas, the latter two items having been

obtained from native sources. As these are skin-covered fruits, they were not suspected, although, of course, this source is possible.

The onions used in the salads and hash were States' onions and appeared to be in good condition.

The apples were from the United States.

The water served was all chlorinated. This water is tested daily, so that over or under dosage of chlorine was not possible.

In view of the above facts, of bacteriological findings, and other conditions to be discussed later, the meat was suspected to be the source of poisoning. It will be noted that January 31, 1925, fell on Saturday and that the meat supply for both Saturday and Sunday was laid in that date.

A few patients said they felt "feverish" Saturday evening, but no diarrheas developed until late Sunday. It would appear, then, that the greatest degree of poisoning occurred on Sunday and probably came from the fried beefsteak served at noon. It is likely that some bacterial growth had occurred in the meat eaten at noon Saturday and that the microorganism continued to multiply in the remainder until Sunday noon, when more was served as fried beefsteak. The process of frying was possibly not thorough. The poor conditions of refrigeration obtaining in the camp made the continued growth possible.

The hash served for breakfast Monday was made from the same meat, but was baked for one hour and a half before serving, with no incubation period intervening after preparation. Nevertheless this hash may have been responsible for some cases which reported on Monday, though it would seem unlikely if the baking was continuous and at a high temperature during the hour and a half.

The hash served Saturday morning was not believed to be the cause, since it was made from fresher meat, obtained on Friday, and since so much time elapsed between its consumption and the appearance of severe symptoms, a period of about 36 hours.

At first the hash was suspected and the cases were reported on Form F cards as poisoning by fresh beef hash. But more leisurely analysis makes me believe now that the fried beefsteak served Sunday noon was the source of the poisoning, particularly since the majority of severe cases reported their illness as having begun Sunday night.

It should be noted also that the officers did not partake of this steak Sunday, but had chicken instead. They did, however, eat of this same lot of meat on Saturday, probably before much bacterial growth had taken place.

IV. About 15 men reported for treatment during the night of February 1, 1925, most of them after midnight. About 45 came to

sick call the following morning and the rest at odd times during that day. A few did not appear until the following day, but admitted illness the day previous. It is thought that most cases developed in from 8 to 20 hours after the food was ingested.

V. Twenty-five cases had to be admitted to the sick list. The rest, about 67 in all, were more mildly affected and were treated in their quarters.

VI. A large part of the command ate of this steak without becoming ill, but cases came from every division of the camp. The strength of the command was 381 men.

VII. (*a*) All cases were affected clinically in the same manner with varying degrees of severity. They all complained of headache, backache, and some vertigo. Some stated the first symptom was cramps; some said diarrhea.

(*b*) The onset seemed to be sudden.

(*c*) There had been no previous disease or symptoms, except that some stated they felt "feverish" on the afternoon of January 31.

(*d*) This was evidently not a recurrence of any previous disorder.

(*e*) There were so many cases that it is difficult to determine how soon the patients reported to the medical officer after illness developed. It is believed, however, that the majority reported as fast as they were affected, since, as soon as food poisoning was suspected, orders were issued to that purpose.

(*f*) The more severe cases were prostrated, weak, pallid, and apathetic.

(*g*) Pain consisted of spasmodic cramps in the abdomen, accompanied by tenesmus.

(*h*) There was no vomiting, but all patients were nauseated.

(*i*) There was intestinal colic and some distention in the more severe cases.

(*j*) A diarrhea of marked frequency existed. There was straining and tenesmus. The stools were watery, greenish at first, light colored later, and contained some mucus, but no microscopical blood. Chemical tests for blood were positive. The odor was foul.

(*k*) The patients described no definite chills. Only chilly feelings were complained of.

(*l*) The cases all presented fever, ranging from 100° F. to 103.8° F. upon admission. The pyrexia subsided rapidly, pursuing an irregular course, and the temperature became subnormal in from one to four days. This subnormality persisted for a day or two, after which a stable normal temperature supervened and the patient felt well.

(*m*) Headache was complained of in every case. It was persistent and of the frontal type.

(*n*) Most cases felt soreness and aching in the thighs and groins. This symptom was of short duration.

(*o*) Moderate to marked prostration existed in the more marked cases and appeared to be sudden in onset.

(*p*) The mouths of all were dry, but none noticed anything more than a slight, continued, brackish taste.

(*q*) No ocular symptoms were noted. The pupils were slightly dilated, but the pupillary reflexes were normal.

(*r*) Some showed signs of alternate flushing and pallor, but pallor was the predominating objective sign.

(*s*) The pulse rates ranged from 90 to 110 upon admission, but fell with the temperature, and every case developed bradycardia ultimately. In some the rate fell to as low as 50 beats a minute. This slowness of the pulse lasted two or three days in severe cases. At no time were the pulses intermittent. They were all weak but regular. The blood pressures were all low without exception. A marked feature was the small pulse pressure recorded. Systolic, 115, diastolic, 82, represented an average reading. One case presented a systolic pressure of 90 and a diastolic reading of 60. After recovery the readings in this case were systolic, 110; diastolic, 70.

