BURRALL
ON
ASIATIC CHOLERA

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BY

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"Glean and gather among the reapers."

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INTRODUCTION.

THE object of this work is to bring together in a condensed form the more prominent views, especially of recent authorities, with regard to this fearfully interesting disease. It is mainly a study of evidence, in which the subject has been considered from many sides, and the result is set down in language as far as possible expressive of the amount of credence to which the different points are entitled.

The communicability of the disease has been dwelt upon at some length, for the adoption of this view is of extreme practical importance; and it is not a sufficient reply to those facts which are brought forward to prove that cholera is communicable, that in another set of cases, and under circumstances apparently similar, the disease did not extend. It devolves upon those who are unwilling to admit that cholera is transmissible from the sick to the well, to show that the facts in favor of such transmissibility are insufficient evidence. The testimony of the five witnesses who saw the culprit steal the axe, was not weakened by that of the twenty who swore that they did not see the theft. Enough evidence is on record to warrant the assertion, that the connexion between the arrival, from an infected to a healthy and sometimes isolated locality, of those sick with cholera, and the speedy appearance of the disease in that locality, is sufficiently immediate to stand in the relation of cause

and effect. It is also significant that in some cases, as in the ship New York, where it was supposed that no connexion existed with an infected locality, a closer examination has demonstrated that such a connexion did exist, so clear as not to admit of a reasonable doubt.

If a ship laden with poisonous serpents should stop on its passage at different ports, where no such reptiles existed, and soon after its arrival these venomous creatures should be observed in those ports, the natural inference would be that they had been brought thither by that ship; and it would not be a sufficient reason for disbelieving it, that in some other ports touched by the same vessel, no such reptiles had subsequently made their appearance.

Something has been learned of the characteristics of this pestilence, although very much still remains in obscurity.

It may be claimed as known, that in the large majority of cases the disease is preceded by a premonitory stage which is easily controllable; that instead of sweeping with the wind over oceans and continents, there is ample reason to believe that human intercourse is the means by which it is propagated, and that the noxious element requires certain foul adjuvants for prolific germination. Accumulating evidence goes to prove that a kind Providence has placed even this great scourge among the number of preventable diseases.

ERRATA.

Page 45—Atlantic should read Atalanta.
Page 75—1855 should read 1865.

ASIATIC CHOLERA.

CHAPTER I.

The successive epidemics of Asiatic Cholera which have prevailed since 1817, when it first left the Delta of the Ganges to become a universal pestilence, have been marked by a striking uniformity in their prominent features. In fact, this uniformity excites a doubt as to whether the destructive epidemics of cholera, which reliable authorities* have described as existing previously to 1817, could have committed such fierce ravages and yet remain within such comparatively narrow limits, if there had been present the same progressive elements which have characterized its subsequent career. It is also remarkable that medical writers of remote antiquity, in describing the cholera as a disease

* Aretæus (A.D. 50) gives an account of cholera, and describes the dejections, loss of voice, general coldness, and suppression of urine. The disease is also noticed in Sanskrit. From 1769 to 1790 there are also reliable accounts of cholera (endemic?) by Chisholm, Folly, Curtis, Girdlestone, Jameson, Johnson, König, Sonnerat, Thomson, and others. See "Die Epidemische Cholera." Dr. Drasche, Vienna, 1860.

indigenous to the banks of the Ganges and detailing its features, do not speak of its epidemic character; for this is noticed by them as a mark of other pestilential diseases of that period, and is so striking a feature of Asiatic Cholera that it could not have escaped observation if it had been present. The probable inference therefore is, that the cases described were for the most part instances of sporadic cholera, while it is possible that other diseases with somewhat similar symptoms were also described under that name.

From the middle of the eighteenth century to its close, and during the early part of the nineteenth,* there are trustworthy accounts of violent epidemics, yet the disease still remained within its original limits. It is true that epidemics which resembled the Cholera of India prevailed during portions of that period in Madras and Mauritius, also in Pennsylvania (Will. Curie, Philadelphia, 1790) and the Antilles; but it was not until 1817 that the disease displayed those characteristics which have secured for it such a dreadful prominence as the Epidemic Cholera.

It will be interesting to notice the circumstances under which the cholera assumed in 1817 such striking epidemic features, while it may also throw some light upon the nature of the disease.

In the report of Dr. James Jameson,† it is stated that

* Trincomali, 1804; 1814, among the troops at Jaulnah; 1816, in the district of Purneah.

† Report on the Epidemic Cholera Morbus as it visited the territories subject to the Presidency of Bengal in the years 1817, 1818,

unusual variations from the ordinary course of the weather were observed in Bengal in February, 1817. This month was more like an autumn one, with rain every third or fourth day. In March there were frequent alternations of clear and cloudy weather with very severe storms. April was more regular, but the rain appeared in May fifteen or twenty days earlier than usual, and then diseases of the bowels made their appearance. June and July were unusually rainy, and there was also much rain in the beginning of August, but in the middle of the month the heat was extreme. Ordinarily the air becomes cooler and more refreshing during the rainy months; but in 1817 the excessive heat destroyed this beneficial influence. The end of August was accompanied with constant rain, by which the air became suddenly cooled. As a result, while the cases of fever which occurred were mild, there followed severe attacks of diarrhœa and inflammation of the liver, and now cholera made its appearance in a most active form.

The disease had already prevailed during May, June, and July, in Nuddya and Mymunsing, districts far distant from each other, but as it was limited to distinct localities and not often fatal,* no special notice was taken of it until the middle of August, when its virulence and rapid spread caused universal alarm.

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and 1819, etc., by James Jameson, Assistant Surgeon and Secretary of the Board. Calcutta, 1820.

* Ueber den Ursprung und die Verhütung der Senchen, &c., von Dr. W. F. P. Kiehl, etc., etc. Berlin, 1865.

It was at this time that Jessore was visited by the disease, and it is a prevalent belief that during this visitation the cholera underwent certain changes, which so modified its character that it became in many respects a new disease, and hence the origin of epidemic cholera has been placed in that town. Previous to the attack upon Jessore the malady had (with the exception of occasional severe local epidemics) prevailed at certain seasons in several places simultaneously, as a disease indigenous to India, apparently produced by atmospheric or malarial causes. It had attacked chiefly the natives, was not greatly feared by foreign residents,* and subsided as the cooler weather came on. But after having appeared as an epidemic in Jessore, it assumed a wandering character, and, as if humanized, passed along the great highways; stopped at some houses or villages, while capriciously neglecting others; entered ships, and was carried through rivers and across seas, and followed man all over the world.

Jessore,† a thickly populated town, one hundred miles north-east of Calcutta, is situated in the midst of the Delta of the Ganges, on a flat, reedy bank of the river, slightly elevated above sea-level, on a soil composed of river de-

* Kiehl. "Ueber den Ursprung," &c.

† It was so rare among foreign residents that neither of the physicians who had been connected, one for five, and the other for ten, years, with the General Hospital of the Bengal Presidency for Europeans, had seen a single case of the disease previously to the outbreak of the epidemic.

posits, placed in beds of clay and sand. During August there is little variation in the climate of that vicinity, it having a medium temperature of 81° Fahr., which is the same as that of the river surface. The barometer has a medium height of 29.45. "About eighty miles distant is the tract of Soonderbunds,* and the hot south-west monsoon scatters pestilential vapors over all parts of the Delta for six months of the year. From the 15th July until 15th October, the atmosphere in Bengal possesses all the properties of a filthy vapor bath, producing a sensation of indescribable fatigue and oppression, and an exhausting perspiration."† On the north side of Jessore a shallow, almost stagnant, arm of the river extends inwards, having an original bed about seventy-five yards wide. During the rainy season this bed was transformed into a fetid swamp, covered with rank vegetation. By the side of this sluggish water stood the bazaar, and long narrow rows of low, mean huts, surrounded by trees, which afforded shade, but prevented the rapid escape of moisture. The stream was the receptacle for excrementitious matters, and the bodies of partly burned corpses were also thrown into it, in accordance with religious superstition. The water of this stream was also used to some extent for drinking purposes.‡

* This is the name given to a large number of low and marshy islands in the Delta, formed by the different channels which the Ganges makes in its course to the ocean.

† Kiehl.

‡ An estimate has been made that the Ganges empties 550.000 cubic feet of sediment every second into the ocean.

In addition to these extremely insalubrious conditions, the rice crop, which furnished the chief subsistence of the natives, had turned out badly in 1817. "Rice is, in consequence of the large proportion of starch and gum which it contains, a good vegetable aliment, but when employed as the sole article of diet, insufficient for the wants of the system. But the blood of the individual depends upon the nature of the food consumed, and therefore the blood of the Bengalese must be of a poor quality, deficient in albumen and fibrin."*

According to an analysis made by J. Moleschott, rice contains, on an average, in 1000 parts:

Gum and Soluble Albumen	50.69
Cellulose	10.18
Starch	822.96
Dextrin	9.84
Sugar	1.73
Oil	7.55
Salts	5.01
Potash	1.01
Soda	0.13
Lime	0.35
Magnesia	0.21
Oxide of Iron	0.12
Phosphates	3.12
Silicates	0.07
Water	92.04

There are two rice harvests yearly in India. The cho-

* Kiehl.

lera of 1817 occurred about the time of the first harvest, in the rainy season, in August. This first rice is very unwholesome, and the natives consume a third less of it than of the older quality. Sometimes it even produces a fatal disease characterized by vomiting and diarrhœa.* Such food as this would increase any intestinal irritability in a marked degree.

The first cases of cholera noticed in Jessore were in the narrow streets near the swamp, during the rainy season.

On the 19th August, 1817, Dr. Tytler, the physician of the English colony in that city, was called at mid-day by a native physician, to see a middle-aged man who was sick in the bazaar. At first, Dr. Tytler supposed the case to be one of narcotic poisoning, and this suspicion was increased by the fact that the man was to appear as an important witness in a criminal case. The sickness proved fatal on the following day, and then it was discovered that ten others had died with similar symptoms in the same corner of the bazaar, and more lay sick with the disease in other parts of the city.

Now, it does not seem possible that this could have resembled even a severe attack of the ordinary cholera of India; for Dr. Tytler, who was an intelligent man, and must have seen that disease, considered that this patient was suffering from a specific malady caused by the use of noxious rice.†

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* Kiehl.

† Remarks upon Morbus Oryzæus; or, Disease occasioned by the

On the other hand, investigations made after the outbreak of the disease in Jessore, showed that cholera had been prevailing as an epidemic along the Ganges from May until August, and the opinion is quite general that the disease which attacked Jessore was, in its commencement there, an extension of the epidemic. It is also noticeable that physicians of India who had seen the cholera epidemics of the eighteenth century, and who now saw this later pestilence, considered them as identical diseases. Hence, there is good reason to regard Asiatic cholera not merely as sporadic cholera prevailing epidemically, but as the endemic disease so metamorphosed by some specific influence or agent as to have become what, in the absence of an intimate knowledge of the disease, is termed malignant.* Something similar to this is noticed in the difference between the simple and malignant forms of the exanthemata, and in those throat diseases which assume a grave diphtheritic character.

Why epidemics should be more severe at some periods than at others is a matter of speculation; yet this is a feature connected with the outbreak of cholera in 1817 and of subsequent extensive visitations of the disease. They have been preceded by unusual activity of the malady in Hindostan. This was the case with those of 1831 and 1832,

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Employment of Noxious Rice as Food. In Two Parts. By Robert Tytler. Calcutta, 1820.

* This term is used to express the effect of certain causes not yet understood.

and in 1860 the epidemic prevailed extensively in the valley of the Ganges between Calcutta and Putna. In 1861 the most serious epidemic since 1846 broke out in and extended over the north-west provinces of India. While pursuing this course it appeared in Candahar and Bagdad, on the western and thrice followed track. In 1863 the mortality of the disease in Bombay was fifty per cent. above the average; and in March, 1865, the cholera showed itself on the banks of the Ganges, and prevailed as an epidemic for twenty-two days without leaving the country.

A review of the circumstances connected with the outbreak of epidemic cholera presents the following facts. A season of unusual atmospheric changes was accompanied by an earlier and more general visitation of endemic cholera. The fatality was not very marked until August, when, perhaps rendered more active by the advanced season, it visited during the rainy months a locality in the malarious Delta of the Ganges, slightly elevated above sea level, having a fetid swamp beside it which served as a receptacle for excrementitious substances, and the water was also sometimes used for drinking. The inhabitants, degraded and filthy,* were badly nourished or partially poisoned by a defective crop of the staple which formed their principal subsistence. The streets were narrow and dirty, the huts overcrowded, and the air within them poisoned by emanations resulting from excessive crowding. In short, malaria,

* Report of College of Physicians of Philadelphia to Board of Health. Philadelphia, 1832.

defective nourishment, and animal filth, stand forth prominently in connexion with the outbreak of the cholera in Jessore.

Such circumstances would be likely to produce disease, or to modify it when originated. The instances are very common in which a low state of the system will render a mild disease severe, and transform even a simple incision into a gangrenous ulcer. Even vaccination, under similar conditions, is followed by very severe inflammation, while the influence of filth and crowding, in giving increased virulence to disease, is generally admitted. Martin notices the effect of these causes, and says: "It was amongst the poor, ill-fed, ill-clothed, and crowded inhabitants of Jessore that epidemic cholera made its first appearance."

In this connexion may be noticed the early cessation of a severe cholera epidemic, which is narrated by Kiehl to show the effect of favorable hygienic conditions in arresting disease.

In 1783 more than a million of pilgrims came to Hurdivar in India, during the time of the April full moon, to bathe in the sacred waters of the Ganges. It was their custom to pass the night near the river with scarce a roof to cover them, or under the open sky. The climate of this vicinity is very changeable; hot, sultry days, alternated with cold nights and heavy dews, while the proximity of high mountains rendered it liable to sudden blasts of cold mountain air. The cholera broke out soon after the commencement of the ceremonies and destroyed over twenty thousand

souls. Yet the town of Juvalapore, only seven miles distant, was not affected by the disease, and the pestilence ceased when the pilgrims separated.

The chief reasons assigned for the cessation of this epidemic are, firstly: That the causes which occasioned it were of a passing or temporary character; that is, it originated among a transitory population. Secondly: Hurdivar was about seven hundred miles from the mouth of the Ganges, and nine hundred and fifty feet above sea level. Besides, the pilgrims were not in houses, but encamped in the open air, and the disease appeared early in the season, before the protracted summer heat.

Some have considered the different varieties of cholera (cholera morbus, sporadic cholera, endemic cholera, cholera Asiatica) to be varying grades of the same morbid process, depending upon differences in climate and surroundings for the variations in intensity. There is a similarity in the symptoms of each, so great, occasionally, as to cause perplexity in diagnosis, and the post-mortem appearances of sporadic cholera have sufficiently resembled those found in Asiatic cholera to lead some authorities (Andral, Brown, Ferrus, Griesinger*) to regard them as essentially similar. With regard to the distinction drawn between sporadic and epidemic cholera, from the absence of bile in the dejections of Asiatic cholera, Niemeyer says: "It must not be inferred from the paleness of the dejections, that the formation or

* Die Epidemische Cholera, von Dr. Drasche. Vienna, 1860. Page 308.

excretion of bile has ceased; for even if the bile were produced in normal quantity and poured into the intestine, it could not exert any marked effect upon the coloration of such a large quantity of fluid."

Yet, as has been previously said, there is good reason to believe that epidemic cholera is something more than an aggravated form of the endemic variety, but the relations which they bear to each other are at present a matter of opinion on which high authorities differ, and which still waits for a satisfactory solution.

There have also been decided differences in the views taken by able observers, concerning the nature of the ultimate cause of epidemic cholera. Even as early as after the first general invasion of cholera, the theory was advanced that the ultimate cause of the disease was of an animal nature. An infusorial contagion, originating in the swampy districts of Hindostan, while plausible, is thought to explain some of the strong peculiarities of the disease. The almost marvellous vitality of microscopic animalcules, as well as of their germs, is supposed to account for the periodic renewals of the disease at comparatively short intervals—latent germs being quickened—either as the result of fortuitous circumstances, or in consequence of peculiar inherent laws.* The extinction of epidemics also has its

* A distinguished lady of title has lately made a communication to the French Academy of Sciences, in which she declares that she has discovered the cause of cholera in a microscopic insect which she calls the "winged leech," and which, she says, is developed espe-

analogue in the entire extermination of myriad swarms of insects; but a thorough examination of the infusorial world during cholera epidemics has given no positive results, so that the question still remains unanswered. The same may be said with regard to the theory that the cholera contagion is of a vegetable nature; a fungoid growth developing in the cholera dejections. Pettenkofer's opinion is very decided upon this point, and is thus expressed, in a recent journal: "Without the least danger of making an error, we can assert that the substance in question (the ultimate cause of cholera), although quite unknown to us as a separate entity, must be of organic nature, and either a cell or a ferment."*

The solution of these questions would not only be of the greatest importance, as related to cholera, but would, in all probability, throw much light upon many obscure points in other diseases.

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cially in marshy and filthy localities. The details she gives in relation to this animalcule and its connexion with cholera, are so minute that the Academy, which commenced by laughing at the first paragraphs of the report, finished by deciding to investigate the matter.—*Letter from Paris in New York Times of February 5th*, 1866. The correspondent, "Malakoff," is an American physician, living in Paris.

* *Beilage zur Allgemeinen Zeitung*, October 9th, 1865.

CHAPTER II.

The evidence in favor of the contagious nature of cholera is, mostly if not altogether, of a circumstantial character. While the disease is not contagious in the same manner as small-pox and scarlatina, yet the well authenticated cases are so numerous, in which a direct connexion has been traced between the origin of a cholera epidemic, and the arrival of an individual from an infected to a previously healthy neighborhood, that there should be no doubt as to the spread of the disease by human intercourse. This point may be considered as so well established that a practical disregard of it involves the assumption of a grave responsibility.

The evidence which is advanced against the contagiousness of cholera does not weaken the accumulated force of the facts in its favor, some of which do not admit of a reasonable doubt, but it only shows that the liability to contagion is diminished, or strengthened, by certain localizing causes.

Preconceived opinions, although honestly taken, have been in many instances an obstacle to the belief in the communicability of cholera from individual to individual, and the same result has been produced in others from a failure to appreciate the indirect manner in which the disease is believed, on good evidence, to be communicated.

The other methods supposed to account for the exten-

sion of cholera are, in general terms:—Progressive atmospheric influence, local atmospheric influence, and terrestrial emanations.* It has been found, however, that as diffusive agents they are insufficient to explain the peculiar features and progress of the malady.

The following opinions, from a distinguished authority, upon certain atmospheric conditions supposed to favor cholera epidemics, are the results of extensive experience, and are entitled to very great respect:

"Great importance has been attached to the meteorological conditions attending an outbreak of cholera; they do not appear to be very important except in two or three cases.

"1. *Temperature.*—High temperature favors spread by increasing the putrefaction of the stools, and by augmenting generally the impurity of the air. When cholera has prevailed at a low temperature (it has been severe at a temperature below freezing), the drinking water has possibly been the cause.

"2. *Pressure.*—Pressure has no effect. The old observation of Prout, that the air is heavier in cholera epidemics, has never been confirmed.

"3. *Moisture in Air.*—Combined with heat, this seems an accessory cause of importance, probably by aiding transmission.

"4. *Dryness of Air.*—Seems decidedly to check it.

"5. *Rain.*—Sometimes augments, sometimes checks, it.

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* Byrne on Cholera, page 28. Philadelphia, 1854.

This, perhaps, depends on the amount of rain. A very heavy rain is a great purifier.

"6. *Movement of Air.*—It is certainly worse in stagnant atmospheres, as in the cases of all the specific poisons.

"7. *Electricity.*—Is not known to have any effect. This was particularly examined by M. Lamont, in Munich, one of the most celebrated physical philosophers of our time, but with entirely negative results.

"8. *Ozone*—Has no effect on its presence or absence (Schultze, Voltolini, Du Methe, Lamont)."

The history of cholera shows that its usual method of progress is from a centre * in more or less irregular directions; yet, at the same time, its course has been more strongly imprinted along the chief lines of trade and intercommunication.† The grand routes of travel and traffic have always been especially marked in its progress; it has followed large bodies of men in motion; and when it has passed from one continent to another, the first cases have been observed in seaport towns, from which it has spread to the interior.

"Cholera has frequently attached itself to bodies of troops on their march in India, and has remained with

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* Reports on Epidemic Cholera, etc., by William Baly, M.D., and William W. Gull, M.D. Lond. 1854, p. 96.

† "Hastened down the Ohio and Mississippi rivers to New Orleans with the rapidity of a steamboat."—*Byrne on Cholera.* Pettenkofer explains the prevalence of cholera near rivers by the presence of moisture held by the soil (grundwasser), which he regards as a chief localizing cause.

them during many days in their passage over long tracts of country, the inhabitants of which were not suffering from the epidemic. The duration of the epidemic in marching regiments is stated by Dr. Lorimer, who has collected the largest number of instances, to be, in the majority of cases (in 88 out of 121), less than thirty days. It has often, however, been longer, and in the more severe outbreaks, the epidemic reached its climax in the regiment about the eighteenth day. Many points relating to these attacks of marching troops in India are matter of dispute, but the fact that the disease remained with them for many days, when it did not prevail in the country round, seems not to be gainsaid: and here, again, the inference is irresistible that the cause of the disease travelled with the troops, and affected different men in succession."*

Byrne notices the singular circumstance that, although at the date of his writing (1854), thirty-four years since the cholera first reached Canton, it had never crossed the *atmosphere* of the Pacific; yet since immigration to America had become very extensive it had crossed the Atlantic a number of times.

Besides, it cannot be regarded as a mere coincidence that the disease should never have been seen on the coast of South Carolina before the arrival of the brig Amelia in October, 1832, at Folly Island; and that the only cases on the island were of those employed about the vessel; or that the first cases at Detroit occurred soon after the arrival of the

* Baly and Gull, page 135.

Henry Clay, July, 1832, with cholera on board; or that it never should have appeared at Key West until the arrival of the Ajax, which had sailed from the infected port of New Orleans, and which arrived at Key West with the disease on board; besides many other well authenticated instances of a similar character.