(*t*) The respirations were not markedly abnormal. They averaged from 17 to 24 a minute. There was slight dyspnoea on exertion.

(*u*) No skin eruptions were noted.

VIII. Blood counts were not made in all cases. Three cases were picked for study. The counts in these were very similar. Therefore one is given as typical:

Total white count		6,400
Polymorphonuclears	per cent	62
Large lymphocytes	do	3
Mononuclears	do	3
Transitionals	do	2
Eosinophiles	do	2
Basophiles	do	0
Small lymphocytes	do	28

IX. The urines of all bed cases were examined. Study of these reports may be summed up as follows:

Amount	Slightly decreased.
Color	Amber (a few cloudy).
Reaction	Acid.
Specific gravity	1.011 to 1.028 (majority of high specific gravity).
Albumin	From negative to a trace.
Sugar	Negative.
Microscopical findings	Few red blood cells, epithelial cells, and a few leukocytes.

In the three most severe cases microscopical examination showed the following: Granular casts, waxy casts, red blood and pus cells, and, in one case, hyaline casts.

No case presented microscopical blood.

Cultures were made from the urines in the three worst cases.

X. Bacteriological technique was performed by S. P. Heselton, Ph. M. 1 cl., United States Navy. Three cases were picked for study. The findings were: Stools were plated out on endo's medium. Large numbers of vermilion colonies, many grayish colonies, and a few streptococcus colonies appeared in all cases in from 24 to 48 hours. The grayish colonies were selected for study. Report on these in subcultures was as follows:

Gram negative bacilli:

Motility	Positive.
Glucose	Acid and gas.
Lactose	Negative.
Saccharose	Negative.
Mannite	Acid and gas.
Maltose	Acid and gas.
Litmus milk	Acid, first day; Alkaline, third day; Still alkaline, eighth day.

Brownish discoloration on lead acetate medium.

Blood cultures in all three cases were positive for bacilli, showing the same characteristics as those isolated from the feces.

The urine was also plated. Grayish colonies showed in all cases and presented the same cultural characteristics as the above.

There is no question from the above findings but that we were dealing with one of the enteritidis-paratyphoid group.

Agglutination occurred on the seventh day as follows:

Case 1.—(Last antityphoid (triple vaccine) inoculation completed October 7, 1922):

Typhoid agglutinated in dilution	1–64
Paratyphoid A agglutinated in dilution	1–64
Paratyphoid B agglutinated in dilution	1–128
Unknown organism agglutinated in dilution	1–128

Case 2.—(Last antityphoid (triple vaccine) inoculation completed April 21, 1924):

Typhoid aagglutinated in dilution	1–32
Paratyphoid A agglutinated in dilution	1–64
Paratyphoid B agglutinated in dilution	1–256
Unknown organism agglutinated in dilution	1–256

Case 3.—(Last antityphoid (straight typhoid vaccine) inoculation completed January 3, 1925):

Typhoid agglutinated in dilution	1–1024
Paratyphoid A agglutinated in dilution	1–512
Paratyphoid B agglutinated in dilution	1–256
Unknown organism agglutinated in dilution	1–256

No laboratory animals were available, therefore exact determination of the identity of the infecting organism by the specific sera method was not possible.

In the absence of these, however, the following agglutinations were tried in the hope that some useful information might be derived from them, despite the apparent difficulty of interpreting such results in inoculated persons:

PS = patient's serum.
X = unknown organism.
sA = standard paratyphosus A.
sB = standard paratyphosus B.
sT = standard typhosus.

Case 1.—	PS+X+sA	No agglutination (45 minutes).
	PS+X+sB	No agglutination (45 minutes).
	PS+X+sT	No agglutination (45 minutes).
	PS+sA+X	Agglutination 1:128 (28 minutes).
	PS+sB+X	No agglutination (45 minutes).
	PS+sT+X	Agglutination 1:64 (12 minutes).
Case 2.—	PS+X+sA	No agglutination (45 minutes).
	PS+X+sB	No agglutination (45 minutes).
	PS+X+sT	No agglutination (45 minutes).
	PS+sA+X	Agglutination 1:256 (25 minutes).
	PS+sB+X	No agglutination (45 minutes).
	PS+sT+X	Agglutination 1:256 (16 minutes).
Case 3.—	PS+X+sA	No agglutination (45 minutes).
	PS+X+sB	No agglutination (45 minutes).
	PS+X+sT	No agglutination (45 minutes).
	PS+sA+X	Agglutination 1:512 (25 minutes).
	PS+sB+X	No agglutination (45 minutes).
	PS+sT+X	Agglutination 1:512 (23 minutes).

Under the circumstances it is realized no exact interpretation can be made of the findings presented above; but it is thought that the preponderance of evidence is in favor of *Bacillus paratyphosus* B, for the following reasons:

(*a*) Agglutination of the unknown organism occurred in the patient's serum in the same dilution as *B. paratyphosus* B.

(*b*) The unknown organism seemed to have removed all agglutinins from the blood, while *B. paratyphosus* A and *B. typhosus* did not remove the specific agglutinins for the unknown. But *B. paratyphosus* B, apparently, did remove the specific agglutinins for the unknown. It would seem possible therefore that the unknown and *B. paratyphosus* B were identical.

(*c*) The action of the unknown on lead acetate medium.

(*d*) In all but *Case 3* the agglutinating power for *B. paratyphosus* B was higher than for *B. paratyphosus* A or *B. typhosus*. If Castellani's observations are to be accepted, the opposite should have been found, in the absence of a *Bacillus paratyphoid* B infection, unless, of course, the titer against *B. paratyphosus* B could

be considered as having been correspondingly raised by group action, in case the infecting organism was *Bacillus enteriditis.*

Case 3 had been inoculated so recently that the titer for typhoid was naturally very high.

XI. The suspected meat was Cuban beef. This beef comes from a ranch located a few miles from the naval station. The cattle are inspected from time to time by the medical officer of the naval station. The animals are not inspected on the hoof before slaughter, however. Slaughtering is done by natives in the afternoon at about 4 o'clock. The meat is wrapped in cheese cloth and burlap and taken to the naval station the next morning. There it is placed in storage, chilled but not frozen, where it may remain from 24 to 72 hours. It is then distributed.

Upon arrival at this camp it is taken to the refrigerators, which are not good, and is kept for from 4 to 20 hours before being consumed. It may be well to mention here that this is a new camp and efficient refrigerators have not yet been installed. Meat is obtained daily except on Sunday. All meat remaining from the day before is thrown away after breakfast each day.

The contract, it is understood, does not call for freezing the beef.

The suspected meat was prepared, cooked, and served in the usual way by the regular galley force. None of the latter had symptoms of any disease previous to the outbreak. No rats nor cockroaches or other vermin could have had access to the food. Flies are not prevalent in this camp and the galley is comparatively free of them. Other features connected with preparation of the food have already been mentioned.

XII. Canned goods are not believed to have been responsible. The stock all appears good and no suspicious cans were noted. None of the canned stuffs were allowed to stand in the tins before serving.

XIII. Specimens of the food could not be obtained, since by the time it was realized that we were confronted with food poisoning all of the left-over food had been hauled away in the garbage.

XIV. The suspected food was eaten in camp, as no liberty had been allowed for six days previously due to quarantine for diphtheria.

As thorough a study was made of this epidemic as circumstances and facilities permitted. Being in quarantine rather handicapped us, since relations with the outside were difficult and we were already engaged in an extra amount of work connected with the epidemic of diphtheria.

As soon as the condition was diagnosed on the morning of February 2, 1925, the following steps were taken to prevent the recurrence and spread of the disease:

(*a*) All affected cooks and mess men were removed from the galley.

(*b*) All mess men and cooks were cultured (urines at once; feces later). No carriers were discovered.

(*c*) Cuban meat was put to boiling as soon as possible after its arrival in the morning and was kept cooking until served for the evening meal. This practice will be continued from now on, in order to obviate the likelihood of a similar outbreak from this source in the future. It will be used or discarded after the evening meal. Hash will no longer be served.

(*d*) All men, and particularly the galley force, were instructed to wash their hands thoroughly and frequently before handling food. A bucket of bichloride solution 1–1000, properly protected and labeled, was placed in the head, and all men were required to dip their hands into this prior to leaving.

(*e*) Head seats were scrubbed hourly with 5 per cent cresol solution.

(*f*) Flies are not numerous, but special care was taken to protect food from possible contamination by them. The same applied to rats and cockroaches.

(*g*) Isolation and treatment of the serious cases. The others, by force of circumstances, had to be treated in their barracks. These buildings, however, were already segregated by quarantine regulations in effect against diphtheria.

(*h*) Swimming was stopped in the region of sewage pollution.

(*i*) Cases of severe character were cultured and proved negative before discharge to duty.

(*j*) All bed clothing was sunned and aired for two hours daily.

All health records had been checked as to typhoid inoculation three weeks previous to the epidemic and the entire command was brought up to date in this respect upon their arrival here from Quantico on January 12, 1925.

STUDY OF FOOD POISONING AT THE NAVAL STATION, GUANTANAMO BAY, CUBA

The attention of medical officers is invited to the excellent report, printed on preceding pages, of the epidemiological study of an outbreak of food poisoning made by Lieut. H. B. LaFaver, Medical Corps, and S. P. Hessleton, pharmacist's mate, first class, United States Navy.

It is gratifying to the Bureau of Medicine and Surgery to note the care that was taken to cover as completely as possible all points of interest in connection with food poisoning of the type caused by microorganisms of the *Bacillus enteriditis-paratyphoid* group.