The present epidemic is consistent with previous ones in affording evidence that the disease has been mainly diffused along the lines of travel by means of human intercourse.*

Dr. Tilbury Fox, who was travelling in Syria at the time when the epidemic prevailed there, states, that numbers of

* Dr. Althaus in a letter to the *Medical Times and Gazette*, dated October 30th, 1865, writes the following with regard to the recent introduction of cholera into Saxony: "In Berlin, Vienna, and other large towns no case of cholera has as yet occurred. But the disease has been imported into the very heart of Saxony by a few travellers who left Odessa some weeks ago when cholera was at its height there. These gentlemen, a few days after, having arrived at Altenburg, a small town near Leipzig, fell ill and died with all the symptoms of cholera. Several of the inhabitants of Altenburg were subsequently affected and died, and the disease then spread to Werden, a neighboring town which is in railway communication with Altenburg, and where the epidemic has assumed comparatively large dimensions. Up to October 20th there had been 149 cases of cholera at Werden, of which 52 proved fatal; and according to the latest accounts the epidemic is by no means decreasing. This insulated outbreak of cholera in a previously healthy country, and which is clearly traced to persons coming from a centre of infection, must prove an important link in the evidence already accumulated to prove the contagious nature of the disease."

pilgrims from Southern India died of cholera during the months of February and March, at the Arabian ports of Djeddah and Moculla. Eighty deaths occurred on one vessel which arrived off Moculla in mid-winter, before the companions of those who had died left the ship for Mecca. Egyptian physicians have also established the fact beyond question, that the disease advanced in the last weeks of May from Arabia along the North African coast, and Egypt was soon visited by the pestilence conveyed thither by the flying pilgrims.* In the report of the chief physician at the Isthmus, it is stated that nearly 20,000 pilgrims, all more or less infected, passed Suez in order to embark at Alexandria for Europe or elsewhere. Suez, Alexandria, and Marseilles were healthy until some pilgrims from Mecca, who had embarked at Djeddah, where the cholera prevailed, arrived at those ports.

Prof. Tommasini, who published a work on cholera in 1837, states, on the authority of Dr. Frias, a physician of Leghorn, who had lived several years in Alexandria, that the disease was originally carried from Mecca to Alexandria by pilgrims returning from the same feast of Kurban Bairam.† This year the same carriers seem to have borne it

* Geographical and Statistical Report of the Epidemic of this Year. Dr. Drasche, Docent. *Wiener Med. Wochenschrift*, 1865, No. 66. "Intelligence from Bagdad states that cholera appeared among the pilgrims from Mecca; thousands died in a few days." Ibid.

† Sul Cholera Morbus. Nozioni, etc. Prof. G. Tommasini, Bologna, 1837.

from Mecca in all directions, since it followed the main routes of the caravans.*

Steamships have also played an important part in carrying the seeds of the present epidemic to different parts of the Mediterranean, Black Sea, and up the Danube. They were overcrowded with those flying from the different places where the pestilence prevailed; and outbreaks of the disease occurred at various landings soon after the arrival of the steamers. It was also noticed that the disease would pass by ports nearer those localities where the malady was then raging, and attack others more distant, with which the means of communication were more frequent and direct. Thus it passed by Candia, Rhodes, and the Cyclades, and first appeared at Samothraki and Salonica.

The reason why the disease showed a tendency to prevail in the basin of the Mediterranean is, that it was carried to the different seaports by the steamers, and spread from those ports as centres. On the Black Sea the regular line of steamships was discontinued, for it became evident that the disease was being propagated by means of them.

The recent introduction of the disease into Constantinople, was by a ship which had been lying in the port of Alexandria. It is stated† that Osman Pacha came by way

* The epidemic which broke out in 1848 in Egypt, is traced to a festival in Tantah, in honor of a Mohammedan saint, which called together about 165,000 pilgrims. The cholera appeared among them, and immediately on their dispersion was observed in Alexandria.

† Dr. Drasche.

of Alexandria in the beginning of July, bearing a message to Constantinople concerning the Suez Canal. Three persons died of cholera on the passage. The physician and captain concealed the deaths, at the Pacha's order, and declared the ship healthy to avoid quarantine.* The first cases treated in the Marine Hospital belonged to the crew, and the epidemic commenced in that part of the city near the hospital.

The coincidence of the outbreak of the disease on this continent, and on islands in the middle of the ocean, with the arrival of an infected ship from an infected port, is one of the most conclusive facts in favor of the transmission of the disease by human intercourse. There are a number of well authenticated instances of this character.†

The brig Carricks sailed from Dublin, then infected with cholera, in April, 1832, having 175 emigrants on board. The disease appeared among the passengers a few days after leaving port, and forty-two persons died of it before the 3d June, when she arrived at Quebec. The remainder were permitted to land on Grosse Isle, a few miles from Quebec, and no rigid measures were taken to prevent intercourse

* Here is an instance in which quarantine regulations have been inefficient in warding off the disease.

† Byrne notices the circumstance that cholera follows the line of a single vessel when crossing the ocean, but branches out in a hundred directions after reaching the land. See also *London Lancet* of March, 1854, page 236. Also *British and Foreign Med. Chir. Review*, Oct. 1865, Barraut on Cholera.

between them and the city. Several cases of cholera appeared in Quebec on the 6th, 7th, and 8th of June, and on the 9th, fifteen cases were reported officially. This was the beginning of cholera in America.

The emigrant ship New York sailed from Havre on 9th November, 1848, and the epidemic made its appearance on the sixteenth day of the voyage. Fourteen fatal cases occurred during the passage, and on the 2d December, cholera patients were landed at the Quarantine Hospital on Staten Island. Eight cases and five deaths immediately occurred on Staten Island, and there was a severe epidemic in mid-winter upon the Quarantine grounds.

At about the same time (11th December, 1848), the ship Swanton, also from Havre, reached New Orleans with 280 emigrants on board. Thirteen passengers had died at sea, subsequently to 26th November, most of them from bowel complaints, supposed to be dysentery. On the day following the arrival of the ship at New Orleans, a woman with well marked cholera was taken to the hospital. On the following day, a man who had come over in the ship and had diarrhœa on his arrival, was brought in a state of collapse to the hospital, and died in a few hours. Three other cases of cholera, all fatal, were admitted from different parts of the city the same day. In these latter cases, no communication with the ship was traced. The disease now spread rapidly in the hospital and city, although it did not exist at this time in any other part of the United States except Staten Island. These cases are not recent, but are

introduced in connexion with the following extract from an article in the British and Foreign Medico-Chirurgical Review* for October, 1865, which refers to the vessels just mentioned:

"It was in the last week in November, 1848, that it manifested itself at sea, on board two emigrant vessels, bound, the one for New York and the other for New Orleans; when they had been out, the former sixteen and the latter twenty-seven days from Havre, which was unaffected at the time of their departure. The circumstances attending the nearly simultaneous appearance of the disease in two vessels traversing the Atlantic, and about a thousand miles apart, are among the most curious on record in the history of epidemic cholera. The disease did not extend beyond the limits of the Staten Island Hospitals at New York, after the arrival of the infected ship there."

These incidents, apparently obscure, admit of an easy solution; for although the disease may not have existed in Havre when the emigrants passed through that city, they came from and through cities where the cholera then prevailed. One of the emigrants died of cholera in Greenwich street a few days after leaving the "New York," and soon after two other fatal cases occurred in the neighborhood. There were more than 1000 fatal cases reported from the emigrant vessels at Quarantine, and a severe epidemic raged

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* Sketch of the Geography of Epidemic Cholera, by Galvin Milroy, M.D., F.R.C.P.

at the Quarantine grounds during the winter. This is stated on excellent authority.

The circumstances connected with the appearance of the cholera on the "Atalanta," which arrived off New York on the 2d last November, are so well known that they may be passed with the observation, that in this case the disease, instead of making a bound from Havre to Staten Island, was carried in the ship by emigrants who had come from hotels* where the cholera prevailed. It did not extend to the first cabin, but remained in the steerage, probably because the cabin passengers were not near the dejections, and sanitary regulations were carefully enforced among them by the surgeon of the ship.

M. Grimaud† narrates the following facts concerning the epidemic in Marseilles. The Stella, Capt. Regnier, entered the port Napoleon on Sunday, June 11th, at half-past two from Alexandria, with ninety-seven passengers, of whom sixty-seven were Algerine pilgrims. On the evening of the same day the Byzantine arrived with fifty-five passengers,‡ having left Alexandria June 3d and touched at Malta. The Syria arrived on the 15th, with the English mail and 320 passengers; and the Said on the 16th with 190 passengers. Of the 67 pilgrims on the Stella two were thrown into the

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* *Philadelphia Med. and Surg. Reporter*, Jan. 13th, 1866.

† See *Boston Med. and Surg. Journal*, Jan. 1st, 1866, and *Gazette des Hôpitaux*, Oct. 17th and 26th, 1865.

‡ This makes a total of 562 passengers, arrived from Alexandria at a time when cholera was in its ascendant there.

sea eight days after leaving Alexandria; and two days after, on the 11th June, the remaining sixty-five disembarked, of whom Ben Kaddour died on landing.

The Arabs left Fort St. Jean to re-embark; a crowd surrounded them and assisted them with their baggage outside the fort. It also accompanied them along the bridge overlooking that part of the city. There the first case of cholera appeared, but it did not remain there, for on the 22d June a severe case was reported by Dr. Forcade in Rue de Rome; and thus the cholera was, for the sixth time, introduced and developed in Marseilles.

Dr. Baly,* in his "Report on the Cause and Mode of Diffusion of Epidemic Cholera," gives some very interesting accounts of the disease as it was observed in eighteen lunatic asylums in England. This report consists mainly of deductions made from the replies of English physicians to questions on cholera, which were addressed to them by Drs. Baly and Gull in 1848 and 1849, during the prevalence of cholera in England; and its conclusions are of great importance. The weight of opinion is increased by the fact, that while in the commencement of their investigations these gentlemen were disposed to question the contagiousness of cholera, their views became much modified as their inquiries progressed. The report says:

"The commencement of the disease usually in one limited

* Reports of Epidemic Cholera drawn up at the Desire of the Cholera Committee of the Royal College of Physicians, by William Baly, M.D., and William W. Gull, M.D., London, 1854.

part of a public establishment, or in one of a group of houses, and its extension to others in succession, is not easily reconcilable with the theory of a general and persistent state or influence. To adapt this theory to the facts, one of two hypotheses must be adopted: either it must be assumed that a peculiar condition of localities is necessary for enabling the general epidemic influence to produce its effects, and that when one part of a public establishment or a group of houses previously free from this condition, has on a sudden acquired it, other parts are very likely to participate in it, in more or less quick succession; or else it must be supposed that a peculiar state of susceptibility is necessary in the persons who are to be affected by the hypothetical epidemic influence, and that when one or more among the inmates of a public establishment or group of houses who have all hitherto resisted that influence, chance, from whatever cause, to acquire the necessary state of susceptibility, those in different parts of the building or in contiguous houses are apt successively to fall into the same state.

"A much more probable explanation of the commencement of the epidemic in one part of an asylum or other public establishment, and of its subsequent extension through other parts, is obviously afforded by either of the other theories, which suppose the cause of the disease to be a material poison transferable from spot to spot, and from person to person, by human intercourse or currents of air. Again, if the theory of the production of cholera by a general atmospheric influence were adopted, the continuance of the

disease in each ward of a lunatic asylum for a certain time, its cessation in some wards sooner than in others, its final disappearance from almost all before the epidemic in the neighborhood had come to an end, could be explained only on the supposition of the temporary existence in each ward in turn, of that supposed condition, either of the locality or of the patients, which was necessary to excite the general atmospheric cause to action. The difficulties in the way of this hypothesis are obvious. . . . .

"If, on the other hand, the theory of contagion be rejected, and the cause of cholera be regarded as a poison not reproduced within the bodies of the sick, but existing and increasing independently of human bodies, the comparatively protracted duration of the epidemic in one ward of a lunatic asylum, while it was spreading to other parts of the establishment, seems to require some such assumption as that the poisonous matter attached itself to the surface of the walls, or furniture of the ward, or the clothes of the patients, and remained there for awhile, its quantity increasing more or less, and that while one portion of it was imbibed in some way or other by patients in the ward, another portion was conveyed to other parts of the establishment. According to this view, too, the ultimate cessation of the disease in each ward must be ascribed either to the destruction of the poison by a spontaneous process, such as might be supposed to take place in the most simple vegetable organism, after it had thrown off germs, or to its destruction or removal, either by an altered state of atmosphere, or by the venti-

lating, cleansing, or other sanitary processes adopted. The hypothesis of the susceptibility of only a limited number of persons, would not here suffice to explain the entire cessation of the disease, inasmuch as it would leave the cause of the disease still existing, and ready to affect any persons newly exposed to its influence.

"If, then, the doctrine of contagion be rejected, it is undoubtedly difficult to find a mode of explaining the cessation of the epidemic in each limited spot which would not be simply conjectural."

The outbreak of the cholera in the school for pauper children at Tooting in England, gives a striking example of the communicability of the disease from individual to individual. The malady commenced in the school on the last two days of December, 1848, and in consequence of the great mortality among the children it was determined to distribute them in the parishes to which they belonged.

"In four known instances fatal attacks of the epidemic occurred immediately in the workhouses or other asylums into which the infected children were received, and the outbreak of the disease in a fifth institution was traced to communication with one of the dispersed parties of children.

"Forty-five of the children being removed on the 6th or 7th of January to the Bellevue-House Pauper Asylum at Margate, one of them died there on the 8th January; and immediately afterwards several inmates of the house, who had not come from Tooting, were attacked, and three died two on the 11th and one on the 23d.

"At the Royal Free Hospital, 155 of the children were received from Tooting on the 5th January; four of them died between the 6th and 8th of January; five of the attendants were attacked, and two of them died between the 13th and 20th of the month."*

One of the attendants at the Royal Free Hospital, who was attacked with cholera, died at the Holborn Union Workhouse, and the disease at the same time broke out in the latter institution. Similar results were observed in the St. Pancras Workhouse, and in Park-House at Hackney, showing that the disease was traced immediately to the advent of the pauper children.

On the 17th July, 1832, two females left New York, then infected with cholera, for Newport, where they arrived the next day. They were detained one week in Quarantine, and on the 25th permitted to land, when both were found to be sick of spasmodic cholera, which proved fatal. On the 30th, Mr. Forbes, who had helped bury them, had bilious colic, and after several recurrences of symptoms, was restored to health. Subsequently four members of his family had cholera, and his wife and two children died. The first subject of the disease was a nursing child, who died on the 4th of August. Two hospital nurses, living in Newport, also had the disease and died; both of them had been employed at the house of Mr. Forbes. At the time of the appearance of the disease Newport was healthy, and Mr Forbes's house was in a healthy part of the town.

* Baly and Gull, pp. 166 and 167.

Such instances as the preceding are numerous in every epidemic.

An argument against the communicability of cholera by human intercourse, is based on the assertion, that the attendants of those sick with the disease do not contract it, or if so, the instances are rare. The evidence on this point, however, shows that there is undoubted reason to believe that attendants are more liable to contract the malady than those less exposed.*

"The instances are very numerous in which the communication of cholera by single patients laboring under the disease, is supported by evidence which it is scarcely reasonable to doubt."†

During the recent epidemic at Ancona, a city of 46,227 inhabitants, fourteen physicians lost their lives, and the Sisters of Charity were decimated. In this visitation, the total number of deaths was 1346 of the entire population.

The irregular progress of the disease—sometimes against the wind, and again, leaving towns in its route and passing on to others, to return again to the first; as well as the circumstance that those who might be supposed, from acclimation, to enjoy an immunity from attacks, are often early victims—these are all facts most readily explained by supposing that the pestilence is carried by man, particularly as other explanations are insufficient, while this is entirely ade-

* See Report of Massachusetts Medical Society, pp. 58, 59. Boston, 1832.

† Baly and Gull, p. 186.

quate. This is also the most plausible method of explaining why the disease should sometimes spread during the winter, in defiance of what might be considered atmospheric obstacles, and why its rate of travel should correspond with the comparative speed of intercommunication and traffic in different countries.

It may, therefore, be considered as a well established feature of cholera, that it is transmitted by human inter course; yet the evidence also shows that direct contagion, if it ever occurs, is very uncommon. The labors of Pettenkofer,* Snow, Delbrück, Budd, Griesinger, and others, have shown that the dejections from cholera patients, or those suffering from cholera diarrhœa, are a very frequent and, as they claim, the chief cause of the propagation of the disease. Griesinger says: "It is possible that the disease may be propagated by other methods, yet this is problematical, while it is certain that the dejections contain the infectious material." With reference to the same subject, Dr. Parkes writes: "On looking back to the epidemics I saw in India, I can perceive many points which are capable of explanation if the putrefying stools are the cause."† It is also believed that fresh stools are innocuous, and therefore that the dangerous element is developed during their putrefaction.

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* Verbreitungsart der Cholera, von Max Pettenkofer. Munich, 1855.

† A Manual of Practical Hygiene, by Edmund A. Parkes, M.D., F.R.S. Lond. 1864. Page 433.

The germ of the last cholera epidemic in Munich is believed to have been brought there by Italians, who had come from places where cholera existed, to the exhibition in the Munich Crystal Palace. These, by using the latrines of the Crystal Palace, infected them, and as they were also used by many others, the infection was carried to all parts of the city.

Dr. William Budd, in a recent pamphlet,* gives a number of very striking instances, in which the spread of cholera was arrested by an immediate disinfection of the discharges. Among other incidents, he narrates the following:

"Immediate disinfection was tried, at my suggestion, in the same year (1854), at Fishponds, in the workhouse situated there for the reception of the Bristol poor.

"In 1849, cholera, brought in by a woman coming from an infected quarter in Bristol, killed, in this same workhouse, more than 130 out of less than 600 inmates.

"In 1854, although the pest was introduced into the workhouse three separate times, only eight died of it, and the total number of attacks was under thirty.

"In the prison of Kaisheim cholera was introduced by a prisoner who died there. The sanitary conditions of the prison were as bad as possible, but the choleraic discharges were disinfected, and the result was, that only one of the 500 other prisoners took the disease.

"In the prison of Elrach, on the contrary, where no mea-

* Memoranda on Asiatic Cholera; its Mode of Spreading and its Prevention. By William Budd, M.D., etc. Bristol, 1865.

sures of this kind were taken, of 350 prisoners, fifteen per cent. perished.

"At Traunstein, in Bavaria, in every case in which the rice-water discharges were disinfected by sulphate of iron, the disease ceased with the person first seized.

"In conclusion, I may mention the case of a planter in the Island of St. Vincent's, who ascribes the almost entire escape of his laborers from cholera in the great epidemic of 1853, to similar measures. When cholera broke out on his estate, he encamped all his negroes on open ground, and by the advice of one of my friends, had a pit dug in the earth and deeply charged with chloride of lime, to serve as a receptacle for all discharges from the sick. The result was, that while the neighboring estates were all decimated by cholera, and some almost depopulated by it, this gentleman's estate escaped with only a slight outbreak."

Yet, admitting that the dejections of cholera are a very frequent cause of the disease, it is certain that their noxious effect depends to a great degree upon certain conditions.

Pettenkofer thus defines his views as to the circumstances which are essential for the development of a cholera epidemic:*

1. "An inhabited stratum of earth which for a certain depth (the depth of the moisture in the soil) is sufficiently porous to admit of the diffusion of air and moisture.

* Beilage zur Allgemeinen Zeitung, October 8th, 1865. See the same journal from October 1st to October 10th. I am indebted for these numbers to Dr. M. Herzog, of this city.

2. "An occasional decided variation in the quantity of this moisture. This is best observed in the varying quantity of water held in alluvial soils, and here the period when the moisture recedes from an unusually high level is the period of danger.

3. "The presence of organic materials, especially such as are formed from excreta with which the soil has become infiltrated.

4. "The specific germ, transmissible by human intercourse, the ultimate cause of cholera, transferred principally in the dejections of those suffering from cholera diarrhœa; perhaps also by persons in good health coming from infected districts.

5. "A predisposition on the part of individuals to receive the disease."*

The Commission appointed to prepare a report based on observations made throughout the whole kingdom of Bavaria, during the cholera epidemic of 1854, decided "that all cases where the cholera has prevailed epidemically, stand on a porous soil which is permeated by air and moisture, and according to our present knowledge, the water lies at a depth of from five to fifty feet. This condition of soil seems necessary for the existence of an epidemic. In localities upon a compact rocky foundation, or upon rocks which contain no moisture, scarcely any instances of cho-

* By this seems to be implied not a special predisposition, but those causes which ordinarily render individuals liable to disease; as nervous depression, errors in diet, etc.

lera have been observed, at the most only individual cases, but not an epidemic."

Dr. E. Harris, in a Report on Epidemic Cholera,* gives the following results of observations made during cholera epidemics at the Staten Island Quarantine, as to the contagious properties of the rice-water evacuations:

"In studying the history of fourteen epidemics of cholera that have occurred within the walls of our New York Quarantine establishment, the writer has seen abundant evidence of the infectious agency of the sick and their 'rice water' evacuations. Ten of these epidemics at Quarantine unquestionably depended upon cholera patients from ships, and in six instances, at a time when there was no cholera upon our Atlantic coast. These sudden outbursts of cholera, as a general rule, occurred within a period of four days from the disembarkation of the sick, and whenever cholera was not generally epidemic in this country, these epidemics at Quarantine ceased as suddenly as they came, after sweeping off a portion of the convalescents and patients that were in other hospital buildings, having other diseases. The cholera patients were kept as remote from other patients as possible.

"Concerning these repeated outbreaks of cholera at Quarantine, it should be stated, that while they proved how

* Report on Epidemic Cholera by the Council of Hygiene and Public Health of the Citizens' Association of New York. New York, November, 1865.

fatally infectious the cholera poison may become in the midst of crowded hospitals and public institutions, they utterly failed to prove that from the same exclusive cause—viz. the contagion of the cholera evacuations—a world-wide epidemic could be caused. These outbreaks did prove, however, that the stools and besmeared clothing of the sick with cholera can, under certain circumstances, propagate the disease; while, on the other hand, a series of events at Quarantine and in the city demonstrated, that for the production of a wide-spread epidemic, other important causes than the presence of the 'rice-water' stools and vomitings must be present."

Those instances in which the disease has ravaged a certain locality during one epidemic and passed by it in a succeeding one, although prevailing in its neighborhood, Pettenkofer explains by the varying level of the water in the soil, and this water or moisture he considers as the chief localizing cause of cholera.

This theory is supported by many very striking facts,* and explains, among other circumstances hitherto difficult to understand, why the disease, contrary to its usual affinity for low and marshy soils, has prevailed at very considerable elevations. In Flintern, the principal cholera field of Zurich, where the epidemic raged 400 feet above sea level, while sparing the adjacent low ground, an abundance of water was found, on boring, at a depth of only ten feet. A humid soil is also supposed to have afforded a localizing

* Beilage zur Allgemeinen Zeitung, Oct. 2d and 3d, 1865.

cause for the epidemics which have prevailed during the winter.*

Yet some writers consider that the existence of all epidemics of Cholera cannot be explained on this theory. Kiehl† says that cholera has prevailed in Hindostan on a soil where every trace of vegetation was destroyed, and not even a blade of grass could find nourishment. Dr. Drasche, in his monograph on cholera, also gives a number of instances in which the disease prevailed epidemically without regard to the moisture in the soil, and even on the bare rock. Dr. R. Lorange, physician to the Johannes Hospital in Beyroot,‡ who has been in that city during the recent epidemic, also finds Pettenkofer's teachings insufficient to account for the prevalence of the disease there. He states that it is a city renowned for healthfulness, and the soil is unusually free from moisture. During the summer there is a deficiency of water, and the wells which indicate the level of the water in the soil (these contain a greater or less quantity of salts of lime) are at a depth of eighty feet or more. The stratum on which Beyroot lies is a moderately fragile limestone, with an occasional vein of flint, and the earth is so thin that in many places the houses stand upon bare rocks. He adds that the diet of the Orientals is bad. Their cooked dishes are almost always too complicated and greasy, and

* Moscow and Orenburg, 1830; Prague, 1831; Ancona, 1846; Staten Island Quarantine, 1848; St. Petersburgh, 1852 and 1853.