The limited laboratory facilities at the naval station, Guantanamo Bay, were relatively inadequate for coping with an extensive outbreak of infections of the intestinal type in comparison with the laboratory equipment of naval hospitals in the United States. The thoroughness with which the *Gram negative motile bacilli* in this instance were pursued in the endeavor to identify them is noteworthy. The lack of laboratory animals did not check the initiative of these investigators, as indicated by their resorting to the expedient of testing the power of the unknown microorganism to absorb agglutinins for *B. typhosus* and the strains of paratyphoid A and paratyphoid B used in the triple vaccine formerly issued to the service.

Study of the report will give medical officers additional information regarding the relationship existing between the question of food poisoning and the problem of preventing typhoid fever and paratyphoid infections by inoculations with killed cultures of the bacilli. These questions have been discussed from time to time in previous numbers of the BULLETIN. The causative agent in this outbreak was isolated from the blood stream as well as from stools and urine. It will be noted that two of the three patients selected for bacteriological study had more or less recently been inoculated with vaccine containing paratyphoid A and paratyphoid B bacilli.

Some students in this country as well as abroad subscribe to the view that there are paratyphoid bacilli both of the B type and of the A type which cause in man invariably in case of infection a typhoid fever-like disease, while others, not really paratyphoid bacilli, belong to a group that includes *B. enteritidis*, *B. aertrycke*, *B. suipestifer*, *B. caviae*, and others, perhaps many others, that cause the manifestations of food poisoning and do not cause a typhoid fever-like infection. These observers have apparently made their deductions from the comparatively narrow range of present-day methods of establishing identity in the laboratory. Certainly the epidemiologist with a more general training is not disposed to close his mind upon coming in contact with this laboratory viewpoint. No definite statement can be made on this point for the time being, but one may be justified in expressing the opinion that convincing evidence has not yet been adduced to show that there is in reality any clean-cut dividing line between any isolated strain of paratyphoid bacilli and other microorganisms belonging to the food-poisoning group.

REGARDING STATISTICS AND PROPER MANAGEMENT OF THE VENEREAL DISEASES

Measures planned for the prevention and control of venereal diseases are advocated by the Bureau of Medicine and Surgery, not merely to secure reduction in admission rates but with the hope that disease will actually be prevented.

No single measure or group of measures, subject to interpretation or misinterpretation by the medical officer, should be applied in a manner that is likely to influence men to conceal disease or to seek advice regarding treatment from any person other than the medical officer of the unit or organization. In other words, the policy should be to avoid any lack of attention, interest, judgment, or tact that will tend to weaken trust and confidence or interfere with the willingness of the men to consult the medical officer freely, approaching him as a patient would a physician in civil life in so far as essential service conditions permit.

The medical officer should see to it that venereal-disease patients are made to feel that they are receiving as much consideration and as careful treatment as men with other diseases. Unless the necessary feeling of confidence prevails among the crew it must be expected that concealment of disease will go on, and this despite surprise inspections, if such inspections are considered necessary. When the crew as a whole has confidence in the medical department it is not likely that any considerable number of men will conceal infection except perhaps until the end of a short liberty period to avoid being placed on the restricted list. When the conditions are right other members of the crew will usually report a man whom they suspect to be diseased. Periodic examination of food handlers rests on a broader basis and is a different matter; likewise physical examination of men before starting out on a hike, forming landing parties, etc.

Proper organization of the medical department of the ship or station, with insurance of correct attitudes on the part of hospital corpsmen, must take first place among medical measures directed toward the prevention and control of venereal diseases.

Complete reporting of these diseases for statistical record is also very important. One might ask, "What difference does it make whether or not the case is recorded, provided the medical officer knows about the case and the patient receives proper and adequate treatment?" In certain individual cases of gonorrhea and chancroid infection that may be true. But by and large it is not to be expected that the work of the medical department will be effective to the desired degree if cases are treated under cover.

It is a fundamental principle in preventive medicine that it is necessary to know as accurately as possible when, where, and under what circumstances cases of any communicable disease are occurring if rational and adequate preventive measures are to be planned and instituted. The Bureau of Medicine and Surgery in its province can not make as intelligent a study of the Navy's venereal-disease problem as the gravity of that problem demands without reasonably complete and accurate statistics.

Apart from these considerations it is difficult to believe that under ordinary conditions proper efforts will be made to provide high-grade treatment with careful follow-up observation or to encourage all men who need treatment to report at once for examination if there is any lingering feeling that it is not expedient to show admission rates as high as they actually are. One who is content to let well enough alone and not go out of his way to encourage more men to seek treatment, so long as the cases that come to light naturally are sufficiently numerous to make a moderately high admission rate, is not likely to act very energetically along such lines as getting the men to avail themselves of chemical disinfection promptly after exposure, instructing the crew regarding the hazards of the venereal diseases, etc. Often the first effect that follows the giving of such instruction or manifesting particular interest in the treatment of the men, for that matter, is to bring a good many cases to light unexpectedly.

Rear Admiral E. R. Stitt, Medical Corps, United States Navy, Surgeon General of the Navy, has for many years had in mind the grave effects that may follow infection with syphilis. He has hoped and continues to hope that during his term of office something can be done to lessen the menace of this disease in the Navy, both by reducing the numbers of new infections that occur from year to year and by checking up on the treatment given Navy patients so that all cases will receive what can be regarded under present-day standards as adequate treatment, continued until, under the best criteria that can be applied, further treatment appears unnecessary.

A medical officer is now engaged in studying the health records on file in the bureau which contain histories of syphilis. The purpose of the study is to determine what the records indicate regarding early recognition of syphilis, adequacy of treatment, quality of the records, and the character of the evidence which led to the conclusion that further treatment was unnecessary in cases which appear to have been regarded as cured. An attempt will be made also to determine in what percentages of the cases complications and serious after effects occurred, including general paresis and other parasyphilitic affections.

The Surgeon General in the course of a 20-minute address on "Contributions of the Medical Department of the Navy to medicine," read before the American Congress on Internal Medicine during the recent meeting in Washington, D. C., touched upon the venereal diseases. He briefly stated some of his ideas in the very few minutes that could be devoted to this subject. His remarks were as follows:

"We now have a board of line officers associated with us in the application of measures for the control of venereal diseases which we believe to be ethically correct and scientifically sound.

"The environmental influences in many of the cities and towns from which our sailors come are so bad, from a social hygiene standpoint, that we can hope for little result from our instruction. For the success of an educational program, explaining the dangers of venereal diseases and inculcating the necessity for continence, the start should be made in the home and in the schools. In the Navy we try to make the man think of the future, pointing out the effect of disease on his advancement and the dire consequences which may follow in case of marriage.

"If our advice is ignored and infection follows, we encourage the men to seek early treatment, avoiding as much as possible all measures tending to weaken trust and confidence in their medical officers. In the control of any communicable disease it is essential that we have complete reporting, for which reason we discourage pressure on the men or medical officers which might encourage concealment of disease. Only concealment of disease and failure to seek early treatment should be punishable.

"We have spared neither effort nor money in the application of chemical prophylaxis, constantly seeking new formulas, which may be more effective, but so far such measures have given us but little encouragement.

"Living apart from the companionship of women makes more strong the longing for such association, and we recognize the help that can be given us by churches and other organizations in arranging entertainments where the enlisted men can meet young women of the right type and thus form desirable acquaintanceships.

"Recognizing the importance of public opinion, we try to support the influence of the men of character and to put an end to the pernicious activities of the man of loose morals. In our statistical reports and supporting analyses we are trying to assist in the solution of this most difficult problem."

In conformity with the policy expressed by the Surgeon General and the principles discussed above, the bureau recently addressed the following letter to the commanding officer of a ship which carries a

crew of more than 850 men. The letter may be of interest to medical officers generally. It speaks for itself:

To: Commanding officer, U. S. S. ———.
Subject: Request for comment relative to the low incidence of venereal disease on board the U. S. S. ———.

1. Reference to monthly reports of venereal diseases submitted by the U. S. S. ——— discloses that cases have been reported since July 1, 1924, as follows:

1924:		1925:	
July	11	January	0
August	12	February	1
September	13		
October	3		
November	3		
December	1		

2. Please instruct the medical officer to furnish information regarding the factors which possibly account for the sudden reduction in the venereal disease rate which occurred in October and has been maintained since.

3. The statement made in the February, 1925, report relative to the lack of repression of prostitution in Vallejo, Calif., is noted, and the information will be conveyed to the proper authorities.

4. One to three cases of venereal diseases per month represents an unusually low incidence of venereal disease for a ship carrying more than 850 men. It would appear to the bureau that the low admission rates recorded could only be explained by assuming: (*a*) The men were not exposed; (*b*) chemical disinfection was faithfully applied and proved efficacious; (*c*) cases which occurred have not been discovered or have not been recorded.

5. The bureau requests information regarding these three points. It is hoped that no measures, other than those required by G. O. 69 and the act depriving men of pay while actually on the sick list, have been applied that would tend to discourage infected men from reporting venereal disease and following treatment until cured.

It is not possible to look into the very distant future, but it is clear enough that for some years to come the venereal diseases are going to be among the most damaging conditions with which the Medical Department of the Navy must deal. It is therefore evident that medical measures, especially early recognition of cases, high-grade treatment, and careful follow-up observation must necessarily be regarded as of so much importance from any viewpoint that care should be taken in the prosecution of apparently conflicting preventive measures, required or otherwise, to apply them in such a way as not to discourage members of the crew from turning naturally to the medical officer of the organization for advice and treatment.

SODIUM THIOSULPHATE IN THE TREATMENT OF POISONING BY ARSENIC AND THE HEAVY METALS

There is increasing evidence of the efficacy of sodium thiosulphate not only in the treatment of acute and subacute poisoning by arsphenamine compounds and inorganic salts of arsenic but in cases of poisoning by any of the heavy metals such as lead, mercury, and copper. Sodium thiosulphate is believed to act by combining with the metallic poison in the circulation to form a relatively inert sulphide. At any rate this salt of sodium is a more promising therapeutic agent than any of the various antidotes heretofore recommended. A number of recoveries appear to have followed intravenous medication with it after the ingestion of enough bichloride of mercury, taken accidentally or with suicidal intent, to have made a fatal issue probable. It appears to have proved serviceable, too, in the treatment of acute poisoning with tetraethyl lead.