† Ueber den Ursprung, etc., p. 349.

‡ Berliner Klinische Wochenschrift, November 6, 1865.

fruits and vegetables are preferred by the poorer classes in an unripe or raw state. The interval between the morning and evening meal is too long; and the fasts of the Christians, as well as the Mahommedans, contribute to the production of intestinal catarrhs. In summer, a large part of the population passes the night in the open air. There are no sanitary regulations worthy of the name, and Dr. Lorange is at a loss to know how, if Pettenkofer's teachings with regard to the dejections of cholera are correct, the epidemic might not continue indefinitely, since there were, at the time of writing, so many *infected* privies and 800 badly buried corpses. To these may be added some interesting facts with regard to the cholera as it appeared in Beyroot in 1855, for which Dr. W. H. Thomson, of this city, who was there at that period, is authority. On the east side of the city there are large vineyards, which are irrigated by a river which comes from the mountains behind. Intermittents are very common in that locality. The western extremity of the city is more healthful, and in that vicinity the excrements and refuse of the city are deposited; it is a kind of dumping ground. The cesspools of Beyroot run from the houses into receptacles in the streets; these receptacles are emptied by a class of men called zibbàls, who carry away the excreta in large panniers upon the backs of donkeys to the dumping ground. Sometimes the zibbàls also ride upon the load. During the epidemic nearly all of these men died of the disease, and the cholera prevailed with much greater violence on the west side of the city, usually the more

healthful, but near which the refuse of the city was deposited, than on the east side, infected with malaria, and, ordinarily, more unhealthful. Such facts seem to show that a cholera epidemic may prevail upon a dry and rocky stratum, in which the moisture lies more than fifty feet below the surface, when it appears among a people careless of the ordinary laws of health and in the vicinity of an abundance of decaying excretions; also, that such excretions favor the spread of cholera more than a malarious atmosphere. At the same time, the fact that the disease was not indefinitely protracted does not weaken the theory that the dejections contain the infectious material, for the striking mortality among the scavengers in Beyroot is an additional argument to the many more in its favor; it only proves that the laws upon which the duration of a cholera epidemic depend are still unknown.

Whether the cholera principle is transferable in clothing and the cargoes of vessels, except as these may have been defiled by choleraic dejections, is still a debatable question. M. Grimaud relates the following incidents of the recent epidemic which he considers reliable:

"A peasant died of cholera near St. Jean du Desert, at St. Pierre, not far from Marseilles, in an isolated place, and his wife also died. He had not left the country, but, Dr. Dussiller states, that his wife was a laundress, and had received a bundle of linen belonging to an individual recently arrived from Egypt. It was the husband who opened the bundle and unfolded all the pieces." There is

very good reason for supposing that this clothing was defiled.

The next case which he narrates is still more interesting, since there is not the same probability of contact with cholera dejections:

"The postal department of Marseilles numbers 120 persons, of whom seventy-five to eighty are clerks; twenty-two are employed at the bureau of departure, and nine at the bureau of arrival. There has not been a single death, or even a case of sickness, at the former bureau, while of the latter nine employés, eight have been sick and one has died. These eight have been taken sick one after the other; this has been proved of the first five. The one who opened the dispatches from the East fell sick, was 'cholerisé,' another was put in his place, the same effect followed, and so on up to the fifth." *

The custom has been adopted in the East, during epidemics of cholera, to send the mail in boxes, on the supposition that they are less likely to carry infection than bags.

From a personal experience of a two-weeks quarantine in the port of Messina, it may be stated as a custom of the authorities there to fumigate with sulphur all letters from those in quarantine who have left ports supposed to be infected with cholera. This custom may be supposed to have been adopted as the result of experience. With regard

* *Boston Med. and Surg. Journal*, Thursday, December 21, 1865.

to the transmission of the disease in cargoes, it has been noticed, in connexion with the epidemic on the Atlantic, that "thousands of boxes of merchandise not only came from Paris, but from Marseilles, Toulon, and Barcelona, while cholera was prevailing as an epidemic there, without producing the disease in a single instance." *

The opinion of physicians in Europe has been tending towards a belief in the contagious nature of cholera. During the last epidemic in Paris, the cholera patients were treated in separate wards, and the administration ordered the immediate removal, cleansing, and disinfection of the bedding used by cholera patients, as well as the washing and fumigation of the personal clothing.

M. Velpeau considers the contagious character of the disease proved to a certainty, and the same is true of other prominent European physicians. M. Jules Worms, chief physician of the military hospital of Gros-caillou, is also of this opinion, and presented the following views on the method by which cholera is propagated at a meeting of the French Academy of Medicine, held on the 10th of October:

"On the banks of the Ganges, and under conditions which are not well understood, a special agent, poisonous to a large number of individuals, is produced.

"This agent shows itself among individuals who are col-

* See letter in N. Y. Herald from Theodore Walser, M.D., November 6, 1865.

lected together in rest or motion, but always presents an uninterrupted connexion.

"The cholera is a malady transmissible by man.

"This agent manifests its influence on certain human beings (probably also on certain animals) by mild or severe effects.

"The proportion of individuals liable to the poison can only be approximately estimated, and is under all circumstances very small. The human system may become a fruitful field for the multiplication of this agent as soon as its poisonous effects are manifested.

"The multiplication of this poisonous agent takes place chiefly in the alimentary canal.

"The vomitings and dejections of cholera patients contain the active agent of the transmission of the disease.

"This communicability does not correspond to the time when the dejections are voided, but is developed a few days subsequently, and seems to be exhausted at the end of from fifteen days to three weeks.

"The corpses of cholera patients emit the toxic agent in a greater degree than the bodies of the sick.

"Persons attacked merely with choleraic diarrhœa (cholerine) void with their dejections the agent which is capable of producing confirmed cholera in their vicinity.

"The greater or less density of the soil on which the dejections are cast diminishes or favors the propagation of the disease."*

* *Archives générales de Médecine*, Nov. 1865, p. 623.

In proportion as further study reveals more of the essential nature of cholera, unexplained phenomena will become clearer, and apparent discrepancies reconciled. Something has been already accomplished in this direction, and the following important propositions, which are sustained by sufficient evidence to justify a belief in them, are the results of comparatively recent investigations:

First. Cholera is a disease which is diffused by human intercourse.

Second. The cholera dejections are the chief (if not exclusive) agents in disseminating the infectious material.

Third. Certain circumstances, among which moisture in the soil has a prominent, but not exclusive, part, favor the spread of the disease.

CHAPTER III.

In the study of the prevention of cholera, the inquiry at once arises, where does the disease usually prevail with the greatest violence, and what class of the population is most liable to its attacks; while with regard to this country, the additional circumstance, that the pestilence has always been brought here in a comparatively few ships, across a wide ocean, also deserves consideration. The general testimony as to the chosen haunts of cholera is quite unanimous. It is in low, dark, damp, over-crowded dwellings, and among the ill-fed, badly clothed, filthy, and dissipated, that the disease makes the greatest ravages. Dampness, filth, impure water, over-crowding and deficient ventilation, dissipation, poverty, fatigue, and improper food, favor the advance of cholera; they are causes which produce depression of the nervous system and irritation of the alimentary canal.*

Sometimes, it is true, the disease has shown an apparent inconsistency. At first raging with great fury in filthy localities, it has passed by others which were near and equally insalubrious, and has then attacked places where the sanitary condition was comparatively good. Yet this is simply one of those seeming contradictions in cholera, which is

* Report on Asiatic Cholera, by William Baly, M.D., F.R.S.

easily reconciled on the supposition that the infectious material is transported in the dejections. Such instances do not weaken the fact that "the very general association of cholera where it is rife (is) with over-crowding and deficient ventilation, imperfect drainage, want of cleanliness, and the effluvia from privies, cesspools, foul drains, &c." *

As is well known, the recent epidemic in Constantinople was accompanied with great loss of life. The sanitary condition of that city is extremely defective. All offal and filth is thrown into the streets, and what is not consumed by the dogs, remains under a burning sun, a heap of putrefying animal and vegetable matter. The only drains are open ditches in the middle of the narrow streets; and the Turkish houses are, as a rule, wanting in the most necessary conditions of health. Crowded burial grounds are another fruitful source of epidemic disease, especially

* The localizing causes of cholera are thus further specified in the Report of the Council of Hygiene on Epidemic Cholera, page 19.

1. Decaying organic matters, bone, hide, fat and offal houses, neglected stables, putrescent mud and filth.
2. Bad drainage, local dampness, malaria.
3. Obstructed sewers, filthy streets, gutters, stables, garbage, and cesspools.
4. Water and beverages in any manner contaminated by putrescent organic matter, particularly by any soakage from privies.
5. Neglected privies and putrefying excrements.
6. Overcrowding and neglect of ventilation.

as the Turks, from a religious superstition, seldom bury their dead more than two feet below the surface.* In the presence of such conditions it is not a matter of surprise, that during the prevalence of an epidemic of cholera the mortality was so great. †

It is also an interesting feature connected with cholera, that a second epidemic will sometimes commence in the same house where the first began, even in the same room. Thus in Tœplitz the cholera broke out in the same house, near a canal, two years in succession. In Edinburgh one of the first two cases which occurred in 1848 was in the same house where the malady had first appeared in 1832, while in Leith in 1832 and 1848 the disease commenced in the same room. The epidemic in Rheims of 1849 and 1854 also originated in the same house.

A low level of the soil is usually associated with a deficient drainage, and under ordinary circumstances damp ;‡ while the deadly influence of poisoned air, such as is found in filthy over-crowded dwellings, has forced itself upon the notice of the inhabitants of tenant houses, and its effects have been characterized by themselves in striking language as "tenant house rot." During a cholera epidemic, such

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* *Medical Times and Gazette*, October 7th, 1865.

† The mortality is placed at from 30,000 to 58,000.

‡ Mr. Farr found that in proportion as the mortality from cholera increases, the elevation of the soil is as a general rule lower.

an atmosphere would be far more deadly from the presence of the poisonous dejections.

Bad food, less common here than in other countries, scanty clothing, darkness, and dissipation, dispose to any disease by diminishing nervous resistance. During the prevalence of cholera there is a general predisposition to looseness of the bowels, likely, if unchecked, to run to a grave termination, and this is aggravated by improper food, or water impregnated with organic or excrementitious matter.

The agency of impure water in increasing the mortality from cholera has been very strongly marked, and in Paris the idea prevailed during one visitation of the malady, that the waters of the city had been poisoned. Dr. Snow, of London, believed that the cholera was propagated to a great degree by means of water; his theory, however, included more than this, and was as follows: Cholera is pathologically a disease exclusively of the alimentary canal. The primary change is in the alimentary canal, and is always caused by the introduction into it of a specific poison. The poison itself is exclusively contained in the intestinal excreta of the infected person; that is, in the vomit or dejections. There is nothing from the lungs or skin that produces the disease. This poison is not a gas or vapor, but a substance capable of existence in the fluid or dry form of matter; hence it can only be wafted a little way by the air, and when in the dried state can only be carried long distances by being attached to articles of clothing, or disseminated by the agency of water.

The methods of propagation are four in number:

1st. Moist excreta on clothes and bedding of infected persons, may be carried by the vapor of water and enter the nostrils and mouth and be swallowed.

2d. Dry excreta on infected clothing may be wafted a short distance by the air when the clothing is moved or unfolded.

3d. Nurses and those who attend the sick may introduce the poison into their system by not washing their hands before taking food.

4th. Utensils used by the sick and not properly cleansed may also contain the germ of the disease.

The same objections may be made to this as to some other theories on cholera: that they are too exclusive. Is it safe to assert that the poison is *exclusively* contained in the intestinal excreta, or that it is not gaseous or a vapor, when it is so subtle as to have eluded the most searching examinations! Some points in this theory seem to be substantiated, as that the poison is (mainly) contained in the excreta, and that it may be carried on clothing or food; hence it is better to admit what is known, and patiently follow the teaching of facts in a further elucidation of those features of the disease which are as yet unknown.

To return from the digression; it has been observed that the cholera has shown the same affinity for moist and unhealthy localities, when visiting this country as in other lands. Those localities where fever, diarrhœa, and dysentery prevail, are also the haunts of cholera.

The first epidemic made its appearance in this city in the vicinity of Roosevelt and Cherry streets, and at the same time it appeared in Reade, Washington, and Duane streets. The Five Points and the whole region of the 6th Ward, were visited by the epidemic with fearful virulence. In 1849 it commenced in Baxter street, and quickly extended to the 1st, 4th, 5th, and 13th Wards. In Philadelphia it appeared in the districts of Moyamensing and Southwark, where the work of cleansing was incomplete. In Boston the epidemic began in Hamilton street, and spread through such places as Ann, Cove, Hanover, and Sea streets. At Louisville, Ky., the centres of the epidemic were associated with filth, malaria, and crowding; the same was true of Buffalo, New Orleans, and other cities.

The inference from the preceding is, that all towns, and especially sea-ports, should be placed in the best possible sanitary condition, since by this method the influences of those causes which favor the spread of the disease may be very much diminished. At the same time, as there is good reason to believe that the disease is chiefly propagated by choleraic discharges, these should, in the event of an epidemic, be at once disinfected, and the advance of the pestilence contested step by step.

Low, moist places, should be thoroughly drained; yet this should be done before the appearance of an epidemic;

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* See Sanitary Condition of New York, Report of Council of Hygiene; Citizens' Association, page lxiii. (Note.)

for it is often observed that in very dry seasons, malarial fevers prevail in consequence of the drying up of marshes or ponds; and there is every reason to believe that malaria and cholera devastate the same ground. Hirsch says it is a well known fact, that malarial fever has preceded outbreaks of cholera not only in single places or particular regions, but in an almost pandemic distribution. Dr. R. Lorange, Physician to the Johannes Hospital, also states that during the recent epidemic in Beyrout, before the disease had reached its height, there appeared what he terms a gastric, rheumatic, remittent fever, of an epidemic character. The fact that malarious districts are favorable to the spread of cholera, does not necessarily imply an identity between the agencies which develop malaria and those which produce cholera; since it may only indicate that circumstances which favor one may also favor the other.

A very strict watch should be kept over those localities in which previous epidemics of the disease have commenced; and if necessary they should be thoroughly cleansed.

During the prevalence of cholera the greatest household and personal cleanliness should be observed; yet all street, pavement, and house cleaning should be done, as far as is possible, without water, by what is called dry cleansing. Fires should be kept in damp places. Persons inhabiting damp localities should, if possible, leave them temporarily for dry ones; and it is in general desirable that those whose presence is not needed during an epidemic, should, if circumstances permit, go to some dry or health-

ful neighborhood; as in this manner a larger supply of fresh air is left for those remaining, while the number exposed to the disease is also lessened. This is particularly important in the case of pregnant women.

The effect of poisoned air from unavoidable over-crowding, may be diminished by keeping windows open, the entire dwelling being thoroughly ventilated; since it is believed that fresh air is the best disinfectant. At the same time, since the best air in certain localities is bad, disinfecting substances should be used in connexion with free ventilation. Drains should all be provided with good traps, and drains and sewers often flushed and disinfected. Garbage should be speedily removed or disinfected by chloride of lime, or some similar agent, if there is delay in its removal. It is also of the greatest importance that privies should be thoroughly disinfected as often as twice daily during the prevalence of an epidemic. This is particularly required for public latrines, such as those of hotels, saloons, schools, factories, and railroad stations; and it would be a proper precaution for strangers coming from infected districts, to make a free use of disinfectants, particularly if suffering from diarrhœa.

The sick, and the appurtenances of the sick room, should be isolated from all but the necessary attendants, and the room well ventilated. At the same time it is advisable to place dishes containing chloride of lime in the vicinity of the patient; since it has been inferred from experiments made in hospitals that this agent hinders the propagation

of the disease by neutralizing those conditions which favor its advance.* Yet a disinfectant in a closed room does not take the place of fresh air.

The dejections and vomitings should be received into vessels containing either permanganate of potash, carbolate of lime, a solution of chloride of zinc, sulphate of iron, or some other active disinfectant, and be at once removed. If the discharges have been ejected upon the bed, they should be sprinkled with some disinfectant, as Labarraque's solution. It is also recommended to place a bag (folded cloths) containing a sufficient quantity of Condy's or Macdougall's disinfecting powder, under the breech of the cholera patient to disinfect involuntary discharges. The privy into which the dejections are cast should be used exclusively for that purpose, all utensils of the sick room kept scrupulously clean, and attendants should wash their hands before taking food.

In country towns it would be preferable to place the discharges in a pit containing chloride of lime, and cover them with earth. The bed and body linen of the sick which cannot be disinfected should be burned. Boiling water is a powerful disinfectant of clothing defiled with cholera discharges: Yet since individuals exposed to the vapor of hot water containing such clothing, as washerwomen, have in many instances contracted cholera, perhaps from that source, it would be advisable to add some disin-

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* Gazette des Hôpitaux, Nov. 16, 1865.

fectant to the water into which the clothing of the sick is immersed.

After the cessation of the disease the sick room should be thoroughly cleansed and fumigated;* in fine, a kind of domestic quarantine should be established, since from instances afforded by the present and past epidemics, there is reason to believe in the efficiency of such a method.†

The following suggestions, by Dr. E. Harris, concerning "How to use disinfectants," are introduced for easy reference.‡

"1. *Quicklime.*—To arrest putrefaction, to act as a rapid dryer, and to decompose certain moist and hurtful effluvia, strew the dry lime upon the earth; or, distribute upon plates, etc.

"2. *Chloride of Lime.*—Employ this for same purpose as quicklime, also as one of the cheapest sources of chlorine. One pound of this substance will usually disinfect about 1,000 gallons of fluid sewerage. To mix immediately with offensive materials, it may, for convenience, be combined with water in proportion of 1 lb. to the gallon.

"3. *Chloride of Zinc, Proto-Chloride of Iron, Sulphate of Iron, or Nitrate of Lead.*—Make a saturated solution

* Liebig recommends burning sulphur for this purpose.

† Copland's Medical Dictionary, Lond. 1858, Vol. III. Part 1, p. 115; also Memoranda on Asiatic Cholera, etc., by William Budd, M.D., Bristol, 1865; also Medical News and Library, Feb. 1866, No. 278; also Med. Times and Gazette, Nov. 17, 1855.

‡ Report on Epidemic Cholera, Council of Hygiene, Citizens' Association.

of the salt, and use such solutions diluted in eight or ten times the quantity of water.

"4. *Chlorine Gas.*—When required more copiously than it would ordinarily be given off by the chloride of lime, or Labarraque's solution, the following ready methods may be resorted to for generating it. For the ordinary methods see books of chemistry.

"*Quick Method.*—Pour dilute hydrochloric, sulphuric, nitric, or acetic acid, upon chloride of lime, zinc, or soda. This may be done gradually by means of a glass or lead syphon, or by the capillary syphon or lamp-wick, dropping the acid upon the chloride, if desirable to evolve the chlorine steadily for many hours.

"*Chlorine water* may be readily prepared by mixing two tablespoonfuls of common salt in two teaspoonfuls of red lead in a quart of water, and add half a wineglass of sulphuric acid. It will give off gas as needed.

"It must be borne in mind that chlorine is irritating to the lungs. It is believed not to disinfect and destroy the cholera poison itself, but it arrests putrefaction and destroys many noxious gases.

"5. *Nitrous Acid Gas.*—This is prepared by putting a mixture of nitrate of potassa (saltpetre) and sulphuric acid in an iron or porcelain dish. It must not be breathed.

"6. *Coal-Tar.*—To be used in sinks, sewers, privies, and bed-pans, by directly applying it, and allowing it to be washed away. It serves an excellent purpose when painted frequently upon the interior walls or sides of sta-

bles, prison cells, privy vaults, etc. Carbolic acid is derived from coal-tar, and is more convenient for use in the sick room. Dilute it.

"7. *Bromine.*—Is a powerful disinfectant; to be employed by physicians.

"8. *Permanganate of Potassa.*—To be used as an immediate and most effective disinfectant. Dilute the saturated solution of this salt in from 10 to 500 parts of water, according to the requirements for the occasion. It is the neatest and most effectual of all the disinfecting fluids, and can be used in less quantities than most others. A few drops of the solution will instantly disinfect a quart of drinking water.

"9. *Heat.*—Boiling water or steam to be employed in cleansing as the most certain means of disinfecting contaminated clothing, etc.

"10. *Charcoal.*—As a disinfectant or deodorant for extensive use in masses of putrescent material, and for local purification, fresh charcoal is of acknowledged value. The British Sanitary Commission in the Crimea ordered whole ship-loads of peat-charcoal, which they used in the progress of their work of purification in the hospitals, barracks, and camps in the East. A Report of that Commission states that 'perhaps the best deodorizing compound was one used by the inspectors in all their works. It consisted of *one part of peat charcoal, one part of quicklime, and four parts of sand or gravel.*' But it may properly be stated in this Report that charcoal does

not seem to disinfect or destroy the cholera poison. The ships which were employed in transporting charcoal from Constantinople to the Crimea were ravaged by cholera."

To the above may be added the advice of the Privy Council of the British Government on the same subject:

"In the ordinary emptying of privies or cesspools, use may be made of perchloride of iron, or chloride of zinc, or of sulphate of iron. But where disease is present, it is best to use chloride of lime or Condy's fluid. Where it is desirable to disinfect, before throwing away the evacuations from the bowels of persons suffering from certain diseases, the disinfectant should be put into the night-stool or bed-pan when about to be used by the patient.

"Heaps of manure or other filth, if it be impossible or inexpedient to remove them, should be covered to the depth of two or three inches with a layer of fresh burnt vegetable charcoal in powder. Freshly burnt lime may be used in the same way, but is less effectual than charcoal. If neither charcoal nor lime be at hand, the filth should be covered with a layer some inches thick of clean dry earth.

"Earth, near dwellings, if it has become offensive or foul by the soakage of decaying animal or vegetable matter, should be treated on the same plan.

"Drains and ditches are best treated with chloride of lime, or with Condy's fluid" (permanganates), "or with chloride of iron.

"Linen and wearing apparel requiring to be disinfected, should without delay be set to soak in water, containing

per gallon, about one ounce either of chloride of lime or of Condy's red fluid. The latter, as not being corrosive, is preferable. Or the articles in question may be plunged at once into boiling water, and afterwards when at wash be actually boiled in the washing water.

"Woollens, bedding, or clothing, which cannot be washed, may be disinfected by exposure for two or more hours in chambers constructed for the purpose, to a temperature of 210 to 250 degrees Fahrenheit.

"For the disinfection of interiors of houses, the ceilings and walls should be washed with quicklime water. The wood-work should be well cleansed with soap and water, and subsequently washed with a solution of chloride" (permanganates) "of lime, about two ounces to the gallon."

The question of diet is one which has been the theme of much discussion. The Cholera Commission of Munich in 1854 addressed the following inquiry to the physicians of Bavaria: "What food and drink seem to have furthered the outbreaks of the disease?" The result of the replies was a list of all the various articles of diet consumed throughout the kingdom. Yet there are certain kinds of food which are to many persons difficult of digestion at ordinary times, and it is the part of prudence for all to avoid these during an epidemic of cholera. As examples, are cabbages, cucumbers, turnips, green corn, cherries, apples, plums, whortleberries and milk, green vegetables, and all kinds of unripe fruit. To this list may be added crabs, oysters, clams, lob-

sters, and fresh pork. On the other hand, a diet which is in general terms nutritious and easily digestible, is to be recommended; and bread, rice, beef, mutton, and poultry, with a moderate use of thoroughly cooked ripe potatoes, are examples of articles which are nutritious and easily assimilated. Certain sub-acid fruits, as ripe currants, are considered by some as actually beneficial. An excessive use of starchy food is not desirable. It is perhaps worthy of mention that beef tea often produces a relaxation of the bowels, in which case mutton broth may be substituted.

Yet the details of diet must be varied to meet particular cases, and that which one may eat with impunity would be most injurious to another. The object to be attained is to repair the waste of the body by an unirritating and easily digestible diet.

Water used for drinking should be boiled or filtered, and as pure as can be obtained.

In addition to the preventive measures previously mentioned, the custom of wearing a flannel band sufficiently large to cover the abdomen, is most excellent. This is very important in the case of children, since the flannel shirts which they wear are an insufficient protection, and with the varying movements of the child the shirt often becomes rolled up upon its chest. The feet should be kept dry, and night air avoided. Mental anxiety should be laid aside as far as possible, and cheerfulness and calmness cultivated; since the influence of fear in predisposing to attacks of cholera is generally acknowledged. It has also been ob-

served that the insane are more liable to choleraic infection than those of a healthy nervous organization, and the wise man has said, what the experience of every physician confirms, that "a merry heart doeth good like a medicine."

An objection to cholera hospitals (houses of refuge) is, that the disease seems to spread from their vicinity. Yet the poor and friendless must be cared for somewhere. If in their own unhealthy homes, the chances of their recovery are diminished; while in consequence of their careless habits the disease is likely to become epidemic in that locality, or be carried to other neighborhoods. If in general hospitals, experience has shown that cholera extends in the wards, and the fear of receiving the malady would operate unfavorably upon those sick with other complaints. Therefore by centralizing and isolating the disease, and placing cholera patients in large, cleanly, and well ventilated wards, a benefit would be conferred upon the sick, and the danger to the health of the community diminished. The removal should be effected as gently as possible, and for this purpose biers are preferable.*

When the circumstances permit the use of tents they are the best hospitals. Dr. Parkes says: "Men sick from cholera are also best treated in well ventilated tents; cholera wards and hospitals do not answer. Even in cold countries, up to the end of October or the middle of November, tents can be used if properly warmed."†

* Dr. Drasche.

† The expression that "Cholera wards and hospitals do not an-

Instances of the treatment of cholera in tents are of the most interesting character. The two hospital buildings in Varna received from the 10th of July to the 18th of September 1854, 2314 cholera patients, of which 1389 died, a mortality of 60 per cent. In the three tent hospitals in Varna and Franka there were also received, from the 5th of August to the 19th of September, 1854, 2635 cholera patients, of which 698 died, or a mortality of 26 per cent. Besides, notwithstanding vigorous hygienic measures, the hospital buildings remained full of infection, while this was not the case in the tents. In the hospitals of Gallipoli, Adrianople, and Varna, 17 physicians lost their lives, while not one of those physicians in charge of the tents took the disease.

In 1854, when the cholera appeared in the hospitals of Pera and Rami-Tchifflick, in Constantinople, M. Levy immediately removed all cholera patients from the hospital buildings into tents; this was twice rendered necessary, and each time the epidemic came to a speedy termination. About the end of October the bad weather made it impossible to continue the care of the cholera patients in tents, and as a result of the change 14 cases of cholera sicca appeared; while before the return of the patients to the wards of Rami-Tchifflick, there had not been a single instance of this form.

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swer," is to be understood comparatively, since they are better places for the sick than their own ill-ventilated abodes. The comparison is between tents for hospital purposes and ordinary hospital buildings.

In the Austrian army and in Berlin, similar favorable results have been observed.

Systematic house to house visitations, in the commencement of and during an epidemic, have been found to diminish in a marked degree the general mortality. This experiment was tried in England, and statistics show that of 130,000 cases visited, 6000 narrowly escaped real cholera, and only 250 had the disease; thus it would seem that the system of visitation prevented 5,750 cases of cholera. Dr. Gull, who examined this question very critically, states that the evidence "is sufficient to place the preventive system in the first position of importance, as a measure for counteracting the development of the disease into its severer forms."*

It is not an unwarranted assertion that the seeds of every cholera epidemic which has appeared in this country have been brought hither in ships; therefore a careful watch should be kept over all vessels arriving from infected ports, or which would be likely to contain passengers who had been exposed to cholera. A suitable detention of ships and passengers should be enforced, and a thorough fumigation practised of personal clothing and baggage. With regard to the fumigation of ships and cargo, the probabilities, as drawn from evidence, are, that they do not nurture the infectious principle. Perhaps an exception should be made to a cargo or ship defiled by cholera discharges.

* Report of Massachusetts Medical Society. Page 131.

It is true that some writers consider quarantine restrictions as useless, judging from the instances in which the disease has crept through the closest barriers; yet these instances do not overthrow the weight of those in which there is good evidence that quarantines have been effectual in preventing or delaying the introduction of cholera. This country is also, to a certain extent, isolated from those whence the disease has been previously brought, by a wide ocean; and as the intercommunication is by means of ships, there is more to be hoped from quarantine detentions here, than in those countries which are in close proximity to infected districts, and where there is a constant intercommunication of individuals.

At the same time, the fact that the most rigid quarantine has often been penetrated, should have its full force, and a reliance upon quarantine restriction as the sole means of preventing the entrance of cholera into any country is not justified by experience, and should certainly not supersede the thorough cleansing of all exposed ports and their vicinity.

It is also essential that the quarantine regulations should be uniformly observed along the entire coast.

The period of incubation which has been assigned to the disease by trustworthy observers, is a guide as to the length of time for which those held in quarantine should be detained.

There are some very interesting observations which have been made upon this point.

The Genoese Medical Commission who were sent to Hungary and Vienna for the purpose of studying the phenomena of cholera, concluded that:—"Those who have absorbed the germs of the disease are generally attacked before the third, and always before the fourth day."*

The British Medical Commission, who made similar observations in St. Petersburg, in 1831, after detailing a series of cases upon this point, state as their opinion:—"That in the above cases, in all of which the time intervening between an only exposure to infection, and the subsequent development of the disease, was most accurately marked, the period of incubation ranged between one and five days."

Observations made in Berlin upon the same point, showed that of 171 cases, which happened in houses where one case had been reported, 159 occurred within five, and the remainder within eight days after the first. Prof. Niemeyer,† after stating that some have placed the period of incubation at from eight to fourteen days, adds, that in a number of cases noticed by himself and Dr. Greifswald, the duration of this period was not less than thirty-six hours, and not more than three days. Dr. William Budd is of opinion that it seldom exceeds three days. Other observers (Madin, Huette, Rilliet, Hielmann, Weissbrod)

* Report of Massachusetts Medical Society on Spasmodic Cholera. Boston: 1832. Page 129.

† Pathologie und Therapie. Berlin: 1861. Page 636.

place it at from twelve hours to eight days. The disease appeared in Quebec three days after the arrival of the brig Carricks, and in Folly Island a day or two after the arrival of the Amelia; on Staten Island "immediately" after the arrival of the New York, and in New Orleans on the next day after the Swanton reached that city.

These results indicate that the period of incubation occupies, in most cases, only a few days, and generally less than a week; but there are instances in which a much longer time has apparently elapsed between exposure and the appearance of the disease.

During an epidemic in the prison of Ebrach, in Bavaria, a released prisoner, who had been isolated in an adjacent building for fourteen days before being allowed his liberty, was seized with cholera on reaching his home at Kulmbach on the river Main. The homeward route from Ebrach did not lead through any infected district.* It is also stated that the first case of declared cholera at the Island of Mauritius, in 1819, did not occur before the fifteenth day from the arrival of the Topaz frigate.† Pettenkofer places the maximum of the incubation period at twenty-one days.

Such instances seem to throw uncertainty upon the question as to the length of the period of incubation, but the facts connected with the appearance of the disease on the

* Pettenkofer über die Verbreitung der Cholera. Page 135.

† Report of Massachusetts Medical Society on Cholera. Page 180. See also *London Lancet* for March, 1854. Page 236

New York and Swanton, may account for the long interval which has in some cases apparently elapsed between exposure to cholera and its development. As has been previously stated, the disease did not show itself on the New York until sixteen, nor on the Swanton until twenty-seven days after sailing. Now there is evidence to make it highly probable that clothing defiled with decomposing cholera discharges is capable of communicating the disease, and in the following instance *the origin of an epidemic* is traced to infection from the clothing of a cholera patient.

In 1854 cholera was not known in the county of Bedford, when it broke out in the village of Ridgmount, and eleven cases occurred from first to last, all of which were fatal. On careful inquiry as to its origin, it was clearly ascertained, that the first case occurred in a man whose son had died of cholera in London a week or two before, and whose clothes were sent down to the country. The poor man unwrapped the bundle of clothes himself, was seized with the disease and died; his case was the nucleus of the rest.*

Hence, it is highly probable that emigrants or travellers from infected districts may have among their baggage defiled clothing, which, when brought out, would give rise to cholera. A supposition of contagion by such fomites

* On Malaria and Miasmata, and their Influence in the Production of Typhus and Typhoid Fevers, Cholera and the Exanthemata. By Thomas Herbert Barker, M.D., F.R.S., etc. London: 1863. Page 140.

would account for some, if not all, of those cases in which the period of incubation is unusually protracted.

Consequently, although on excellent authority the maximum period of incubation is placed at twenty-three days, so long an interval is rare, and may depend upon contagion by fomites. On the other hand, the length of this period of incubation is usually less than a week ; so that when the vexations and often useless delays consequent upon a long detention are considered, it is a question whether the uncertain immunity which it affords compensates for such impediments to commerce. A bundle of infected clothing may be passed through quarantine barriers, and produce an epidemic. Therefore, if thorough disinfection of personal clothing and baggage is practised, and all exposed localities are carefully cleansed, so that if the disease enter it may find no soil to nourish it, it does not seem necessary to require a detention longer than ten days, including the passage, for healthy vessels from infected ports, or which contain passengers from infected districts; or for infected vessels, of more than ten days after the last case of cholera or acute diarrhœa.

If the baggage of emigrants could be subjected to disinfection or ventilation before the voyage, and great attention paid to the care of such emigrants on the passage, during the prevalence of cholera in Europe, the chances of importation of the disease to this country would be still further diminished.

There is reason to believe that, other circumstances be-

ing equal, cholera is more likely to spread on land than on water. This might be inferred from the consideration, that the diarrhœa dejections of those on shipboard are cast into the water, while at the same time the vessel undergoes a kind of constant disinfection by means of the tarry exhalations which are given out on every side.

The limitation of the disease on the Atalanta favors this idea, and there are other facts which afford similar evidence.

In the Report to the Minister of War of the British Sanitary Commission, sent to the seat of war in the East —1855, 1856—it is stated that during the prevalence of cholera in the ports of Varna and Balaklava, it was observed among the crews of the vessels stationed there, that those ships which put out to sea with an infected crew, lost the disease in from ten to sixteen days. The Britannia left Varna for the high sea, for the purpose of purification. The ship was heavily manned, and after the first week was deprived of so many soldiers and sailors as to be short-handed. In this emergency the commander requested the captain of another vessel, free from cholera, and which had not been in contact with any infected port, to take his sick men and at the same time send some of his own healthy crew to the Britannia. As a result, none of the crew which had left the clean vessel, or of those which remained on board of it, were seized with the disease.

The "North America" arrived off New York in 1854 with cholera on board, which had existed two weeks

before her arrival, and of which ten individuals had died. Seven cases were sent to the hospital on her arrival, and the following day all her passengers were landed. In three days 128 cases and thirty-two deaths occurred among 250 passengers; while the crew remained perfectly healthy, and no new cases could be traced to the vessel.*

It is also worthy of note that, notwithstanding the extensive commerce which has long existed between India and England, the disease has always travelled to England by what might be termed an overland route.

From the preceding it follows, that since there is no reasonable doubt of an immediate connexion between the presence of a ship infected with cholera at any port, and the origin and spread of disease in and beyond that port, it is very important that infected ships should be kept as far away from shore as is practicable, and intercommunication prohibited. It may also be inferred that a quarantine will be more effectual if maintained upon the water than on the land; if on the land, an island or a rocky foundation should, if possible, be selected for the accommodation of the sick, and if this be impracticable, then as dry a soil as can be found to answer the purpose. Where tents can be used they are preferable to hospital buildings.

The well should be taken from the infected vessel, and detained in a separate vessel or structure built upon the water; at the same time thorough ventilation and disinfection should be practised on both vessels.

* Philadelphia Med. & Surg. Reporter, Jan. 13th, 1866.

Hence cleanliness, ventilation, disinfection, the avoidance of moisture, a rigid isolation of the sick and their surroundings, together with immediate destruction of the specific powers of the cholera discharges by disinfectants, and the adoption of as strict a quarantine as is practicable, are, in general terms, the main preventive measures to be used for averting cholera.

CHAPTER IV.

The severe symptoms of cholera are usually preceded by a painless diarrhœa. M. Marin states that premonitory diarrhœa was present in nine-tenths of the recent cases in Marseilles, and the replies received by the Cholera Committee of the English Royal College of Physicians, 1848 and 1849, "served to establish the frequency of a stage of diarrhœa, lasting from a few hours to several days."* In 200 cases reported by Briquet and Mignot there was premonitory diarrhœa in 143, and of these, the period within which the antecedent symptoms passed into those of a severe character, was in twenty-four cases one day, in twenty-one two, in fourteen three days, in three one hour, and in the rest from two to sixteen hours. Mr. Grainger and others have noticed that during certain epidemics individuals have suffered from frequent spasmodic pains in the bowels, and cramps in the calves of the legs, especially in those districts where the disease was severe, and these symptoms were not always accompanied by diarrhœa.

Yet, while diarrhœa precedes the characteristic symp-

* In the late epidemic in Alexandria the disease was almost invariably preceded by premonitory symptoms.

toms in a majority of cases, it is not always present; in some instances a few discharges are followed by collapse, and in others, very rare, a mortal coldness is present from the outset. The manner in which the disease develops is in many cases an index of its course.

Dr. Gull states "that the diarrhœa premonitory of the severer symptoms of cholera was often feculent and bilious, and presented no characteristics whereby it could be certainly distinguished from other forms."*

Dr. La Segue, in charge of the Hôpital Necker in Paris, writes in the Archives Générales de Médecine of November, 1855, with regard to the diarrhœa of the recent epidemic, that it is liquid, serous, abundant, and more or less colored. The stools succeed each other every hour or two, and sometimes oftener. After the second or third they become whitish, like very thin paste, are voided without pain, and cause no sensations of burning or tenesmus. In the interval there is an occasional rumbling of the intestines. The evacuations are not followed by that sensation of sinking so frequently associated with smaller discharges. When, after five or six stools, the nature of the matters passed is unchanged, and the excretions are no more serous or paler, it is a favorable symptom. The vomitings are sometimes green long after the discharges have become exclusively serous.

* Report on Morbid Anatomy, etc., of Epidemic Cholera. By William W. Gull, M.D., Assistant-Physician to Guy's Hospital. Page 129.

Recent writers also state that diarrhœa and other prodromata did not make their appearance before the outbreak of the epidemic in Paris, but that soon after its commencement diarrhœa became very prevalent.* This would seem to indicate that no epidemic influence preceded the arrival of the pestilence, but that after its introduction an infection pervaded the air.

Some observers have stated that diarrhœa is not the earliest symptom of cholera. Dr. Barraut† considers that a contracted and immovable pupil precedes all other manifestations of the disease, and Dr. McNaughton, writing of cholera as it prevailed in Albany in 1832, says:—"The very first morbid change which I have been able to detect, was in the tongue. This varies with a shade of white, so slight as scarcely to be perceptible, to that in which it is covered with a white, slimy coat, as thick as a sheet of paper. This coat may exist to a considerable degree without any loss of appetite or complaint on the part of the patient; but when it is well marked, a slight check of perspiration or irregularity of diet will bring on diarrhœa."‡

M. Gibert states that the tongue, in bilious or inflammatory diarrhœa, is red, dry, and pointed; in choleraic diar-

* This was also observed with regard to the late epidemic in Alexandria.

† British and Foreign Medico-Chirurgical Review, Oct. 1865. Page 416.

‡ This symptom is mentioned in recent French journals as a new observation.

rhœa, broad, moist, white, and covered with a mucous paste.*

The preliminary symptoms are succeeded, if unchecked, by what is usually termed an attack of cholera. Like the onsets of the sporadic disease, it often commences towards morning. The frequency of the attack at this time coincides with the reduction of nervous energy peculiar to this, the colder period of the twenty-four hours.

Severe vomiting and purging, with tendency to collapse, are the marked features of this stage. Sometimes the entire contents of the intestine seem to be evacuated by the first discharge, which is ejected with force, and those succeeding consist of the characteristic rice-water stools. Chemical and microscopical analyses of these discharges have shown that the fluid part of them is the serum, deficient in albumen, but quite rich in salts, especially chloride of sodium, which has drained through the intestinal capillaries, and that the flocculi are composed of epithelial shreds, young cells, and detritus. Crystals of the ammoniaco-magnesian phosphates, undigested food, parasites, vibriones, and spores, are also sometimes present as unessential and irregular components. Blood corpuscles are sometimes observed, and in such cases the stools give indications of a larger quantity of albumen. The matter

* M. de Wouves has recently demonstrated that albumen is present in the urine of all cholera patients several days before the appearance of the severe symptoms. He regards this as a means of distinguishing between cholera and diarrhœa.

vomited is generally similar to that discharged by the intestines.

At the same time the thirst is insatiable, but draughts of water are rejected, there is languor and listlessness, and there are cramps, especially of the gastrocnemii.* These sometimes continue for a half minute or minute, and are often accompanied with intense pain. The debility increases; the pulse begins to contract; perspiration breaks out; the voice becomes feeble or mute (vox cholerica), and the evacuations involuntary. The secretion of urine is suspended, or a very small quantity is passed of a low specific gravity (1006–1012), and albuminous; and while the cramps increase in intensity, there is added a sensation of oppressed respiration, which is one of the most distressing symptoms of cholera.

In the meantime the countenance undergoes a great change. The eyes retreat in their sockets; the nose becomes pointed; the cheeks sunken (facies cholerica); the

* The cramps usually commence at the lower extremities, chiefly in the muscles of the calves, and extend upwards; involving first the fingers and arms, then the thorax, neck, and abdomen, occasionally the loins. Cramp of the maxillary muscles is very rare. This spasm does not implicate alone the system of voluntary muscles, but extends to the involuntary. Among those organs endowed with smooth muscular fibre which have been noticed during life, the iris has frequently been found in a state of moderate spasm, the pupil being somewhat contracted and responding very slowly to light. (Buhl) Drasche on Cholera. Page 231. The pulse is usually about 85, decreasing as the disease advances.

fingers wrinkled; and if the skin is pinched in a fold it slowly recovers itself. The lips, extremities, and genitals are more or less cyanosed; sometimes the entire surface has a bluish or greyish hue. The carotids gradually cease to throb, the impulse of the heart and heart-sounds become imperceptible; and with the irregularity of the circulation, and flow of an imperfectly oxygenated blood to the surface, the temperature of the body, especially of the exposed portions, is like that of a corpse (Stadium algidum). The sick seldom complain of headache, but frequently of tinnitus, vertigo, or muscæ volitantes. The intellect is not confused; most patients are extremely indifferent to the threatened danger, but complain of cramps and a feeling of oppression. The skin preserves its sensibility, but its irritability is almost extinguished. The tongue is cold, generally coated in the centre, and cleanat the tip and edges.

The discharges cease some time before death, which is usually attended with complete apathy, and is not accompanied by the death rattle, heard at the close of nearly all other diseases.

The ancient aphorism, that heat is life and cold is death, does not always apply to the corpses of cholera patients. There is very often an elevation of temperature after death, but this has also been occasionally observed* after asphyxia, yellow fever, peritonitis, and pneumonia.

When death occurs at the height of the disease, the appearance of the body is very characteristic. The hands

* Cruveilhier, Dowler, Briquet, and Mignot.

are clenched, the limbs drawn up, and the abdominal muscles contracted. Cadaveric rigidity comes on early, and lasts from twenty to forty hours. The countenance is greatly changed; the eyes are sunken, and surrounded with wide blue rings; the lids half closed; the uncovered portion of the globe is like parchment; the nose is pinched; the lips bluish or dark brown; the whole surface, in fact, cyanosed, a phenomenon most marked on the last phalanges and the toe and finger nails. The skin is wrinkled.

On opening the body, the most striking appearances are the dryness of the subcutaneous cellular tissue, and the deep red hue of the muscles. "The blood contained in the cavities of the heart was, in the majority of cases, coagulated into a dark homogeneous mass, with fibrinous coagula extending into the large vessels. Virchow's statement, that these coagula contained a large number of colorless corpuscles, was confirmed by our own observations. The large venous trunks, and the veins of individual organs, were full of blood, whilst the arteries and capillaries were for the most part empty. This fulness of the veins was more marked in cases where death followed quickly upon the commencement of reaction after the cold stage."* The cerebral sinuses and meningeal veins are full of dark blood, the substance of the brain dry and firm. Several writers† mention the presence of a fulness of the exterior vessels of

* Reinhardt and Leubuscher. (From Dr. Gull's Report.)

† Payne on Cholera. Page 138. Report of Bell and Condie. Page 112. Drasche on Cholera. Page 250.

the spinal marrow, and Buhl observed the veins of the spinal marrow and the nerves proceeding from it (sämmtlicher nervenstränge) to be swollen with blood. The vagus especially is surrounded with a dilated network of vessels at its entrance into the chest. The congestion of the sympathetic is rather confined to the ganglia, the solar plexus is often reddened throughout its entire substance, and ecchymoses are sometimes observed.* There is no serum in the pericardium; its inner surface has a viscid feel, and is often covered with ecchymoses. The muscular substance of the heart is firm, contracted, and of a deep red color. The pleuræ, like the pericardium and other serous membranes, are covered with a viscid layer, and sometimes ecchymoses are observed in them. The lungs collapse suddenly on opening the thorax, apparently because the air finds no obstacle to its exit from the alveoli, through the dry and empty bronchial tubes. A section of the pulmonary tissue reveals no traces of congestion or œdema.