Most medical officers of the Navy have doubtless followed in recent medical literature the reports of cases in which sodium thiosulphate seems to have given good results in the treatment of exfoliative dermatitis following the administration of arsphenamine or neoarsphenamine as well as in overcoming other manifestations of acute and subacute arsenical poisoning. It is already possible to refer to a somewhat extensive bibliography, as shown by the references listed below.

In the treatment of dermatitis exfoliativa and other cases which perhaps may be classified for practical purposes as subacute arsenical poisoning, such as those involving degenerative changes in the liver and kidneys, and manifested by jaundice or evidence of acute nephritis, it appears that a proper dose of sodium thiosulphate for an adult, administered intravenously, is 1 gram in 24 hours. That dose may be repeated daily for as many as 10 days. It is not unlikely that increasing experience may justify the employment of larger doses. In cases of acute poisoning, as when 15 grains of bichloride of mercury have been swallowed with suicidal intent, or when convulsions and coma have followed the administration of an arsenical compound, the probability that death will result without intensive treatment obviously justifies the use of larger doses or the more frequent repetition of 1-gram doses.

In the acute case of mercurial poisoning, for example, there is urgent demand for energetic therapy. Something must be accomplished with the drug in the course of a few hours if destructive changes in the kidney are to be prevented. The patient will probably tolerate 3 grams per day, 1 gram in each dose given intravenously. In addition probably as much as 3 grams three times a day can be given by mouth. The drug has been used to some extent clinically in

2-gram intravenous doses where the prognosis was bad without it. Sodium thiosulphate appears to be comparatively nontoxic. A very large dose may cause gastrointestinal irritation, due to the action of the sulphurous acid content, with resulting colic and diarrhea.

In connection with these remarks a case of sulpharsphenamine encephalitis reported by R. H. McBride, M. D., in the Journal of the American Medical Association, March 7, 1925, is of interest. The patient, a white boy, aged 4, and weighing 33½ pounds, developed clinical manifestations, which in all probability represented acute encephalitis of the hemorrhagic type, three days after the third intravenous injection of 0.35 gram of sulpharsphenamine given every other day. He had a series of general convulsions followed by coma. Treatment with sodium thiosulphate was begun one hour after his second convulsion. He was given 0.46 gram (0.03 gram per kilogram of body weight) intravenously in a 5 per cent solution every three hours for five doses. A very severe convulsion occurred after the second injection. The lips and ears were cyanotic, the pulse irregular, and the respiration gasping in character. Gradually he became less comatose. The following day he could be partially aroused at intervals, and toward evening he was brighter and his pulse was regular and strong. Epinephrin was also given that day every four hours subcutaneously in seven minim doses. The next day he was clear mentally and the report states that he left the hospital apparently in perfect health seven days after the third dose of sulpharsphenamine or four days after the onset of symptoms indicative of acute encephalitis.

Sodium thiosulphate (hyposulphite of soda) is already on the supply table and is issued in one-half pound bottles, but consideration is being given to the question of issuing the salt in form convenient and suitable for the immediate preparation of a sterile solution which can safely be injected intravenously in the emergency treatment of acute poisoning.

Solutions of sodium thiosulphate for intravenous medication should be freshly made. A solution, sealed or unsealed, can not be insured against decomposition or deterioration. Precipitation occurs after the solution has stood for several weeks.

The commanding officer of the United States Naval Medical Supply Depot, Brooklyn, N. Y., in commenting on the form of the drug and method of administration, wrote as follows:

"The depot is advised that the commercial grade of photographic hyposulphite of soda, or even a U. S. P. grade, is not to be recommended for intravenous administration; sodium thiosulphate of the highest obtainable purity only should be used in this form of treatment. In view of the deteriorating effect of heat on sodium thio-

sulphate, this salt is best deposited in sterile condition and in a fine crystalline form by alcohol precipitation. The depot understands that sterile sodium thiosulphate crystals (by alcohol) in ampules keep indefinitely when kept below 45° C.; kept in a somewhat higher temperature (48–50° C.) would melt the crystals and cause the material to adhere to the surface of the ampule, thus making the product more slowly soluble and less convenient to handle; at still higher temperatures, from 90 to 110° C., deterioration occurs through the separation of sulphur. The average dose of sodium thiosulphate to be given in metallic toxemias is 1 gram. Solutions of sodium thiosulphate for intravenous administration should be freshly prepared in the strength of 10 per cent with sterile distilled water, and such solutions should be used immediately, it having been found that under certain conditions exposure to air for a relatively short period is apt to cause sufficient oxidation to give rise to trouble."