The loose folds of the small intestines have a ruddy appearance on the exterior surface, while the large intestine retains its normal hue. In both large and small, are found, sometimes in large quantity, the peculiar rice-water discharges, as well as occasionally, medicines which have been administered but not absorbed.† The mucous mem-

* Buhl.

† Experiments have shown that absorption, although diminished during an attack of cholera, does not cease. Iodide of potassium administered during the algid stage, has been detected in the blood and urine.

brane of the small intestine is the seat of a high degree of congestion of minute vessels, most marked near the ileo-cœcal valve, and gradually extending upwards. With this congestion, ecchymoses and hæmorrhages upon the free surface of the membranes frequently coexist. Sometimes the small intestine is pale, neither ecchymosed nor congested. This is simply a post-mortem appearance, since the intestine is, in such cases, always full of fluid, and so large a quantity must have been poured out from congested, not empty vessels. The mucous membrane and entire intestinal wall are œdematous and swollen, and Peyer's patches and the solitary glands are filled with serum, or a firm exudation. As a result of this swelling of the follicles, the inner wall of the intestine seems fretted with, separate or aggregated, granular protuberances. Sometimes a bursting of the follicles results in the formation of reticular patches.

The most marked change in the intestine is the enormous separation of epithelium. The follicles are deprived of their protecting layer; sometimes the epithelial covering is raised by serum, and clings loosely to the follicles, but generally it is completely separated, and lies in shreds upon the inner surface of the intestinal wall, or forms the "rice-water" granules. It may be said, that the intestine of post-mortem examinations after death from cholera, is like a portion of integument from which the epidermis has been raised by a burn.*

* Niemeyer.

Virchow* states that in women there was very commonly "a menstrual (?) condition of the ovaries, and of the lining membrane of the uterus; in the ovaries, recently-flattened follicles with effusion of blood; and in the uterus, great swelling and hyperæmia of the mucous membrane, with enlargement of the uterine glands; but apart from the menstrual period, it was not rare to find numerous extravasations under the peritoneal covering of the ovaries, giving them a mottled and purple aspect."

No constant changes are observed in the large intestine. The liver is pale and of normal consistence; the larger veins full of dark, viscid blood; the gall-bladder usually filled with a thin, brownish or greenish bile; the spleen presents no constant changes. The kidneys, in the early periods of the disease, are normal, with the exception of a moderate venous hyperæmia. Sometimes whitish points may be seen, especially in the pyramids, and a microscopical examination reveals the urinary canals filled with turbid, swollen epithelium and fibrinous exudation. The mucous membrane of the urinary passages is covered with viscid particles and shreds of epithelium; the bladder contracted and generally empty.

When death occurs in the stage of reaction, or during the typhoid period, cadaveric rigidity is less decided. The teeth and gums are covered with a dry and brownish exudation; the cyanosis is absent or less marked. The connective tissue is more moist; the blood more fluid,

* Med. Reform, No. 12 (from Dr. Gull's Report).

and of a lighter hue. The cerebral meninges are slightly injected; in the meshes of the pia mater and lateral ventricles is an abundance of serum. The right side of the heart is generally distended; the endocardium and lining membrane of the great vessels discolored. The lungs are more moist, and occasionally the seat of lobar or lobular pneumonic or hæmorrhagic effusions. The external coat of the small intestine has lost its redness, and the contents are tinged with bile. In many cases there is a restoration of epithelium, but often a diphtheritic exudation, by which the mucous membrane is more or less transformed into dry and brownish scales. This diphtheritic exudation sometimes extends to the large intestines, and a similar deposit is found in the gall-bladder, vulva, and vagina. The liver and spleen have been found ruptured in rare cases, and the kidneys are full of blood; showing in many, but not all instances, marks of acute croupous inflammation. The bladder contains a variable amount of albuminous urine.

Dr. Niemeyer, from whose work on Pathology and Therapeutics much of the previous portion of this chapter has been taken, gives it as his opinion that the characteristic changes in the post-mortem examinations of cholera patients, when death has occurred at the height of the disease, consist essentially of the terminations of an extensive catarrhal inflammation with shedding of epithelium and immense exudation into the intestine.

Upon this point Dr. Gull writes: "Some observers

have referred the morbid changes to a catarrhal condition, others have regarded the disease as a form of serous hæmorrhage, and the Berlin pathologists, whose attention was particularly arrested by the occurrence of amorphous granular fibrin in and upon the affected surface of the mucous membrane, designate it a destructive diphtheritic inflammation. We believe that for the present such generalizations, however plausible, are of little value, and that we arrest inquiry by their adoption. * * * Cholera appears to consist of but one single series of actions, which may vary in intensity through every gradation, but throughout maintains the same character of passiveness."

Mention should, however, be made of those theories, which, modified by different writers, claim that the phenomena of cholera are due primarily to the action of the specific poison upon the blood, and thus upon the sympathetic and spinal nerves, or on the sympathetic alone. Among these the views of Bell,* Greenhow,† Johnson,‡ and Chapman, are prominent. Dr. Bell is of opinion: "That the ordinary actions of the capillary circulation are put a stop to, or strangely altered, during the condition which we have termed spasm. That the spasm

* C. W. Bell, M.D., R.L S. *Braithwaite's Retrospect*, Vol. xvii., p. 95.

† Greenhow on Cholera, p. 21.

‡ George Johnson, M.D., F.R.C.P., Professor of Medicine in Kings College.

has a tendency to relax of itself in due time, and again to recur unless prevented by a change of action, induced either by natural or artificial means. And we have observed that in consequence of this action the blood is driven inwardly from the extreme capillaries into the great interior veins, leaving the extremities bloodless and chilly."

Dr. Greenhow believed that the first impression of the efficient cause of cholera is made upon the minute ramifications of the sympathetic in the intestinal tube. According to Dr. Chapman, an extreme hyperæmia of the spinal and sympathetic nervous centres is induced by the excessive heat of hot climates. Those nervous centres which govern the alimentary canal, become highly vitalized by this large supply of blood, and, as a consequence, the blood-vessels which nourish the intestines receive a larger supply of nervous influence from the vaso-motor nerve-centres, and contract more vigorously than natural. This contraction diminishes the supply of blood to the intestine, and renders it extremely irritable. For the same reason the reflex functions of the nervous centres are exalted, and "transmit their stimulating influence to the muscular fibres surrounding the bowels with a copiousness and intensity far surpassing the normal amount. Hence these circular muscles, enfeebled, but rendered peculiarly excitable, as previously explained, contract far more rapidly and vigorously than usual. The association of these three conditions—viz. enfeeblement of the muscular wall of the intes-

tine, preternatural exudation from its mucous membrane (caused by contraction of intestinal vessels), and excessive muscular activity, all dependent upon hyperæmia of the nervous centres, constitutes the premonitory diarrhœa of cholera; and, indeed, all those choleraic forms of intestinal flux known as the summer diarrhœa of temperate climates." Dr. Johnson, believing the great central fact of the disease to be, "that during the stage of collapse, the passage of blood from the right to the left side of the heart is in a greater or less degree impeded," places the contraction in the ultimate branches of the pulmonary artery. He says: "I believe the true explanation of the arrest of blood in the lungs to be this. The blood contains a poison, whose irritant action upon the muscular tissue is shown by the painful cramps which it occasions; the blood thus poisoned excites contraction of the muscular walls of the minute pulmonary arteries, the effect of which is to diminish, and in fatal cases entirely to arrest, the flow of blood through the lungs." M. Marey, who has recently written upon the subject, also believes that the influence of the sympathetic system upon minute blood-vessels is the proximate cause of the choleraic diarrhœa."*

How far do the symptoms of the disease and the pathological appearances sustain these theories?

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* See Appendix, also Dr. Gull's Report on the Pathology of Cholera, p. 117; also Payne on Cholera, New York, 1832, p. 110. Dr. George Johnson of Kings College.

Dr. Bell does not regard the collapse of cholera as the same condition to which the term collapse is usually applied. He says: "If collapse from sinking or hæmorrhage may be termed adynamic, we shall be forced to express that which occurs in cholera by the contradictory term dynamic; that it is an active, not a passive condition of the capillary circulation." The blanched skin, resulting from hæmorrhage, is very different from the cyanosed skin of cholera; and a proof that the coldness of the surface is due to a contraction of the capillaries, is the circumstance that when all action has ceased in death, the warmth commences where death commences—in the feet. The cholera is not a disease of the intestinal membrane alone, since changes similar to those which there are observed are met with in other organs, as the kidney and uterus. The force with which the vomitings and dejections are voided resemble the action of spasm, while the amount of collapse does not correspond constantly and necessarily to the discharges from the mucous membrane. The probability that the seat of the disease is in the nervous system, is increased by the fact that there is scarcely any other disease in which such a complete and violent disturbance of all the functions is followed, in some instances, by such rapid recovery.

There is not a paralysis of the sympathetic present during the cold stage of cholera, for experiments show that a section of that nerve is followed by a dilatation of the vessels and an afflux of blood, with an increase of tempera-

ture;* and it is also most probable that if this nerve were paralysed, the lungs, instead of being anæmic, would be congested. The retention of the blood in the right side of the heart and pulmonary arteries seems to be due to spasmodic contraction of those arteries, and the engorgement of the lungs generally found when death occurs in the febrile stage after reaction may be supposed to result from a relaxation of the spasm.

It is impossible to admit that part of Dr. Chapman's theory which claims that the excessive external heat in hot climates, or the direct rays of the sun upon the back, are the cause of cholera, since this hypothesis cannot be reconciled with the prevalence of the disease in winter or with its progressive character. Yet this is not an essential part of the theory, since hyperæmia of the ganglia may result from other causes; and if it be true that the cholera poison is an irritant, then the vaso-motor nerve fibres being irritated, could induce contraction of the blood-vessels by reflex action.† Dr. Gull writes, in reviewing the pathological appearances of cholera:—"The principal phenomena which arrest attention are the œdematous state of the mucous membrane, and the more or less extensive patches of capillary and venous hyperæmia and ecchymoses. These, together with the character and amount of the fluid

* Physiology and Pathology of Nervous Centres, by C. E. Brown-Séquard, M.D., F.R.S. Page 140.

† Brown-Séquard's Physiology and Pathology of the Nervous Centres. Page 146.

effused, demonstrate an important lesion of the circulation through the affected parts. How this is produced can at present be no further elucidated than by the hypothesis of a specific poison acting upon the ganglionic nervous centres, or upon the mucous membrane. The *former* appears to us the more probable supposition, from being more in accordance with some other phenomena of the disease, as the profuse sweating and the sudden and severe collapse."

The hyperæmic condition of the sympathetic ganglia which has been noticed by some, has not attracted the attention of others, but the fulness of the spinal veins is quite generally mentioned.

Although it cannot be considered as proved that an arterial spasm or a hyperæmia of the spinal and sympathetic nervous centres is the cause of the choleraic collapse, the former is rendered highly probable by the results of post-mortem examinations, especially the anæmic appearance of the lung; and the fact that antispasmodic and relaxing remedies have been often found so useful in this disease, must have a certain influence in the same direction. With regard to Dr. Chapman's theory, while it is based upon scientific principles, it must be considered as under trial, and the results of a thorough test of it are awaited with much interest.

If analogy may be used as a guide, the diarrhœa so common among those engaged in dissections, and which may be reasonably attributed to an effect produced upon the blood by exhalations from the cadaver which

enter the lungs, suggests the probability that the cholera poison may taint the blood by being inhaled. It is also probable that it may affect the system by being swallowed, as is seen from the late Dr. Snow's observations on water supply,* and by the following incident from the recent epidemic in Constantinople.

In one instance the clothes, mattresses, etc., of the sick were washed at a fountain, and the water-pipe being unfortunately broken, the foul water communicated with the clean. In a single day sixty people died at Tatavola, which is a small portion of the city supplied by the infected stream.†

Assuming that a spasm of the minute vessels is the cause of the collapse, the symptoms may be explained in the fol-

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* Dr. Snow gives the account of a well in Broad street into which a sewer had been percolating for several months during the year 1864. Hundreds had drunk the water, and although cholera had been present in other parts of London, there had been no epidemic in St. James, the parish in which Broad street is situated. At last a case of cholera was imported by a person who used the privy that was connected by means of the cesspool with the well, whereupon more than 500 persons who received the water from that particular source were attacked within three days. (This may be explained by supposing that the person referred to brought the cholera poison among individuals whose intestines were unusually irritable from the ingestion of water contaminated by ordinary excrementitious matter, and thus cholera was developed. It is not necessary to suppose that a specific poison caused a specific diarrhœa.)

† Report of *Medical Times and Gazette*, Oct. 7, 1865.

lowing manner :—The blood repelled from the surface upon the internal veins forms ecchymoses and congestions in some organs, but its fluid portion is forced through the extreme ramifications of the mesenteric veins into the intestines, carrying with it the epithelium, and forming the rice-water discharges. As the blood is drained of its serum, it seeks fluid from other tissues, and effusions are sometimes thus absorbed, while the salivary and lachrymal secretions are diminished from a deficiency of water. At the same time thirst is induced.

The præcordial pain and nausea are due to the overloading of internal vessels,* and the oppressed respiration to defective pulmonary circulation. The supply of blood to the left side of the heart, as well as to its muscular tissue, is diminished, and hence results a contraction of the left cavities and feeble cardiac impulse. If the circulation of the capillaries of the heart is checked, then, according to all physiological and pathological experience, a cardiac paralysis is the inevitable result.† The small pulse is due to a diminished supply of blood in the artery, and perhaps in some degree to arterial spasm. The cyanosis is caused by the defective respiration and circulation of unaërated blood; as a proof that the respiration is imperfect, appears the fact that cholera patients exhale only a small amount of carbonic acid.

In studying the cause of the suppression of urine, it

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* Bell. † Johnson.

must be considered that the amount secreted depends chiefly upon the degree of lateral pressure in the glomeruli of the Malpighian corpuscles. It is also known that in those diseases of the heart and lungs which are accompanied by a deficiency of blood in the left side of the heart and arterial system, the urinary secretion is much diminished; hence, we cannot be surprised that in the cold stage of cholera, with the heart's action reduced to a minimum, and the pulse imperceptible even in the large arteries, the flow of urine ceases. The low temperature of the periphery of the body depends partly upon the diminished production of heat, less oxygen being taken into the system, and partly upon a deficient supply of warm blood to the skin, in consequence of cardiac debility.*

In favorable cases the discharges become less frequent and smaller, and the stomach less irritable. Occasionally the cessation of the vomiting is followed by a troublesome hiccough. The circulation returns, the cyanosis gradually disappears, the countenance becomes more natural, and the disease passes from the cold stage into that of reaction. With the improvement in the circulation, the respiration becomes less embarrassed. Sometimes, after the symptoms of asphyxia have ceased, a few dejections follow, consisting of numerous masses of a normal hue and decidedly fæcal odor. On the second or third day soft or consistent stools are observed, or there is constipation. The symptoms indicate regeneration of the intestinal epithelium. The

* Niemeyer.

first urine passed is almost without an exception albuminous.*

In some cases in which reparation of the intestinal mucous membrane takes place less rapidly, the violent discharges cease, but a moderate diarrhœa continues, consisting of thin, fetid, and greenish excreta; the pulse remains small, the temperature of the extremities low, and the patients are in much danger of dying from a fresh exacerbation of the disease. An imperfect reaction is often followed by consecutive fever, and sometimes by tardy convalescence. Again, reaction may be immoderate, the pulse becomes full and strong, the surface unusually warm, the eyes injected, and there are symptoms of a hyperæmia of the brain and other organs. Such symptoms may be followed by consecutive fever or convalescence.†

The following tabular comparison between consecutive fever (cholera typhoid) and ordinary uræmia, is from Dr. Gull's report on the pathology of cholera:—"Those (symptoms) characterizing the cholera typhoid, we have set down from the excellent treatise of Reinhardt and Leubuscher on cholera in 1849, and those depending upon ordinary uræmia are described mostly in Dr. Addison's paper of 1839:"

Cholera Typhoid.

1. Dull pain in the head.
2. Dimness of sight, double vision.

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* Niemeyer. † Niemeyer.

3. Giddiness, drowsiness.

4 Slight wandering of intellect.

5. Spasms, tonic or clonic, of an epileptic form.

6. Pupil normal.

7. No paralysis.

8. Pulse various, sometimes below the average; commonly quickened or normal.

9. Temperature of the skin at the beginning slightly raised; in further course normal, with extremities cool.

10. Tongue moist and furred, and later in the disease, dry and brown.

11. Vomiting, which ceased when the cerebral symptoms became more intense. Evacuations feculent; their consistence various.

12. Frequent excitement and irregular rhythm of the respiratory movements, with stertor.

13. Urine suppressed or small in quantity, and albuminous.

Ordinary Uræmia.

(4) "Dulness of intellect, sluggishness of manner. (3) Drowsiness preceding coma, and more or less stertor, with or without (5) convulsions." These symptoms being "very frequently preceded by giddiness, (2) dimness of sight, and (1) pain in the head." There is (8) "a quiet pulse, a contracted, or undilated, or (6) obedient pupil, and the (7) absence of paralysis."

9. Temperature of the skin natural.

10. Tongue at first natural, afterwards dry and brown.

11. Vomiting an early symptom, ceasing when the brain becomes oppressed.

12. Respiration frequently with stertor. Rhythm irregular and quickened.

13. Urine albuminous.

"The communications received by the college,* show that the symptoms of the consecutive fever are most frequently referable to the defect in the urinary secretion." Other observers confirm this testimony.† With regard to a second attack of cholera, Dr. Drasche writes that he found only five cases out of 1630 in which the disease appeared a second time in the same person.

The disturbances of the digestive organs are among the most frequent sequelæ of the disease. Sometimes a chronic diarrhœa, with vomiting and loss of appetite, ensues, accompanied with peculiar sensitiveness in the epigastric region, or there is a protracted indigestion.

The urinary apparatus is also liable to derangement. The urine is very abundant in many cases of convalescence, and the appearances of vesical catarrh are also present. Dr. Drasche has never seen Morbus Brightii, or its specific signs in the urine, remaining consecutively to a recovery from cholera. It is said that epileptic attacks are among the sequelæ of the disease.

Cholera is fatal in proportion to the algid symptoms. Complete suppression of urine or tenesmus with an empty

* Royal College of Physicians.

† "The typhoid symptoms result from retained urinary constituents; perhaps other products of decomposition." Drasche on Cholera. Page 282.

bladder; great anxiety and unrest; the appearance of partial cold and clammy sweat upon the extremities, forehead, or face, are unfavorable symptoms.

Statistics differ much as to the frequency of the cholera exanthem, but seem to show that it is most frequently observed in the latter half of the epidemic. "It appears to be nearly allied to *urticaria febrilis.* * * * Since similar eruptions are known to be intimately dependent upon disorders of the intestinal mucous membrane, and these are, after an attack of cholera, frequent, we cannot but refer it in a general way to such a source, admitting as we must in ordinary urticaria and erythema, that the individual peculiarities which determine its presence are not obvious.'† Some have regarded it as due to sinapisms and frictions employed during the cold stage.

The medium duration of 3600 cases of cholera observed during the epidemic of 1854 in London, was 5·9 days; of 1744 fatal cases, 2·68 days; of the 1856 cases of recovery, 9·06 days. The duration of 9590 cases returned in the register of deaths closely corresponded, being 2·39 days.† Of 4907 deaths during the first epidemic in Paris, 204 occurred in from one to six hours, 1007 in from six to eighteen hours, and 1173 in from eighteen to twenty-four hours.

Deductions made from 72,110 deaths from cholera and

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* Dr. Gull's Report. Page 145.

† Report of General Board of Health. See *Reviews, Med. Times and Gazette,* Oct. 6th, 1855. Page 350.

diarrhœa which occurred in England in 1849, show that although the epidemic was unusually fatal in infancy and old age, it was less so in proportion to the mean percentage of mortality at those ages than during the vigorous periods of life.* The mortality is about the same in both sexes.

It might naturally be inferred that in a disease so modified by local conditions, the rate of mortality would be somewhat variable. It is affected by the mildness or severity of each epidemic, by conditions of soil and climate, and cleanliness; as occurring in hospitals or private practice. An observation of the death-rate in a large number of epidemics, shows a mortality of about fifty per cent.,† but these numbers are only an approximation to the truth. The practical inference is, that since the mortality is increased by local conditions, it may be diminished in proportion as the influence of those conditions is rendered inoperative by hygienic measures.

* Dr. Gull's Report on Cholera. Page 148 *et seq.*

† Dr. Drasche.

CHAPTER V.

An examination of the therapeutics of cholera, as observed in the writings of many authors, renders it apparent that a large number of cases will recover under almost any kind of treatment.

M. Velpeau is of opinion "that it is not impossible that a notable number of cholera patients recover without remedies or specifics, and in spite of them; and the proof is that in all epidemics, in the violent one of 1832, as well as those of 1849 and 1854, more than one-half of the cholera patients have recovered; have recovered by methods of treatment most opposed and various."*

At the same time the tendency to search for a specific cure, sometimes to the neglect of rest, warmth, and other similar powerful aids to recovery in all diseases, is obvious; while it also becomes evident that remedies are successful in proportion as they are administered at an early period of the malady, and that medicines cannot be judged by the success which often follows their use during the decline of an epidemic.†

* *L'Abeille Medicale*, Nov. 13, 1865.

† There is a great need of accurate statistical information as to the effects of remedies in cholera. It is especially necessary in this disease, since so many remedial agents and measures have been

In the preliminary stage it is generally admitted that the results of treatment are very satisfactory. This is evident from the success which has followed house to house visitations. It may also be inferred, that since the object of those visitations has been to stop the preliminary diarrhœa, and there is nothing to show that the large number of patients who have been cured of it, even in the earliest stage (when, if it be true that the diarrhœa is an effort of nature to throw off a morbid poison, it would be natural to suppose that the noxious agent was present in full force), have suffered from the effects of a retained poison; therefore the diarrhœa is not conservative, but should be checked as soon as possible. Another reason for arresting the diarrhœa arises from the fact that during the prevalence of a cholera epidemic the number of deaths from diarrhœa bears a large proportion to those from cholera; while it is known that at such times a looseness of the bowels is often speedily followed by vomiting, purging, and

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warmly advocated. Extensive experience is also deprived of a part of its value when unsupported by statistics; for those who have had ample opportunities of studying the disease, differ as to the choice and influence of remedies. In forming an estimate of the action of medicinal agents in this malady, it is very important to know the surroundings of the patient, the period of the epidemic, and stage of the disease when the dose was given, the amount of the dose, the method of administration, and the results of treatment.

It is stated that nine-tenths of those attacked in the outbreak of an epidemic die.

all the symptoms of a choleraic attack. The same considerations apply to the treatment of cholera by laxatives, and here the case is stronger; for the operation of a purgative has, in some cases, been simultaneous with the first stage of an attack of cholera which has terminated fatally.* Still another reason for checking the watery discharges of a choleraic diarrhœa is, that it is the tendency of the disease to deprive the blood of its water, and thus interfere to a great degree with its natural and therefore requisite composition.

Consequently, it may be considered that the indication with reference to the preliminary diarrhœa is to stop the discharges.

The best authorities are in favor of absolute rest in bed from the commencement of the diarrhœa, warmth to the surface by means of heated flannels, or bricks, or bottles of

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* Two very striking cases have been observed by M. Chauffard in the clinical service of La Charité, where he was temporarily in charge. One was a woman admitted for severe bronchitis, in whom the administration of a saline purgative given for constipation was followed by violent purging, coldness, and change of countenance. She was fortunately rescued after the use of opium in large doses, and the tris-nitrate of bismuth; the second, more unfortunate, was a convalescent from articular rheumatism, who having shown some indications of intestinal derangement, was placed upon the use of Seidlitz water. Its employment produced excessive and uncontrollable diarrhœa, soon followed by the outburst of all the symptoms of confirmed cholera, which was rapidly fatal.—(*Bulletin Gén. de Thérapeutique*, Nov. 30, 1865. Page 473.)

warm water, and sometimes a sinapism to the epigastric region. Some consider abstinence from food as essential, and others are in favor of giving small quantities of nutriment, such as iced beef-tea, at short intervals during the illness. Fresh air is also very essential.

The remedies which have been used in this, as in every period of cholera, are innumerable, but those which have acquired the greatest general confidence for the preliminary stage, contain a certain amount of opium; this, in small doses, is the medicine which may be said to rank first among the curative agents of the preliminary diarrhœa. It is used in powder or tincture, or in combination with camphor, as the camphorated tincture; it is also given with brandy. Large doses of opium are believed to be less efficacious than small ones, and probably tend to induce consecutive fever.

The effects of small doses of opium are thus described in the *U. S, Dispensatory*:—"Taken by a healthy person in a moderate dose,* it increases the force, fulness, and frequency of the pulse, augments the temperature of the skin, and other effects, very important in a remedial point of view, are also experienced. All the secretions, with the exception of that from the skin, are either suspended or diminished; the peristaltic motion of the bowels is lessened, pain and inordinate muscular contraction, if present,

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* In catarrh or diarrhœa, we often prescribe not more than one-fourth or one-third of a grain.—*U. S. Disp.*

are allayed, and general nervous irritation is composed, if not entirely relieved."

This quotation is introduced for the purpose of presenting the effects of moderate doses of opium in detail, since this medicine is sometimes given without a clear view of the indications which it fulfils.

Somewhat similar in its effects to opium is chloroform when administered internally, although it has more of an antispasmodic action. Dr. A. P. Merrill, of New York, claims that it is *par excellence* a remedy for congestion, "whatever may be its cause and character."* Dr. Henry Hartshorne, of Philadelphia, thus writes of this medicine, in the *American Journal of Medical Sciences*:†— "Experience has shown that, taken into the stomach, it is as totally free from danger as any other drug; and its employment is destined to be yet much more widely extended; a fluid-drachm of chloroform taken by the stomach is not more than equal, in soporific effect, to thirty or thirty-five drops of laudanum. In doses of fifty to seventy-five drops (about fifteen minims), I have given it every half hour for several hours together. It differs from the opiate preparations in the promptness of its hypnotic action, the much shorter period of its duration, a less degree of cerebral oppression, and the absence of all stimulus to the circulation. It might be called a 'diffusible narcotic,' comparing in this respect with opium as ammonia does with

* *New York Medical Journal*, Oct., 1865. Page 6.

† January, 1854. Page 113.

alcohol. To produce much effect with it, repeated doses at short intervals will be necessary. Its pungent property causes it to require plentiful dilution, which is, of course, facilitated by the action of some demulcent. Perhaps the orgeat syrup is the best. Every fluid-drachm of chloroform should have at least two fluid-ounces of water with it when taken; and it will need, if in ordinary gum mucilage, considerable agitation to re-suspend the particles immediately before swallowing. When taken in aqueous mixture alone, however, unless in very small doses, it produces nausea with some persons. This is entirely prevented by the addition of a strong aromatic, or still better, by giving the chloroform in aromatic tincture. From the ready solution and kindred action of camphor with chloroform, their combination has become a very common one. For many purposes, however, a still better preparation is a sort of chloroform paregoric, or compound tincture of chloroform, *e.g.* ℞. Chloroform, f ʒ ij; sp. camph. et tinct. opii, āā f ʒ iss: ol. cinnamom., gtt. viij; alcohol, f ʒ iij. M. et fiat tinctura. Dose, from five to thirty minims, or more, as required.

"The most admirable effects have been witnessed from the administration of chloroform, as above combined, in malignant cholera. In the summer of 1849, my attention was first called to it while attending a very severe case of cholera with the late Prof. W. E. Horner. The prompt and signal restoration accomplished in that case, from a state of collapse, was evidently due to the exhibition by Prof. Horner, every five minutes, of a few drops of a com-

bination of chloroform, oil of camphor, and laudanum, with ice, and warm frictions externally. The writer's conviction was very strong that the *short interval* between the doses was an important item in the treatment; and in pursuing the same plan in a number of subsequent cases, several of which were of the most alarming violence, an extremely gratifying success was obtained. The opinion has thus been formed, that no other plan of treatment gives so much promise in the management of malignant cholera as a combination of powerful yet mild antispasmodics, such as above described, with ice internally, and persisting external stimulation."

A part of this extract belongs to subsequent pages of this work, but as the train of thought is more clearly followed by reading it in connexion, it seems better to introduce the whole of it in this place. It will be noticed that the chloroform was given in combination, and that opium was one of the ingredients; perhaps a union of these two agents, or of these with stimulants, is more efficient than either alone. In *Braithwaite's Retrospect*, for January, 1866, chloroform is also recommended as a "valuable remedy in the earliest stages of cholera," and a number of cases are given in which it seems to have been very useful. The theory that vascular spasm is an essential element of the first stage of cholera receives some confirmation from the effects which have followed the use of these and other antispasmodic remedies.

Mention should also be made of dilute sulphuric acid as

a remedy in the premonitory diarrhœa of cholera, since it has apparently been found of great service. In 1851 Mr. Buxton of London called attention to its great efficacy in several forms of diarrhœa, especially choleraic diarrhœa. In October, 1853, Dr. W. H. Fuller, of St. George's Hospital, published a paper in the *London Medical Times and Gazette*, highly recommending it from his own experience and that of his friends, in more than ninety cases without a failure. It was given in doses of half a fluid drachm diluted with water, every twenty minutes in ordinary cases, every quarter of an hour in severe cases. The vomiting, purging, and cramps usually ceased after the third or fourth dose. It is not a suitable remedy in bilious diarrhœa.

Recently, M. Jules Worms, Médecin-en-chef of the Military Hospital of Gros-Caillou, has also endorsed this medicine in very high terms.

His practice is as follows:—

"In cases of premonitory diarrhœa, and according to their greater or less severity, I add three, four, or at most five grammes, by weight, of concentrated sulphuric acid in a kilogramme of decoction of salep, sweetened to 150 grammes.

"The patient takes a glassful of this *lemonade* from hour to hour, rinsing the mouth two or three times after its use; it is seldom that four glasses are necessary. At the same time I allow the use of white wine and champagne, but expressly proscribe beer, brandy, or the alkaline

mineral waters, during the continuance of the epidemic."*

The following statement, introduced without comment, is based on 800 cases of cholera treated in the provinces, throughout England and Scotland in 1854, and, represents the order of percentage of failure after the use of various remedies in premonitory diarrhœa:—†

	Per cent.	Or, including deaths as failures.
Catechu, kino, etc.,	59·0	59·0
Salines,	41·9	41·9
Eliminants,	25·0	25·0
Calomel,	24·0	25·3
Calomel and opium,	18·9	22·0
Stimulants,	16·0	21·8
Chalk and opium,	13·8	17 1
Acetate of lead and opium,	11·2	14·0
Opium,	8·6	13·7
Chalk mixture,	3·6	5·0
Sulphuric acid and opium,	2·6	4.0

Dr. Lasegue, in his recent clinical study of the epidemic in Paris, says, with regard to accidental diarrhœas, such as are produced by indigestion or food taken at

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* *Archives Générales de Médecine*, November, 1865, page 616. A gramme = about 15½ grains Troy measure. A Kilogramme = 2 lbs. 8 oz. i 3 . 14 grains Troy measure.

† General Board of Health. Report on the Results of the Different Methods of Treatment, by the Treatment Committee of the Medical Council, 1855.

improper hours:—"In such cases the stools are feculent, dark, of a characteristic smell, and the diarrhœa yields without being succeeded by any special symptoms. The patients, either from fear or ignorance, have hastily resorted to laudanum, stimulants, or bismuth. The disease checked without being cured, there follows an increased discomfort, thirst, slight febrile reaction, and especially colics, which are combated by the same means.

"Without being in favor of emetico-cathartics, at the commencement of decided cholera, I have never observed anything but benefit from their use, in those affections which did not partake in any degree of the epidemic influence. I am convinced that by suppressing such symptoms which tend to become protracted, the predisposition to contract the reigning malady is rather diminished than increased."*

Yet such cases as those observed by M. Chauffard at La Charité, to which reference has been made, show that the action of purgatives is very uncertain during the prevalence of cholera, and that great caution is necessary in their use.

The treatment of *impending* and *complete collapse* gives very unsatisfactory results. In this condition "the life of all the blood is touched corruptibly," it is a sluggish and thickened fluid, poisoned by retained excretions, and containing an abnormal number of white corpuscles. At the same time absorption, though not suspended, is very imper-

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* *Archives Générales de Médecine*, Nov., 1865.

fectly performed; and remedies, though sometimes followed by a happy issue, are very, very often, inefficacious.

In the report of Drs. Baly and Gull, to which reference has been previously made, are given the results of the treatment of cholera in this stage, as obtained from the replies of English physicians to questions upon this subject. A selection from this portion of that deeply interesting and masterly work, together with outlines of treatment in the different stages of cholera, condensed from a few recent writings, will form the remainder of this chapter.

The treatment by *small and repeated* (about five grains every half hour) *doses of calomel*, gave the following results:—

Of 365 cases there were 187 deaths, and 178 recoveries.

Of 725 cases of complete collapse treated by Dr. Ayre on a similar plan, 365 died. Other statistics on the same point are as follows:—

Of 69	cases,	35	died.		
" 30	"			18	recovered.
" 19	"	11	"	8	"
" 30	"	18	"	12	"
" 70	"	31	"	39	"
" 11	"	5	"	6	"

As to the treatment by *calomel*, *opium*, and *stimulants*, it was found that opium was a dangerous medicine in collapse, and the same was true of stimulants. Perchloride of carbon, and camphor and chloroform, *produced reaction*, but it was not permanent.

"The results of this treatment were unfavorable, and not altogether so indifferent as when calomel was given by itself. Although opium and diffusible stimuli, brandy, camphor, and ammonia, were useful at an early stage of the disease, as collapse set in they not only failed to produce any favorable results, but often aggravated the symptoms. It seems well ascertained, that opium in large doses was at this period injurious, by increasing the cerebral oppression and embarrassing the system during reaction. It was probably less and less applicable as the disease advanced to its characteristic development. Stimuli, especially the various preparations of alcohol, did not act as restoratives in collapse, but often increased the irritability of the stomach and added to the sense of oppression in the præcordia."

Dr. Burrows gives twenty-one cases treated from *July 19th* to *25th*, 1849: twelve were males and two females. All the patients had a warm bath, and five grains of calomel with one of opium were given every two to four hours. According to urgency of symptoms, ammonia, brandy, wine, and chloroform were given, and cold water and ice freely.

Ages.		Of these there were	Deaths.	Recoveries.
Under 20,	6	3 were not in *collapse*,	0	3
		3 in slight "	0	3
From 20 to 40,	12	11 in marked "	7	4
Over 40,	3	4 in extreme "	4	0

In fourteen cases treated on the same plan from Sept.

20th to Sept. 25th, seven males and seven females, the result was as follows:—

Ages.	Of these there were	Deaths.	Recoveries.
Under 20, . . 3	4 were not in *collapse*,	6	4
From 20 to 40, . 9	2 in slight "	6	2
Over 40, . . . 2	8 in marked " but		
	symptoms not extreme	2	6

Dr. Shapter, of Exeter, gives sixty-eight cases, of which forty-one recovered and twenty-seven died. He adds:—

"This combination (calomel and opium) appears to avert death more successfully than mercury by itself; nevertheless, those cases which recover, whether from incipient or complete collapse, are, if the use of opium be long persevered in, more likely to pass into consecutive fever than if no opium be given."

Sixteen cases were treated by Dr. Bashan with calomel and opium, brandy, ammonia, chloroform, sinapisms, and the warm bath; in some cases enemata of acetate of lead were used. There were two recoveries and fourteen deaths, eleven were in marked collapse. Of other cases treated on a similar plan, in

	Deaths.	Recoveries.
27 cases of collapse there were	16	11
4 " the incipient stage, there were	15	6

Dr. Shapter reported forty cases treated with *stimulants:* twenty-one died, nineteen recovered.

Dr. Blackall reported twenty-eight cases, males; five

were treated with brandy and laudanum; ten with camphor, chloroform, and ammonia; seven with chloroform and brandy; three with turpentine; three with camphor alone.

Ages.		Of these there were	Deaths.	Recoveries.
Under 20, . .	10	2 were not in collapse,	0	2
		6 in slight "	1	5
From 20 to 40, .	11	7 in marked "	6	1
Over 40, . . .	7	13 in severe "	12	1

Dr. Barclay's report of cases in St. George's Hospital:—

Stimulants were administered in large quantities in five cases, three recovered; in moderate quantity in fifteen cases, four recovered. They were altogether withheld in four cases, of these two recovered. In no case in which collapse was complete did stimulants restore the circulation.

Mr. Vines, of Reading, says:—"*Chloroform* was tried but its effects were evanescent."

Mr. Butcher, of Ware, in a letter to Dr. Davies, speaks in high terms of the value of chloroform for arresting the early symptoms of cholera, viz. vomiting and cramps. It does not seem to have been successful in rallying patients under impending collapse, nor in arresting the onward course of the disease. Four cases of urgent cholera were treated by Mr. Butcher with stimulants, warm bath, and chloroform; two died and two recovered.

Dr. Barclay's report from St. George's Hospital:—Chloroform was administered in combination with camphor in three cases, two of which proved fatal. In one case it was employed in the premonitory stage every half hour

for several hours, and was abandoned only when decided symptoms of cholera occurred. It was also administered near the close of another fatal case without apparent benefit.

Dr. Blackall says:—"Seven cases were treated with chloroform, one of these was in articulo mortis, and therefore not to be considered. Of four in collapse, three died and one recovered; of two in approaching collapse, both recovered."

"*Cold water* was generally preferred, and good results were often observed when it was taken freely in repeated and copious draughts, although it excited vomiting.

"Dr. Arnot administered a mixture of ice and salt in two cases, both recovered."

Salines, when administered at an early period and in a concentrated form, seemed to favor the discharges.

Dr. Burton reported twenty cases treated mainly by salines, fifteen were males and five females:

Ages.	
Of 7 years there was	1
From 20 to 40 years, there were . .	11
" 40 to 50 " " . . .	3
" 60 to 80 " " . . .	4
Of unknown age, there was . . .	1

Nine were in the premonitory stage, four in approaching collapse, seven in collapse when the treatment commenced. The saline mixture given was sodæ sesquicarb. ℈i.; sodii chloridi ʒi.; potass. chlor., gr. viij.; aquæ Oss.; occasionally the sulphate of magnesia was given, largely diluted.

There were six recoveries and fourteen deaths; three of the six recoveries were mild cases.

Dr. Hawkins reported that of thirty-seven cases in Middlesex Hospital treated by mercurials and salines, seventeen recovered and twenty died.

The report states with regard to the effect of *emetics*:— "The amount of evidence received in the communications is too small to admit of any definite conclusion as to the conditions under which these remedies are applicable, but the general deduction is, that in the early stages they were sometimes of use, and in collapse the effects were equivocal." As to *bleeding*, it is stated that "its general admissibility is to be inferred from its almost entire disuse." Heat was found useful in the early stage; the wet sheet favored reaction in mild cases, but when the disease was severe it proved useless or injurious. Frictions, chloroform liniments, and warm fomentations relieved the cramps, and in the milder cases stimulating epithems of mustard or turpentine were of some use in relieving local symptoms and obviating nervous depression.

No permanently favorable effect was produced by oxygen or galvanism.* "The results of saline injections into the veins are, as in 1831 and 1832, generally unfavorable. Its value cannot, however, be determined by statistics collected from various sources. The operation in all its details is a

* M. Vigla, who has recently experimented with inhalations of oxygen on a grand scale in Paris, states that he has not had a successful case.—*Bull. Gén. de Thérap.*, Nov. 30, 1865.

delicate one, and requires not only a careful discrimination of the cases to which it is applicable, but also an exact attention to the physical characters and composition of the fluid to be injected, and other collateral circumstances. Until these points receive greater elucidation, the results obtained can form no sound basis for an opinion respecting its merits. * * * * In an adult not more than from forty to sixty ounces, at the rate of from two to three ounces per minute, should be injected without intermission. The operation may be repeated according to the necessities of the cases, and this is for the most part to be preferred to throwing in double the quantity at once. Cases have terminated successfully where such an amount of injection has been repeated five or six times."

The salt to be used for injections into the veins should be composed nearly in the following proportions of the various ingredients :—

Chloride of sodium, . . .	60	parts by	weight.
" potassium, . .	6	"	"
Phosphate of soda, . . .	3	"	"
Carbonate of soda, . . .	20	"	"

140 grains of this are to be dissolved in forty ounces of distilled water.

"As to the temperature, it has been found that 110° Fah. is not injurious." The addition of a small quantity of alcohol to the saline injections was tried in 1832 and repeated with success in 1848.

M. Worms says of his treatment in collapse :—

"The patient is left in absolute repose. Frictions are not used unless required to ease the cramps; every half hour a glass of lemonade (sulphuric acid, syrup, and water) of 5 to 10 grammes of acid to a litre is given, and advantage is taken of the instant after the vomiting, for its administration. Wine and ice are allowed *à discrétion.*

"I think it worthy of notice that the lemonade which is very effectual in controlling the alvine evacuations, produces a different action upon the vomitings, which are prolonged in duration and frequency. But this prolongation has a favorable influence, and is generally the indication of a happy termination."

It will be observed that the acid acts as an emetic, and M. Worms states that the vomiting has a favorable influence upon the course of the disease. This medicine is also antiseptic.

In the Gazette Hebdomadaire of December 8th, 1865, Dr. Parrot gives an analysis of sixty-three cases of cholera, treated in La Charité Hospital. The treatment consisted in the administration of from four to eight grammes* of chloroform daily in severe cases, and from two to four in mild ones. The vehicle was water 100 grammes and syrup of quinine twenty grammes. This mixture was given in tea, a tablespoonful every half hour; at the same time iced beef-tea was given very frequently in small quantities. Warmth was applied to the skin, and dry and stimulating

* A gramme = about 15½ grains, Troy weight.

frictions were used. Chloroform given in this way, calmed the anxiety and epigastric pain, and seemed to diminish the frequency of the vomitings, which were also less painful.

Of the sixty-three patients, fifty-three were grave cases, five moderate, and five mild. There were twenty-five recoveries and thirty-eight deaths, but three died immediately after admission, and two at the close of two hours. Two young women in the third stage of phthisis pulmonalis were also among the victims, two others had dothinenteritis, and one had organic disease of the heart. Forty-eight cases came from the city; *fifteen* were taken sick *in the wards*, and of these *thirteen died;* twenty had looseness of the bowels previous to the characteristic symptoms, and among twelve the diarrhœa lasted more than eight days. In the period of reaction, a large blister was sometimes placed over the epigastrium, and where there was a foul tongue and loss of appetite, ipecacuanha was given. Only *two* deaths occurred *during reaction*, the symptoms of which were benign.

This report is somewhat imperfect, since it does not state the comparative number of deaths among the mild and the severe cases. Dr. Parrot is of opinion that, making proper allowances for the moribund, as well as those laboring under previous diseases, the recoveries would nearly balance the deaths. It is worthy of notice that thirteen of those who were attacked in the hospital, died, and that only two deaths occurred during reaction.

The following outlines of treatment are extracted from

lectures on the subject by Dr. Maclean, which were contained in recent numbers of the London Lancet.*

"Secure the best hygienic conditions possible for your patients; avoid crowding them, give abundance of water to drink, and ice to suck; correct cramps and inordinate vomiting by the internal and external use of chloroform; apply external warmth and extra bed-clothes if they are grateful to the patient, but if they make him restless, do not press them. If the cuticular discharge is excessive, wipe the patient dry from time to time, disturbing him as little as possible. If vomiting be not excessive, and if the remedy does not excite it, ten drops of the mixture I have recommended (see Formula No. 3) in the premonitory diarrhœa, may be given from time to time, chloroform being substituted if vomiting be urgent. As soon as vomiting ceases, you must support the patient by proper nutriment. At first I begin usually with thin arrow-root well boiled and flavored with a little aromatic. I give this commencing with a teaspoonful at a time, giving now and then a teaspoonful of brandy in it, never overdistending the stomach. Instead of water, I now quench thirst with milk containing a little lime-water, and flavored, if it be at hand, with a few drops of curaçoa. This may be often given to the patient with a little soda-water. As reaction proceeds, I substitute strong beef-tea, or better still, essence of meat,

* Lectures on the Treatment of Cholera, by Deputy Inspector General Maclean, M.D., Professor of Military Medicine. London *Lancet*, Feb. 3d and 17th, 1866.

using it in the same cautious way, spoonful by spoonful, at proper intervals; later still, eggs beaten up with a little brandy, and flavored as before with curaçoa, are often relished. The greatest caution is required not to disgust the patient, not to re-excite vomiting, not to over-stimulate, so as to bring on cerebral symptoms, during the febrile reaction. When patients are thus carefully nursed, it is seldom that reaction is excessive. Nothing but mischief may be expected from over anxiety to hasten forward convalescence by too freely pressing food and stimulants on the patient." Dr. Maclean also says: "When I first went to India it was a common practice to withhold water, especially cold water, from cholera patients. Following the routine of the day, I have acted in this way, and I was taught by personal experience the folly of this article of prevailing medical belief. There is no necessity to give large draughts, but let not the fact that a portion of almost every supply is vomited, lead you to withhold it entirely.

"Cramps are best relieved by the use of chloroform, given in doses of five or six minims in a little water; and if vomiting be excessive, a little may be sprinkled on a pad of lint covered with oiled silk or gutta-percha tissue, and applied to the epigastrium; or spongio-piline may be used for the purpose. I have used chloroform in this way, both externally and internally, very freely, and always with good effect."

In the same lectures from which the preceding extracts are taken, an opinion is strongly expressed against the use

of opium. It seems, however, to refer especially to its use in large doses, or during collapse.

"In the stage of collapse, if it is retained, it is, it must be, useless. But when reaction sets in, the opium, previously inert, begins to act, and is at once a serious hindrance to the restoration of the secretions, and if the quantity given has been large, often hastening on cerebral symptoms, ending in coma."