SODIUM THIOSULPHATE

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STATISTICS RELATIVE TO MENTAL AND PHYSICAL QUALIFICATIONS OF RECRUITS

The following tables were constructed with figures taken from monthly reports submitted by boards of review at naval training stations:

All naval training stations

(Cumulative data for December, 1924, and January and February, 1925)

	Number	Per cent of recruits received	Per cent of recruits reviewed
Recruits received during the months	3,718		
Recruits appearing before board of review	156	4.20	
Recruits recommended for inaptitude discharge	137	3.68	87.82
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	19	96.32	12.18

United States Naval Training Station, Hampton Roads, Va.

(February, 1925)

	Number	Per cent of recruits received	Per cent of recruits reviewed
Recruits received during the month	139		
Recruits appearing before board of review	8	5.76	
Recruits recommended for inaptitude discharge	8	5.76	100.00
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	0	94.24	0

United States Naval Training Station, Great Lakes, Ill.

(February, 1925)

	Number	Per cent of recruits received	Per cent of recruits reviewed
Recruits received during the month	192		
Recruits appearing before board of review	7	3.65	
Recruits recommended for inaptitude discharge	6	3.13	85.71
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	1	96.35	14.29

United States Naval Training Station, San Diego, Calif.

(February, 1925)

	Number	Per cent of recruits received	Per cent of recruits reviewed
Recruits received during the month	247		
Recruits appearing before board of review	18	7.29	
Recruits recommended for inaptitude discharge	18	7.29	100.00
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	0	92.71	0

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United States Naval Training Station, Newport, R. I.

(February, 1925)

	Number	Per cent of recruits received	Per cent of recruits reviewed
Recruits received during the month	172		
Recruits appearing before board of review	9	5.23	
Recruits recommended for inaptitude discharge	9	5.23	100.00
Recruits recommended for medical survey	0	0	0
Recruits recommended for transfer to hospital	0	0	0
Recruits recommended for retention under training	0	94.77	0

ADMISSIONS FOR INJURIES AND POISONINGS, CALENDAR YEAR 1924

Form F cards received in the bureau during the calendar year 1924 notified injuries and poisonings as follows:

Within command

	Connected with actual performance of work or prescribed duty	Not connected with work or prescribed duty	Leave, liberty, or a. w. o. l.	Total
Injuries	3,724	2,017	1,188	6,929
Poisonings	25	152	30	207
Total admissions	3,749	2,169	1,218	7,136

Of these admissions 82.93 per cent were for injuries and poisonings occurring within the command and 17.07 per cent for cases incurred while on leave or liberty. Of the cases occurring within the naval commands 63.35 per cent were connected with the actual performance of prescribed work or duty and 36.65 per cent were not so connected. Of the total admissions for injuries and poisonings only 52.54 per cent were connected with the actual performance of work or prescribed duties, i. e., the result of true naval industrial hazards. The remainder were incidental to liberty, athletics ashore or afloat, skylarking, quarreling, falls other than those connected with work, etc.

Poisoning by a narcotic drug or by ethyl alcohol is recorded under the title "Drug addiction" or "Alcoholism," as the case may be. Such cases are not included in the above figures.

The following cases selected from reports received during the month of January, 1925, are worthy of notice from the standpoint of accident prevention:

Careless handling of gasoline.—Man threw a lighted match into an exposed bucket of gasoline which he mistook for water. One hundred and eleven sick days accrued in this case to December 31 and permanent disability will result.

Burn of face resulted from the explosion of a gasoline tank which followed its examination with a lighted match.

While wiping down the body of a torpedo immediately after its recovery from a run with gasoline soaked waste the gasoline was ignited by a flare-up from the torch pot, which in turn ignited the man's clothing and caused extensive burns.

Exposed gears.—Unprotected cogs beneath a dish-washing machine caused a crush of right hand requiring 67 days' treatment in hospital and consequent loss of services. The man was reaching for a cup beneath the machine when he slipped, fell forward, and his hand was caught in the unprotected cogs.

Careless handling of firearm.—Not having examined and hence not knowing that the weapon he was cleaning was loaded, a chief petty officer sustained a gunshot wound of the hand and knee when the weapon was discharged.

Gunnery exercises.—Without warning, a gun captain suddenly closed the breech of the gun during drill, thereby catching and crushing a finger of one of the crew before it was off the shell.

Corrosive fumes.—Poisoning by corrosive fumes, with 17 days' disablement, occurred while melting babbit metal combined with sulphur. It is assumed that one or possibly all three of the following preventive measures were lacking, viz, protective mask, exhaust hood, or adequate ventilation.

Open hatch.—Multiple contusions resulted from a fall through an open hatch where safety measures were not observed.

Eye injuries.—Reports continue to reach the bureau with surprising frequency of injuries to the eyes (often causing permanent damage) caused by flying particles incidental to chipping, grinding tools on emery wheels, and certain kinds of work at metal-working machines. This class of injuries is easily prevented if the simple precaution is taken to wear protective goggles.

Defective sidewalk.—A broken plank was the cause of a sprained ankle and 14 days' incapacitation.

Swinging door in gun compartment.—While attempting to close door to gun compartment during target practice, concussion from the gun discharged blew the door open, which struck man on forehead and inflicted wounds which necessitated 17 days' in the sick bay.