In a recent meeting of the New York Academy of Medicine, Dr. John T. Metcalfe gave very briefly his views with regard to the treatment of cholera. He recommended in the first stage rest, warmth, quiet, pure air, and proper diet. Frictions of the extremities, inhalations of chloroform, or hypodermic injections, may be used against the cramps. Warmth should be applied to the epigastrium, and cold water allowed freely. In collapse, no large doses of opium should be given: external warmth should be applied and cold water administered internally; the cold water to be used, even if it cause vomiting. Consecutive fever is to be treated on general principles.

Dr. Niemeyer is of opinion that every one attacked, even with a slight diarrhœa, during a cholera epidemic, should send immediately for a physician, and in the meantime go to bed, keep warm, and drink several cups of hot coffee* or herb tea, the object being to produce perspiration. If there is any delay in the arrival of the physician, the patient should take small doses of opium, in the form of

* Hot coffee has with some persons a decided laxative effect.

paregoric or laudanum. He considers opium in the early stage of the disease as one of the most effectual remedies, and recommends the Russian Cholera Drops (see Formula No. 2). He, himself, gives the tincture, or Dover's powder. If the patient improves under this treatment, then it is continued in small doses, until a firm stool passes from the bowel; if the patient grows worse, calomel in one grain doses should be substituted, and cold water applied to the abdomen. The patient is also allowed to swallow small pieces of ice, or small quantities of ice-water. As collapse approaches, stimulants are indicated, and by preference iced champagne, which stimulates the nervous system without affecting injuriously the coats of the stomach and intestine. The æthereal oils, carbonate of ammonia, and other sharp substances, are less desirable. In practice among the poor, rum and water may be given. Sometimes a cup or two of hot, strong coffee, may be advantageously taken between the draughts of water. Although the coffee will not be long retained, there will be an improvement in the pulse and temperature of the skin before its ejection. A cessation of the discharges caused by paralysis of the muscular walls of the bowel, shown by the continued asphyxia, indicates an increased necessity for stimulant, and the reappearance of the discharges shows that the bowels are recovering their tone. Frictions with mustard may be used for cramps, but there is danger in the employment of sinapisms lest they be left on too long and cause obstinate and painful skin diseases. After reaction, great care should be used in the pre-

paration of food, and the diet should consist of milk, broth, and toast, until the passages become normal.

Dr. Drasche considers that the following remedies, which have been at different times brought forward as cures for cholera, have not fulfilled the expectations formed of them: Venesection, calomel, ipecacuanha, salines, terchloride of carbon, spirits of ammonia, nitric acid, trisnitrate of bismuth, nitrate of silver, hydropathic measures, strychnine, phosphorus, aqua calcis, valerianate of ammonia, hydrated oxide of iron, sulphuric and manganic acid, pyroligneous acid, gunpowder, castor oil, croton oil, chloride of lime, chlorinated water, chlorate of potash, chloric æther, chloroform, animal charcoal, hashish, stachys anatolica, protoxide of nitrogen, oxygenated water, salt, used in baths and for enemata and injections into the veins, injection of the bladder with warm water, inhalation of aromatics, transfusion of blood, electricity, and curative gymnastics. He attaches great importance to a rigid diet in the very commencement, nothing but soups being allowed. From a neglect of this precaution, has arisen the disappointment which many physicians have found in remedies for the diarrhœa. Only a limited quantity of fluids may be taken, and this if possible warm. If the thirst is excessive, ice may be allowed. Patients have stated that the use of cold draughts was followed by marked intestinal rumbling, and soon after a watery dejection, in spite of preventive medicines. His remedy for the diarrhœa is opium, which he prefers to give in the form of tincture (tinct. opii crocata). Should the

diarrhœa continue several days without amendment, astringents should be substituted for the opium. Of these he prefers rhatany and tannin in doses of five grains of each.

As the collapse approaches, stimulants are indicated, to excite the nervous system and quicken the circulation. He likes the æthereal oils, as of cinnamon, mint, and juniper; musk has also a similar action. If the time presses, diffusible stimulants, as warm wine, champagne, rum, or punch, may be employed. Sulphuric and acetic ethers (stimulant antispasmodics) have also a decided action upon the cramps and vomiting. Used for inhalation they improve the pulmonary circulation, and relieve dyspnœa. The effect of ether, thus employed, has often been surprising, especially with young persons. In a short time after the commencement of the inhalation, the pulse has improved, the temperature of the body risen, the cyanosis lessened, the cramps have diminished, and reaction has set in.

As an additional means of restoring the circulation, frictions should be employed, and the body enveloped in warm coverings. Sinapisms are also considered as very useful. If reaction is imperfect, stimulants should be used, mild or strong, as the circumstances require. If excessive, ice may be applied to the head, and cold water allowed. If there is a tendency to cerebral congestion, leeches and cups should not be employed. To restore the urinary secretion, mild diuretics, such as selters water, citric acid, or citrate of potassa, are indicated. If necessary, warmth may be applied to the loins and frictions made with ungt.

digitalis, the oil of juniper, or turpentine. A free use of cold water is also allowable.

If the diarrhœa continues during reaction, astringents, such as tannin, extract of calumba, and extract of rhatany, should be administered. The same remedies are indicated if diarrhœa is present in consecutive fever. Vomiting and singultus are treated by sinapisms to the epigastrium. So long as the period of reaction continues, the patient must remain in bed and confine himself to a diet of soups alone.

For the diarrhœa and vomiting which sometimes continue during convalescence, nux vomica is a suitable remedy. So long as there is any indication that the digestive organs are still suffering, the diet must consist principally of nutritious soups.

An analysis of two hundred and thirty-four cases of *consecutive fever* treated by different remedies shows the following results.

56	cases were treated by	salines,	of which	21	died.
22	" "	mercurials,	"	6	"
101	" "	*aperients*,	"	8	"
1	" "	diuretics,	"	—	"
21	" "	stimulants,	"	14	"
3	" "	external irritants	"	2	"
5	" "	nourishment alone	"	2	"
23	treatment not recorded			3	"
2	not treated by medicine			1	"

" In the practice of one practitioner at Paisley the remarkable number of one hundred and three cases of consecutive

fever occurred in one hundred and ten cases of cholera, sixty of which passed into the fever without having had collapse. In all these cases calomel and opium were used as the prominent treatment in the previous stages. There is no evidence whether the opium was given in unusually large doses. The result, however, corresponds with the large proportion of cases of consecutive fever in the metropolitan hospitals, in which the use of opium combined with chalk appears to have been attended with a similar result."*

The outlines of treatment which have been introduced are drawn but from a few sources. This is not because there is any lack of advocated remedies in the immense field of cholera literature; but many of the remedies have been laid aside, many are but repetitions of others, and the consideration of too large a number would involve considerable perplexity. A comparison of those which have been chosen will afford an opportunity for a selection from different methods.

Without venturing any positive opinion upon a subject which is still involved in so much obscurity, it would seem that, judging the disease by its origin in the midst of highly malarious influences, and in the presence of animal filth, † by its tendency to produce septic alterations in the blood, ‡ its spasmodic character, and its disposition to fall upon the

* General Board of Health Report on the Results of Different Methods of Treatment. *Med. Times & Gazette*, Oct. 27, 1855, p. 422.

† Appendix, p. 134.

‡ Appendix. p. 138.

nervous system, a medicine containing quinine, in combination with an astringent and antiseptic, like sulphuric acid, an antispasmodic like chloroform, an anti irritant like opium, which also possesses other valuable properties (see page 102), and some diffusible stimulant, would fulfil the prominent indications for treatment in the early stages of the disease. With the approach of collapse, opium should be discontinued. Abstinence from food is also indicated in the commencement of the diarrhœa, and simple unirritating nutriment as the disease progresses.

Ice taken internally tends to relieve thirst and modifies the irregular distribution of heat. Cold drinks are more eagerly sought for by cholera patients than warm, and are recommended by good authority, especially in collapse. Judging from analogy, the coverings for the body should be light or warm in the algid stage, as the sensations of the patient may dictate.

Applications of dry cold along the spine have been apparently found so useful as to be worthy of a trial. The assertion that the circulation in the sympathetic ganglia cannot be affected by ice applied along the back is denied; perhaps the effects of this remedy are due in some degree to the influence which impressions made on cutaneous nerves produce upon internal organs.

As Dr. Worms recommends sulphuric acid so warmly, and as emetics have sometimes been found so useful in rousing the system from collapse, this medicine, which acts as an emetic (antispasmodic) in the algid stage, and is also

tonic and antiseptic, seems to offer some hope of usefulness.

A mass of minutely detailed observations upon remedial measures, as employed in this malady, is much needed, for the purpose of acquiring clearer views of treatment.

Such facts would also be of advantage in aiding to arrive at a knowledge of the essential nature of cholera, since, as has been well said, one of the principal uses of medicine is to throw light upon the nature of disease.

FORMULÆ.

No. 1.—In Diarrhœa and Cholera.

℞. Chloroformi. ʒ ij.
Spts. Camphoræ,
Tinct. Opii, *āā* f ʒ iss.
Olei Cinnamomi gtt. vij.
Alcohol, f ʒ iij.
M.

S. Dose from five to thirty minims or more as required.

No. 2.—Russian Cholera Drops.

℞. Tinct. Valerian. æth. ʒ ij.
Vin. Ipecac. ʒ i.
Tinct. Opii camph. gtt. xx.
Ol. Menth. piper. gtt. v.
M.

S. Twenty drops every hour.

No. 3.—To promote reaction in Cholera and Diarrhœa.

℞. Ol. Anisi,
Ol. Cajeputi, *āā* ʒ iss.

Elixir acid. Halleri,
Tr. Cinnamom. āā ʒ ij.
M.

S. Dose, ten, fifteen, twenty drops, with fifteen or twenty drops of Tr. Opii, at short interials.

No. 4.—A modification of No. 3.

℞. Olei Anisi,
" Cajeputi,
" Juniperi āā ʒ ss.
Ether. sulph. ℥ ss.
Liq. acidi Halleri ʒ ss.
Aquæ Cinnamomi ℥ ss.
M.

S. Ten drops every quarter, half, or every hour.

No. 5.

℞. Chloroform. ʒ i.
Olei Terebinthinæ ℥ i.
Aquæ destillatæ ʒ iij.
M.

S. Dose a teaspoonful.

No. 6.—Diarrhœa and Collapse.

℞. Ammoniæ muriat.,
Potassæ Chlorat. āā ʒ i.
Tinct. Opii camph. ℥ iss.
Aq. Cinnamomi ℥ ivss.
M.

S. A teaspoonful to be given at short intervals until one is retained. Then the same quantity every two, three, or four hours.

This prescription has been found useful in the out-door practice of the New York Northern Dispensary.

No. 7.

℞. Tr. Opii,
Spts. Camphoræ,
Spts. Terebinthinæ āā ʒ iij.
Ol. Menth. pip. gtt. xxx.
M.

S. A teaspoonful in brandy and water for diarrhœa, a tablespoonful for cholera.

For an enema add a teaspoonful of laudanum to a tablespoonful of prepared starch.

No. 8.

Dr. Barraut's treatment, founded on that adopted by M. Leclerc in 1854.

For Adults.

℞. Ext. Belladonnæ gr. ¼ every half hour until color returns to the surface and pupils dilate. Then it should be given every second or fourth hour, until the urine appears, when it should be stopped entirely.

For Children.

℞. Tinct. Belladonnæ (London Phar.) ʒ i.

(The Tincture of the London Pharmacopœia is about half the strength of that of the U. S. Dispensatory.)

Aquæ ℥ i.
M.

S. A dessert-spoonful every ten minutes with the same restrictions. This medicine relieves choleraic diarrhœa, but

not an ordinary diarrhœa. The pupils dilate, and in correspondence the skin becomes warm and dry, and this warmth may become excessive if pushed too far. With this treatment, in Mauritius, there were only ten deaths in fifty-eight cases treated in 1859, and during 1862 the mortality was small, only eighteen dying. As a drink the white of egg, beaten up in a glass of cold water, allays this more than an effervescing draught. When cramps have been severe Dr. Barraut has seen excellent effects from subcutaneous punctures with a lancet moistened with a solution of tincture of atropine.

If it be true that there is a vascular spasm present in cholera, and that belladonna is efficacious in arresting the disease in its early stages, it may be accounted for by the relaxing influence of the drug upon organic muscular fibre through its effect upon the nervous system.

No. 9.

Remedies used by the American missionaries in Constantinople (1865).

For the Diarrhœa.

℞. Tr. Opii,
Tr. Rhei,
Spt. Camphoræ, *āā*.

S. Thirty drops, for an adult, is the initial dose, generally doubled if a second dose is necessary; severe cases, sixty drops for the first dose.

For the Vomiting.

℞. Tr. Opii,
" Capsici,

Cardamom. comp.
" Zingiberis āā.
M.

S. Thirty, forty, or more drops p. r n.

From August 1st to August 28th, of one hundred and two cases of cholera found in bed, eighteen died, "the others have recovered or are recovering."—*Chicago Medical Examiner*, May, 1865. Correspondence.

Philippine Islands Remedy.—At the first appearance of the symptoms rub the whole body, especially the bowels, with a brush dipped in brandy. Give a cup of warm mint or imperia tea, containing sixty drops of ether, and wrap the patient in a warm covering. If perspiration does not appear in four minutes, give another cup of tea containing eighty drops of ether, when it is said that perspiration is sure to follow. Occasionally a third cup is required, with 120 drops of ether. (It is a question whether this treatment would not be equally effectual without the frictions, external warmth being substituted.)

APPENDIX.

Nature and Origin.

The Resemblance of the Disease to Tetanus.—Mr. Crew, Superintending Surgeon in Malwa, stated (July 30th, 1818):

"Notwithstanding the early exhibition of the remedies, the disease yet appears to run through a kind of course; for the symptoms of coldness and total absence of pulse frequently take place where there appears to have been but little disturbance in the primæ viæ."—P. 45.

"The disease, as affecting many of the Europeans, appears to me to be a true Tetanus."—P. 63.

(Notes on the Epidemic Cholera, by R. Hartley Kennedy, M.D., &c., &c., late Physician General and President of the Medical Board of Bombay. London, 1846.)

Dr. Kennedy was stationed in Surat in 1818, and it was in the end of August that the epidemic showed itself at that place.

Mr. Barnes, Surgeon in the Hon. East India Company's Service, resident at Jessore for many years, thus writes:

"I had medical charge of the district of Jessore, in Bengal, from 1810 till the end of the year 1822, with an exception of

part of 1816 and 1817. I was, therefore, absent at the time the disease now called Indian Cholera Morbus first assumed the epidemic character. I had, however, been intimately acquainted with the disease as endemic, from the time I first joined the station, but never dreamt of giving it the name of Cholera Morbus. I considered it altogether a new disease, unknown to all the medical writers whose works I had read, peculiar to that part of the country, and to have superseded the periodical remittent fever formerly so prevalent in that district.

"The causes of this disease could not be mistaken, although they were of too extensive a nature to be brought under human control. Putrid exhalations from the constant and rapid decomposition of animal and vegetable matter, and the use of unwholesome water, were the sole causes of this disease; and the extent and fatality of its progress during the time it was endemical depended altogether upon the season. If those violent storms of thunder, lightning, wind, and rain, which annually occur in Bengal, and are known by the name of northwesterns, commenced early in March, and recurred at short intervals until the rainy season began, the hot season (as it is called), namely April, May, and June, was comparatively healthy, and *vice versâ*.

"Again, if the rain did not terminate till the end of September, and the floods subsided gradually during the month of October, the autumn season was free from extensive sickness; but if the rains broke up at the end of August, and the *waters sank rapidly* during September, the disease commenced its attack among the natives at the beginning of October, carrying death and desolation in its progress, until about the middle of December, when the complaint became checked, and in a short time apparently extinct. Twice previously to 1817, this dis-

ease prevailed to such an extent in the town of Jessore and its immediate neighborhood, as to render it necessary to shut the courts of justice and to suspend all business for a time.

"The great changes in the seasons of 1816 and 1817 rendered the atmosphere peculiarly favorable to the extension of the disease beyond its usual limits, favored its progress by contagion, and assisted in generating the pestilence throughout those parts of Bengal where the materials necessary for its production existed, but probably in a less extensive degree than in Jessore.

"Instead of the usual rainy and dry seasons, there was scarcely a week during 1816 without rain in the district of Jessore, from the beginning of January to the end of December. The sun was constantly obscured, the atmosphere close and heavy and moist, with the thermometer varying from 70 to 75 degrees from March to November.

"In such a climate as this, any person acquainted with the materials that compose an Indian camp, and with the crowded, filthy, and ill-ventilated state of the houses and streets of Indian cities and towns, must be satisfied that those, of all others, are the places most favorable to contagion.

"The huts of the natives are nearly surrounded with pits, the earth from which has been used to raise mounds on which their habitations are erected. These pits are the receptacles for every kind of filth, as well as stagnant water, and the exhalations from them at times are almost insufferable."

The Phenomena of Pestilential Cholera, etc., by George McCulloch, M.D., F.R.C.S. (Dublin), and H. C. Maclaran, M.R.C.S. London, 1850. *See* page 27 *et seq.*

"The physician who has been able to follow the march and

observe the features of the cholera epidemics which have appeared since 1832, must come to the conclusion that the disease, since its first appearance, has been undergoing an incessant and successive transformation.

"During the epidemic of this year (1865), which has assumed such large proportions, having been commissioned to observe the disease in Alexandria before it showed itself in Cairo, I was obliged to declare in my report that the disease which ravaged Alexandria was not *the true* Indian cholera. The view which I took of it is shown by my prescriptions, which consisted mainly in the use of quinine. I also judged, from cases observed in Beyroot, that the epidemic which afflicted Syria was similar to that which prevailed in Egypt. Dr. Koutoutâ, practising in Syria, a man of great experience in cholera, assured me that the disease did not present the features of true Indian cholera, but could more justly be regarded as a *pernicious cholera.* Dr. Maurin, writing from Marseilles that the cholera has characteristics similar to those of typhoid fever, observes that "one is struck with the presence of a pernicious element, which is suggested by the course which the disease runs, and the mingling together of sweating, intermissions, and choleraic symptoms."

"Cholera: Difference de ces Caractères suivant les lieux et les temps. Dr. E. Rossi Bey, of Cairo." *Gazette des Hôpitaux*, Dec. 9th, 1865.

"In summing up the evidence regarding the cause and nature of cholera, it may be stated then that there is a poison, the exact nature of which is not perfectly understood; that this poison introduced into the system causes disturbance of innervation, or a sort of paralysis of the ganglionic nervous system;

that this leads to extensive hyperæmia of the alimentary canal, resulting in the symptoms described, and to the reflex phenomena alluded to, and as the disease progresses, obtaining more or less an inflammatory character.

See Dr. Alonzo Clark's Lectures on Cholera, Nos. 2 and 3 of the *Medical Record*, N. Y.

The point of departure of M. Marey's theory is the resemblance which he finds between cholera and paroxysmal fevers, which latter he considers as under the control of the vaso-motor system of nerves.

In the peripheral vascular system, there is a muscular envelope, which surrounds the minute vessels, and is supplied by branches of the grand sympathetic. A contraction of this muscular apparatus produces a diminished calibre of the vessels and a decrease of circulating blood. The opposite is true of a relaxation of this muscular tissue.

Hence the algid symptoms are a result of the contraction of these vessels, in consequence of increased action of the vaso-motor nerves, and since every violent and long-sustained effort causes fatigue and weakness, so, after this intense contraction of the vessels, follows a relaxation or a febrile condition; that is, the extreme vessels allow a greater amount of blood to pass, and the surface becomes warmer. The collapse depends upon increased action (irritability) of the sympathetic, and reaction, upon its exhaustion.

(Essai de Theorie Physiologique du Cholera, par le docteur Marey. Gazette Hebdomadaire, Nov. 24th and Dec. 1st, 1865.)

The paralysis induced by anæsthetics, such as ether and chloroform, furnishes an instance of the manner in which a

morbid process may be developed in the system by an agent which is introduced through the lungs.

M. Baudrimont, who has been making observations upon the blood of cholera patients, was led by his researches to the following conclusions.

In cholera the blood is profoundly altered. It has lost largely of serum which is represented by water, albumen, and salts. The other elements (globules and fibrine) have also lost the property of coagulation. The albumen has become converted into diastase, possessing the property of dissolving starch granules.

This diastase is also present in the dejections.

The mucoid matter contained in the evacuations from the stomach, exists as described by Andral (who found it to be formed of cells analogous to those in pus), but these evacuations also contain spherical globules of a hundredth of a millimetre diameter, similar to those which constitute brewer's yeast.

This presence of diastase and of a substance analogous to brewer's yeast is remarkable; since these substances represent two products which are formed successively at the expense of the albuminoid matter of the barley during the germination of this grain and the fermentation of beer.

(Recherches experimentales et Observations sur le Cholera epidemique par M. Baudrimont. Gazette Hebdomadaire, Nov. 17th, 1865.)

See also the Richmond *Medical Journal* for March, 1866, p. 265.

Epidemic Influence.

Paris, Oct. 16th, 1865.—"Now, as in 1853, ordinary diseases follow their usual course without seeming sensibly affected by the presence of the epidemic, and without bearing that impression generally observed in great epidemics, especially in those of 1832 and 1849." Gaz. des Hôpitaux, Oct. 17th, 1865.

"The cholera of Marseilles, in 1865, has the characteristics of typhoid fever; the predisposing causes are fatigue and wretchedness; debility is its marked feature; it does not rage among those suffering from other diseases; there is not that epidemic influence present which seems to settle upon a city and modify all diseases."

Caractères du Cholera de Marseille en 1865. Par le docteur Selim Ernest Maurin.

In Naples the number of cases began to increase coincidently with the sirocco wind. So the sirocco was the cause of the cholera. The sirocco theory lasted till the wind changed and blew from a northerly direction, "with greater violence than had been known for years before." Still the malady got worse, "and the greatest havoc committed by it was almost all on those blustering days." London *Lancet*, Dec. 9th, 1865.

Diarrhœa.

"In regard to the duration of diarrhœa, the following facts are presented, which were collected at the beginning of an epidemic. The diarrhœa lasted before the occurrence of other symptoms: In one case two and a half hours, ten evacuations; in another two days; in another, there was no diarrhœa until the cramps occurred, and then only four evacuations before collapse; in another, none until cramps set in, when it became very severe; in other cases, it lasted respectively ten, two, two, thirty, thirty-six hours, two and a half days, and three weeks. Dr. Buel, physician to one of the cholera-hospitals in New York during the prevalence of an epidemic, calculated the average duration of the diarrhœa in 469 cases as three days and six hours.

Lectures on Cholera by Dr. Alonzo Clark.

"The premonitory period is marked by extreme lassitude; the least exertion of muscular force is followed by sensation of great fatigue in the knees and elbows. The functions of the skin are badly accomplished, the perspiration being abundant, even although the body is cool. The tongue is not exactly furred, since it is white in the centre, and red at the tip and edges. Patients complain of a bad taste in the month, food has less relish, and although the wish for solids decreases, there is an increased desire for liquids; yet nevertheless the stomach is discommoded by a very small amount of fluid.