Carelessness in opening a steam line.—Because he failed to drain off water in a steam line before disconnecting same, a man incurred burns about the face, chest, and arms from the escaping hot water and steam, which disabled him for 15 days.

Failure to secure the lid of an open chest.—While leaning over the edge of a chest, the lid fell, striking a man on the jaw and causing a fracture of bones of the face. This accident could have been prevented by simply taking care to see that the lid of the chest was

either secured or tilted back far enough. An accident of this character recently caused a fatal fracture of the skull.

An unusual hazard connected with small-arm exercises.—A sprain of the knee and eight days' disability resulted in the following manner: While firing from a prone position, the heel of the left foot was raised when it should have been touching the deck; the instructing officer pushed the heel into position, thereby twisting and spraining the knee.

Electric circuit.—In neglecting to turn off electric current before cutting a wire, an electric-current burn of the hand resulted.

Falling object.—Because the connecting door to the back of a boiler was improperly secured, a mechanic who was working near and jarred the door was injured when it fell and struck him. Sixty-three sick days resulted.

Lead poisoning.—A case of lead poisoning was reported to have been incurred in connection with chipping and painting ship. Ninety-eight days resulted.

Defective line.—While descending a line from stages over the side to dry dock, the line, which was reported defective from use, carried away, letting a man fall to dry dock. Fortunately, only a sprain of the wrist resulted.

HEALTH OF THE NAVY

Ordinarily this monthly review of health conditions is based to a considerable extent upon figures received from ships for the preceding month. Due to ship movements, reports have been received in time for use in this connection only from 11 of 75 ships listed as comprising the Battle Fleet, and from 17 of 71 vessels belonging to the Scouting Fleet.

Form F cards covering admissions to the sick list throughout the Navy during the month of February indicate that the satisfactory health conditions which existed during the early part of the winter continued at least through that month.

Morbidity reports from shore stations in the United States for the month of April show that there were comparatively few admissions for communicable diseases, as might be expected with the coming of warmer weather.

In recent weeks influenza has been more or less prevalent in various parts of the United States. No definite outbreaks have occurred among naval personnel in this country. In all, 44 cases were reported by naval stations in the United States. Ten occurred at the navy yard, Portsmouth, N. H., with an average daily strength of 1,100 men, including prisoners. Morbidity report cards from the U. S. S. *Nevada* indicated that 27 cases developed on board that ship during the week ended April 25, 1925. The U. S. S. *West Virginia* reported the incidence of 67 cases, April 17 to 24.

The following table shows provisional admission rates per 1,000 per annum, entire Navy, for the principal communicable diseases, for January, 1925, together with corresponding median rates for the same month, 1920 to 1924, inclusive:

	February, 1920–1924	February, 1925
Cerebrospinal fever	0. 08	0. 21
Diphtheria	. 49	. 21
German measles	. 98	1. 65
Influenza	122. 87	38. 95
Malaria	16. 17	7. 85
Measles	9. 43	1. 24
Mumps	19. 07	13. 53
Pneumonia	4. 84	2. 99
Scarlet fever	4. 51	1. 24
Smallpox	0	. 10
Tuberculosis	2. 88	1. 65
Typhoid fever	. 20	0

TABLE No. 1.—*Summary of morbidity in the United States Navy and Marine Corps for the month of February, 1925*

	Forces afloat	Forces ashore	Marine Corps	Entire Navy
Average strength	75, 984	40, 177	20, 026	116, 161
All causes:				
Number of admissions	3, 092	2, 644	1, 112	5, 736
Annual rate per 1,000	488. 31	789. 71	666. 33	592. 56
Disease only:				
Number of admissions	2, 760	2, 369	976	5, 129
Annual rate per 1,000	435. 88	707. 57	584. 83	529. 83
Communicable diseases, exclusive of venereal disease:				
Number of admissions	1, 015	1, 189	433	2, 204
Annual rate per 1,000	160. 32	355. 15	271. 45	227. 69
Venereal diseases:				
Number of admissions	878	260	142	1, 138
Annual rate per 1,000	138. 66	77. 66	85. 09	117. 56
Injuries:				
Number of admissions	324	242	108	566
Annual rate per 1,000	51. 17	72. 28	64. 72	58. 47
Poisoning:				
Number of admissions	8	33	28	41
Annual rate per 1,000	1. 26	9. 86	16. 78	4. 24

TABLE No. 2.—*Deaths reported, entire Navy, for the month of April, 1925*

	Navy (strength, 96,135)	Marine Corps (strength, 20,026)	Total (strength, 116,161)
Pneumonia, lobar	1	0	1
Tuberculosis, chronic, pulmonary	1	0	1
Other diseases	9	1	10
Drowning	1	1	2
Other accidents and injuries	3	7	10
Total	15	9	24
Annual death rate per 1,000, all causes	1. 87	5. 39	2. 48
Annual death rate per 1,000, disease only	1. 37	. 60	1. 24

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