"There may be constipation, and then the stools of those who have used alcoholic liquors in excess are dark; the head feels heavy, there is a sensation of weight in the frontal sinus, and the marked characteristic is an absolute prostration of strength. If a critical vomiting occurs, it is marked by immediate and decided relief. If diarrhœa takes the place of constipation, the relief is less decided, yet appreciable, and it is this circumstance which deceives a large number of patients; for observing that this black and fetid diarrhœa refreshes, instead of weakens them, they do not apply to a physician.

"Such is the ordinary commencement of our Cholera."

Character of the Cholera in Marseilles in 1865. By Dr. Selim Ernest Maurin. *Gaz. des Hôpitaux.* Samedi, 30th Sept., 1865.

Communicability.

In reply to that theory which holds "that cholera epidemics and individual cases are almost always preceded for some weeks, if not months, by diarrhœas," M. Pellarin, in the *Gazette des Hôpitaux*, Oct. 10th, 1865, offers his experience of cholera in 1849.

At the outbreak of cholera in the garrison of Givet, the force

consisted of 1,599 men, counting at the hospital in all 33 patients, of whom 17 had fever, 8 were wounded, 7 had venereal disease, and 1 the itch: that is, there was one man in the hospital for every 48.46, and a fever patient among every 96; figures which show that the sanitary condition was little affected by supposed premonitory epidemic influences. The cholera was introduced at Givet by a servant who arrived from Brussels on the 17th August, and who showed characteristic symptoms on the same day. The first case in the garrison was that of a grenadier who visited the servant during her sickness, especially on the day of her death. He was attacked at eleven o'clock on the evening of that day with well marked symptoms, and died at seven in the morning; eighteen other soldiers coming from the same barracks, which were occupied by only two companies, were also attacked.

Fumay is twenty-two kilometres from Givet, in ascending the Meuse. From the 17th August, when cholera showed itself at Givet, until the 11th October following, the inhabitants of Fumay, mostly workmen in slate quarries, had not suffered from any unusual change in their general health.

On the 11th October, a battalion of the 63d de Ligne left Givet for Fumay, which is the first day's march. On the route, a fusileer (Pierre Guerin) was seized with choleraic symptoms. He was carried by water to Fumay, and died on the following day. Two days later a case occurred in the population of this small city, and up to the 26th November the epidemic had claimed 130 victims among three thousand inhabitants.

(Notice of a paper addressed to the Académie des Sciences, by Dr. Ch. Pellarin, *Gazette des Hôpitaux*, October 10th, 1865).

"The following instance of contagion, vouched for by ad-

ministrative documents across a vast extent of country, from Elvas to Oporto, has fully awakened society to the dangers of material contact:—A young married woman of Oporto, on a visit to her sister at Elvas, left the latter city on October 14th, on occasion of her nephew being attacked with cholera. She reached Oporto on the 17th, and on her arrival bore an appearance of malaise. The woman who was her nurse, a young and robust female, immediately returned to her lodging in another ward of the city, and this person was violently attacked on the day following, viz. October 25th. She still survived, but in a dangerous condition, on November 4th last. This nurse's landlord, a small tradesman, was seized with cholera, and died during the course of the nurse's illness. In the meantime, two brazier's apprentices, in the house of the first named female, were attacked with cholera, and died in the hospital whither they had been removed."

(Cholera in Spain and Portugal, *Medical Times and Gazette*, December 16th, 1865.)

There had never been a case of cholera in the village of Puix previously to August 13th, 1854. On that day a travelling beggar arrived from Belfort, where there was an epidemic of that disease. He was taken care of by Marsot, maréchal of the village, fell sick, and died with all the symptoms of algid cholera. On the 16th, Marsot was attacked and recovered. On the 18th, the woman Stenacre, who had prayed near the corpse of the first victim, was seized with the disease, and died on the 22d; her husband, who, in spite of the warnings of the physician, had continued to occupy the same bed, also died of cholera. Her three children were washed, dressed in clean clothing, and taken away, and the house was closed. On the

25th, Perrot, a neighbor of Stenacre, was attacked and died of the disease. Another neighbor sent away his workmen; two of them took lodgings with Collin, who lived at the other extremity of the village. One of these, Courtenant, fell sick on the 29th, and started for his native village, two leagues distant; being unable to continue his journey, he was accommodated in a barn which was the property of Serre. He remained there some hours, and was taken away by his wife, enveloped in a covering belonging to Serre. On the 30th, Muller, another workman lodging with Collin, had cholera and died on the 31st. On September 1st, the infant of Collin was taken sick with the same disease, and died; and on the 2d September, Desneuty, another pensioner of Collin, was also attacked. A servant of Collin, who had remained with the last two patients, also died on the same day as Desneuty. The wife and children of Collin were sent away by command of the physician, who ordered the disinfection and closing of the house. The husband alone resisted, and slept in the bed where his child had died; he was taken sick and died on the night of the 4th or 5th September.

His wife, who returned after her husband was taken sick, was attacked on the 6th, and recovered.

On the 29th August, a girl, a neighbor of Perrot, who was named Jeannenot, fell sick and recovered.

To return to the focus of infection created by Collin's house. A woman named Copatey, living in an adjacent house, was attacked on the 11th, and died on the 12th; her daughter, who had neglected any disinfection, fell sick on the 15th, and died. The last case in the village was furnished by Claudel, an inebriate.

It will be remembered that Serre had lent a covering to one

of the sick men. His wife went for it to the village near, on the 29th August, and brought it back upon her head. She was seized with cholera on the 2d September and died, being the first case in the village of Chaux. Serre refused to destroy the articles which his wife had used; his mother and a young infant, who occupied the room where she died, fell victims to the disease on the 7th and 8th September.

So from the 13th August to the 23d September, sixteen cases of cholera occurred in Puix, the first evidently imported, the others immediately connected with it, and the dates of their appearance are: 13th, 16th, 18th, 22d, 25th, 29th (two cases), 31st, September 1st, 2d, 4th, 5th, 7th, 11th, 15th, 23d. This was the total of cases observed during forty-one days; the length of the medium period of incubation for each case being sixteen hours.—*Gazette Hebdomadaire*, Nov. 10th, 1865.

The first case of cholera in Munich in 1854 was observed on the 19th July. This patient had had diarrhœa for eight days. The physician in charge of those sent with goods to the grand exhibition, five hundred in number, had noticed since the 17th July that a large number of them were suffering from diarrhœa. On the 25th many were unfit for labor, and every day there was an increase of sickness. From the 25th July to the end of August, there were but a few who escaped an attack of the disease, and eleven died of cholera.

Pettenkofer observed the influence which 253 of these men, who lived in Munich, had upon the spread of the disease. These 253 who were treated for cholerine by the physician above referred to, lived in 242 houses scattered in 110 streets of the city. These 110 streets contained 2460 houses. In 843 of these houses (28.4 in 109) there were cases of cholera. In

242 houses occupied by those sent to the exhibition in charge of goods there were 112 cases (46.2 in 170). These houses were of a moderate character. In examining the table which indicated the cases of cholera according to days, houses, and streets, it was observed that those occupied by the class referred to, were attacked almost always three or four days before the rest.

Before the 9th March, 1854, no case of cholera had ever been observed in La Charité hospital. On the 9th and 14th two cholera patients, a man and a woman, were placed, one on the second and the other on the first story, the most airy in the hospital. From the 15th to the 19th, eight cases of cholera and six deaths occurred, and all the eight were among patients placed near the cholera patients, who had been brought in from the city. On the 19th, five new cases appeared, four in the wards already infected and one in a ward more remote, while as yet there were only two cholera patients from the city.

(Dr. Jules Worms: De l'Invasion de Cholera et de son Mode de Propagation.)

M. Paillard found that of those patients admitted to the Hôtel Dieu from the 26th March to the 31st May, 1832, one house furnished thirteen, another ten; five houses gave each nine patients, and three eight.

At Munich in 1836, 326 cases of cholera were treated at the hospitals; 106 of these appeared in connexion with the arrival of cholera patients from the city.

At Vienna, in 1854, the entrance of every new cholera patient into the common wards was followed by the appearance of new cases.

The terrible début of the epidemic of Paris in 1832 was on the 26th March; but the Academy of Medicine knew that a

case had been observed in the Rue des Prouvaires a month before. The first ravages of the disease were limited to a single street, that of Mortellerie.

In the Sorbonne quarter, the first case was not observed until the 28th March at No. 5 Rue de la Parcheminirée. The second case on the 29th was furnished by the same house. On the following days cases were observed in the immediate neighborhood; it was not until the 4th and 5th of April, that the disease extended to higher streets.

"The Vomero, one of the most considerable heights at the back of Naples, is the residence of a great number of laundresses, where a large portion of the dirty linen of the Neapolitans is washed. Nineteen of these poor women have been attacked, and five have died. The height and healthy air of the Vomero seemed to preclude the possibility of cholera ascending there, but it has been discovered that the linen of those who had died or had been attacked by the malady had been sent up there." —London *Lancet*, Dec. 8th, 1865.

An individual who had recovered from cholera sent his clothing to be washed in his native town of Rovigno, where no other cases of cholera occurred except those of three women in his family, who washed the clothing, and all of whom died.

(From a recent work on the cholera in Marseilles, by MM. Sirus, Pirondi, and Fabre.)

TRANSMISSIBILITY BY CHOLERAIC DIARRHŒA AND DEJECTIONS.

The idea of attributing the spread of cholera in a great degree to the dejections is a very old one. Jameson noticed in 1817 in the English camps the frequency of cases of cholera near latrines.

Delbrück relates, in his narrative of the epidemic in the prison of Halle, the pernicious influence of the proximity of these places, where the dejections of the sick were cast, upon prisoners who were lodged in cells remote from those places, but who made use of them; the cleansing and disinfection of these localities and the burying of the choleraic dejections had the effect of restraining the epidemic.

During the cholera in Oxford in 1854, Ackland made similar observations, and was led to regard the dejections as one of the means of propagation.

Thiersch's experiments on animals, to which reference is sometimes made, were as follows:—

He mixed small pieces of filtering paper, which had been dipped in the rice-water discharges and then dried, with the food of a certain number of mice. This imbibition was first practised with the fresh discharges, then with some which had been voided six days and kept at a temperature of about 55° F., and afterwards upon a still older dejection. 104 mice swallowed fragments of these papers; those who partook of the fresh dejections had no bad symptoms, but of the 34 which swallowed the paper dipped in discharges from three to nine days old, 30 became sick and 12 died. The symptoms presented were watery dejections, the disappearance of urinary odor, then suppression of urine. There was no vomiting. Some showed tetanic spasms before death.

The autopsy revealed congestion of the intestines, separation of their epithelium, fatty degeneration of the kidneys, and an empty bladder. Papers dipped in dejections of an older date did not produce any effect.

M. Robin injected the vomited and excreted matter of cholera patients into the trachea and veins of two dogs, and to a third dog he administered the matter vomited by a fourth dog, to which he had given the blood and serum of a cholera patient. In the three cases he observed the vomiting and other symptoms of cholera.—(*London Lancet*, January 13th, 1866.)

On the 24th September, 1854, a young vagrant, who had suffered from diarrhœa for five days, was placed in the infirmary of the prison of Diebourg. He had been walking a long distance, and had already been treated in a penitentiary upon his route. No case of cholera had ever been seen in the prison of Diebourg previously to his arrival. He was seized with vomiting in addition to his diarrhœa on reaching the prison, but no other choleraic symptoms appeared. On the 12th September he left the infirmary completely restored.

He had occupied a small apartment in common with six prisoners affected with phthisis and traumatic diseases.

On the 29th September, five days after his arrival, one of the prisoners placed in this apartment was attacked with cholera, on the 30th a second, and on the 3d of October a third. The first two died speedily. Cases multiplied in the prison, and of 249 prisoners, male and female, there were from the 30th September to the 8th October, 36 *cholerines* and 38 cases of cholera, of which 26 were mortal. Only one inhabitant of the *city*, the husband of one of the women employed in washing the clothing of cholera patients, was seized with cholera and died.—*Gazette Hebdomadaire*, Nov. 10th, 1865.

During the epidemic of 1849, a soldier from Paris suffering from choleraic diarrhœa arrived at his home in a little village twenty-five kilometres from Amiens, where no case of cholera had been observed. He was put to bed and cared for. Four individuals in the family were attacked with cholera a few days after the arrival of this man, who had only a *cholerine*. Of these six persons, four died.—Dr. Jules Worms, *Gazette Hebdomadaire*, Nov. 10th, 1865.

On the 20th August, 1854, a man named Grassl was conveyed to the prison of Ebrach. He had been confined four days in a prison in Munich, in which were several cases of cholera. He left Munich with the diarrhœa, and a short time after his arrival in Ebrach, the diarrhœa continuing, he was placed in the infirmary. The keeper of the infirmary who took care of him was seized with a violent attack of cholera on the 27th, which proved fatal. The epidemic then spread in the prison for males, and also attacked that of the females, completely separated. The first victim was the woman Maier, who had washed the soiled clothing of Grassl, who, attacked with *cholerine*, had introduced cholera.—Pettenkofer.

On the 12th October, 1854, cholera suddenly made its appearance in the Horfield Barracks, about two miles from Bristol; and on the following day I was summoned to the barracks, to advise as to what steps should be taken in the emergency. The disease had been for some time more or less prevalent in the neighboring city; and the village of Westbury, rather less than a mile away, had also quite recently been the scene of a severe outbreak of it. In the barracks, being of recent date, it had not as yet made much head. On my arrival, I found that two men, Cox and Williamson by name, were in hospital, in

the stage of collapse; and that two others were suffering from severe choleraic diarrhœa.

At the date of this outbreak there were living in the barracks from five to six hundred men, for whose use there were five privies, the whole of which were, as I was informed, in a very offensive state. In consequence of the protracted drought, the barrack pumps had lately failed, and all the water used in the barracks had to be got from a distance.

With a view to check the spread of the disorder, I advised the immediate adoption of the following precautions:—

1. All discharges from sick men to be received, *on their issue from the body, if possible*, into vessels containing a strong solution of chloride of zinc.

2. All linen tainted with these discharges to be placed, *without loss of time*, in water strongly charged with the same disinfectant. Tainted mattresses, and other articles not admitting of this treatment, to be burnt.

3. The privy into which the discharges from the sick had been thrown, *to be reserved exclusively for that purpose.*

4. That, and all other privies in the barracks, to be thoroughly disinfected twice a day by the liberal use of chloride of lime and of chloride of zinc, in solution.

5. All men in barracks to be mustered twice a day, and examined as to the state of their bowels.

6. A watch to be kept on the privies; and every man seen going twice to the privy within a short space of time to be treated as a cholera patient.

7. The men to be prevented from visiting the neighboring infected city and village until the subsidence of the cholera epidemic.

The result was that, within the next few days, some eight or

ten cases of severe diarrhœa were detected, which were at once dealt with, and which soon yielded to appropriate treatment. *No other case of confirmed cholera occurred in the barracks.*

(Memoranda on Asiatic Cholera, &c. By William Budd, M.D. Bristol, 1865.)

Quarantine.

At Salonica, Syra, the Piræus, and Sicily, where most rigid quarantine regulations were established during the last year, there was no epidemic of cholera.

Salonica is the second maritime city of Turkey in Europe. No case of cholera was observed in the city, although at the lazaretto, among the travellers from Constantinople, there were sometimes as many as thirty deaths daily. The invasion of nearly all the surrounding villages produced great terror. The people rose and threatened to repulse strangers by force, in case they were received in the lazaretto near the city. Two ships were obliged to withdraw and land their passengers upon an island in the Gulf of Volo.

On the 9th of July, the Cydnus, coming from Smyrna, wished to anchor in the port of Lyra, but cannon were directed upon her, and she was forced to put to sea. On the Grecian continent the quarantine was of the severest character. Importation and exportation were prohibited. While keeping out everything of a suspicious character, they allowed no ships to leave port, lest, by going to contaminated countries, they might be exposed to infection.

As a consequence of the prohibitory measures taken in the Papal States, this portion of Italy has also been preserved. In Genoa and Leghorn quarantine regulations also seem to have been effectual.—*Gazette Hebdomadaire*, Oct. 20, 1865, p. 658,

and the same journal, Nov. 3, 1865, p. 689. Le Cholera et les Quarantaines en 1865, Dr. A. Espagne.

The following statements were made at a meeting of the Société Médicale des Hôpitaux, held November 8th, 1865, with regard to the effects of isolation during the late epidemic in Paris.

The cholera did not make its appearance at the hospital of Saint Antoine until late enough for making special preparations against its spread. This was impossible at Lariboisière and Beaujon, hospitals where the first patients had been sent. As a consequence of special measures employed in Saint Antoine for three weeks, no cases originated in the hospital.—M. Boucher.

M. Hillairet states that at the Hospital St. Louis, where perfect isolation had been practised, by placing cholera patients in a pavilion at the bottom of the garden, there had only been twelve or thirteen cases which commenced in the hospital.

M. Bucquoy stated that in the military hospital of Gros-Caillou, where 180 cholera patients from outside had been isolated in a pavilion situated in a garden, no cases had originated in the hospital. The choleraic dejections had been immediately disinfected by sulphate of iron.

M. Bernutz observed that the same precautions had been taken in the cholera service of the Hôpital de la Pitié. Here 30 cases had originated within the hospital, and 131 had been brought from outside. Among the cases which appeared primarily within the hospital, twelve came from a surgical ward near to the apartment containing the bedding which had been used by cholera patients.—*Gazette Hebdomadaire*, Nov. 10th, 1865.

"On the 22d of last July the first case of cholera appeared

at Barcelona. It was a priest recently arrived from Valentia, where the disease had been prevailing fifteen or twenty days. From the 25th July to the 10th August there was no *death* from cholera. But on the night of the 10th and 11th August, there were seven cases, and from that time they followed uninterruptedly. I have no doubt, as a result of my researches, that the first persons attacked were in more or less immediate connexion (rapport) with the patient of July 22d. I followed the first eight cases step by step."—(Letter from Dr. Ribell of Barcelona to the Editor of the *Gazette Hebdomadaire*, Nov. 17th, 1865.)

In 1832 a stage driver affected with cholera came to the town of Somers, in Westchester Co., New York State. There was then no cholera in Somers, nor was there railroad communication between the town and New York. From the time when the stage driver arrived the disease spread throughout Somers, and one in four of the inhabitants was attacked. Half of those who had the disease died.

Treatment.

The following carefully arranged table of twenty-five cases is interesting as showing the results of treatment by evacuants. The diarrhœa was treated with sulphate of soda in purgative doses. Ipecacuanha was used when there was a furred condition of the tongue. These were the principal medicines given.

From Oct. 20th to Nov. 1st there were *thirteen deaths* among fifteen cases; from Nov. 1st to Nov. 9th two deaths among ten cases. The latter were among children, and during the decline of the epidemic.

Dates.	*Profession and Age.*	*Constitution.*	*Recovery.*	*Deaths.*
Oct. 20.	Mason, 48 years.	Debilitated		Oct. 21.
" 20.	Mason, 26 years.	Good		" 26.
" 21.	Mason, 53 years.	Good		" 22.
" 22.	Mayor of city, 66 years.	Good		" 24.
" 23.	Miller, 36 years.	Good	Nov. 5th.	
" 24.	Gardener, 36 years.	Feeble		" 29.
" 24.	Fruiterer, 49 years.	Good		" 29.
" 25.	Laborer, 29 years.	Good		" 28.
" 25.	Fruiterer, 52 years	Good		" 28.
" 28.	No profession, 33 years.	Good	Nov. 2d.	
" 28.	Scieur de long, 47 years.	Good.		" 31.
" 30.	Infant, 15 months.	Good.		" 30.
" 30.	Infant, 2 years.	Good.		Nov. 1.
" 31.	Gardener, 41 years.	Good.	Nov. 11th.	
" 31.	Infant, 3 weeks.	Good.		Nov. 1.
Nov. 1.	Infant, 9 months	Feeble		" 2.
" 3.	Infant, 18 months.	Feeble		
" 3.	Joiner, 47 years.	Good.	Nov. 11th.	
" 3.	Scieur de long, 18 years.	Good.	Nov. 11th.	
" 3.	Journalist, 30 years.	Fair		
" 4.	Child, 8 years.	Weak		
" 4.	Child, 6 years.	Weak		
" 4.	Child, 2 years.	Weak		Nov. 8.
" 7.	Child, 12 years	Good.		
" 9.	65 years.	Worn out		Nov. 10.

—*Gaz. des Hôpitaux*, Nov. 25, 1865.

It has been supposed that copper is a preservative against cholera, and that artisans engaged in working in this metal are not likely to be attacked by the disease. Dr. Mesnet (Archives Gén. de Médecine, Feb. 1866) reports eight cases which occurred in the hospital of St. Antoine, during the late epidemic, among workers in copper; of eight attacked, five died in collapse.

Rum and tea were used as drinks for cholera patients during the prevalence of the epidemic in Paris. The elixir of the Grande Chartreuse was found to act remarkably well in some cases as a stimulant. The high price of this cordial would prevent its general employment.

Table of the Total Number of Cases (3,727) *of Cholera treated in the Metropolitan Hospitals and Districts, and in the Provincial Districts throughout England and Scotland, showing the percentage of Mortality.*

	Collapse Cases.	*Consecutive Fever.*	*Deaths.*	*Percentage of Deaths.*	
				Total Cases.	*Collapse Cases.*
Of 2,142 *cases treated by alteratives.*					
637 calomel, small doses	416	94	315	49.4	75.7
767 " larger doses	590	160	353	46.0	59.8
472 " with opium	295	140	169	35.8	57.2
80 other preparations of mercury	59	17	42	52.5	71.1
186 salines	140	40	94	50.5	67.1
Of 865 *cases treated by astringents.*					
488 sulphuric acid	307	65	235	48.1	76.5
27 other mineral acids	21	3	11	40.7	52.3
201 chalk mixture and chalk and opium	79	32	55	27.3	67.0
81 acetate of lead and opium	65	26	50	61.7	76.9
36 opium	15	14	11	30.5	73.3
13 preparations of iron and alum	7	2	6	46.1	85.7
19 gallic acid and other astringents	9	4	5	26.3	55.5
Of 548 *cases treated by stimulants.*					
114 ammonia	90	18	70	61.4	77.7
154 ether	73	22	65	42.2	89.0
138 brandy	108	25	87	63.0	80.5
31 chloroform	23	7	15	48.3	65.2
111 other internal and external stimulants	80	16	50	45.0	62.0
Of 172 *cases treated by eliminants.*					
150 castor oil	134	19	104	69 3	77.6
21 emetics	21	1	17	80.9	80.9
1 olive oil	....	....	....	.....	.....

General Board of Health. Report on the Results of the Different Methods of Treatment pursued in Epidemic Cholera, in the Provinces throughout England and Scotland in 1854; being Supplemental to the Metropolitan Report, addressed to the President of the General Board of Health. By the Treatment Committee of the Medical Council, 1855. P. 24.—(*Medical Times and Gazette*, October 27th, 1855.)