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IN THIS ISSUE

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Ruth Kahl Assigned to State Department as Director of Nursing

Ruth Kahl, Public Health Service nurse officer, has been assigned to the Department of State as director of nursing for its domestic and foreign health services.

In her new post Miss Kahl will work with Dr. V. T. DeVault, director of the medical staff at the State Department. She will direct nursing services of the Department's 21 health units, 6 in Washington, D. C., and 15 abroad, including those in the United States Embassies in London, New Delhi, Tehran, and Manila.

Miss Kahl will take the position left vacant by the death of Emijean Snedegar, a Public Health Service nurse officer who was killed in a plane crash near Tehran while on a field trip last December.

Miss Kahl had been in Salt Lake City for the last 2 years, assigned to the Public Health Service Occupational Health Field Station as public health nurse consultant. For 7 years prior to that, she was consultant to the Occupational Health Division at Public Health Service Headquarters in Washington.

University Establishes New Department

The University of California recently has established the department of occupational health for the study and prevention of occupational diseases on the several campuses of the university. Fred R. Ingram, formerly chief engineer with the California Department of Public Health, Bureau of Adult Health, is now a staff member of the new department, located at Berkeley, Calif.

COVER PICTURE—A large melon patch at Blythe, Calif., is dusted with an insecticide from the air. Courtesy of the U. S. Department of Agriculture.

Photograph at Right

A steep climb at the edge of a field being sprayed with insecticide is necessary to clear trees, traffic and telephone or light wires. Accidents have occurred when the pilot's vision is dimmed by dust on his goggles or by toxic effects of the insecticide.

Airplane Pilots Using Organic Phosphorus Insecticides Can Be Protected From Toxic Dusts and Sprays

By Ralph R. Sullivan, M. D., M. P. H.[1]

THE RAPID and tremendous increase in the use of organic phosphorus insecticides by not only the professional applicator on farms and in orchards and nurseries, but also by the amateur home gardener, is a public health responsibility of considerable import.

The limited knowledge regarding the possible chronic effects of prolonged exposure to amounts below that necessary to produce acute poisoning necessitates additional careful study. Another unknown is precise information about the extent of drift and its effects upon personnel and livestock in the vicinity of spraying and dusting operations.

The area of public health interest covered in this article encompasses the cause of accidents, fatal and nonfatal, as a result of impairment of vision, lack of proper coordination, or other physiological disturbances. This report is based upon the investigation of the experience of an airplane applicator of tetraethyl pyrophosphate. His life was, according to his own statement, saved by information he received at an airplane dusters and sprayers short course given by the Industrial Hygiene Section of the Oregon State Board of Health just 6 months before. A brief report of a second pilot applicator of TEPP involved in a fatal crash is included in the discussion.

Abrams (*1*) and others are inclined to believe that at least some of the airplane crashes that have occurred during dusting or spraying operations have been due to the pupil-constricting effect of the organic phosphates used. Abrams and Leonard (*2*) listed in their summary of organic phosphorus poisoning cases reported to the California Department of Health during the period January 1, 1948, to August 31, 1949, two helicopter applicators of TEPP, and one airplane applicator of HETP. The latter crashed. The cause of the crash was not certain but was believed to be due to pupillary constriction, the pilot having complained of poor vision during the reloading operations.

The following description of this fatal plane crash, quoted from an article by Abrams (*1*), is presented here because the author's case history could have matched it, but fortunately did not: "The pilot had been up twice that day and crashed into a row of trees on his third flight. He had been dusting with sulfur and the hopper leaked so badly he was completely covered from head to toe with the sulfur. No changes were made in the set-up when he started using the plane for parathion. The man who assisted the pilot in loading the plane for his last flight said the pilot had remarked about his eyesight diminishing but passed it off as a minor matter. The investigation revealed little as the plane and pilot were destroyed by fire."

Case Report

C. N., age 35, a pilot with considerable World War II and commercial airlines and airplane crop dusting and spraying experience, had been in excellent health as far as he was aware until June 24, 1951. Up to that date he had had no known contact with organic phosphate insecticides in any form. For several days prior to June 24, he had not been flying his regular assigned plane but had used one with a leaky hopper lid. Since he thought he was flying DDT and sulfur, neither this leaky hopper nor the fact that he was later covered with dust from head to foot, disturbed him, he stated.

At 8 a. m. on June 24, he left the airport loaded with TEPP dust to be applied on a field of beans. The second and third loads were taken on at the bean field, a common practice, the insecticide being trucked out from the airport to the place where it was needed. The pilot did all his own loading, handling the dust with his bare hands.

He stated there was comparatively little dust as he parked cross-wind and

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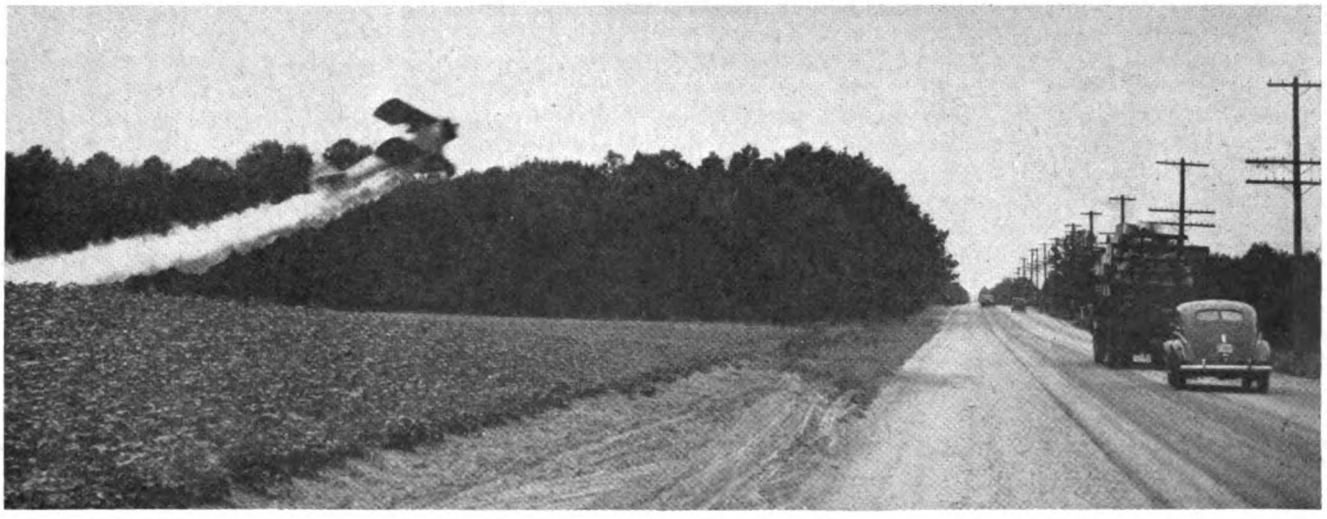


cut the bags in the middle to reduce the amount of dust. Although he handled the bags himself, he was totally unaware of the fact that he had TEPP, assuming that he had DDT. No protective clothing or equipment of any kind except regular flying jacket and goggles was worn. In fact, though there were about 50 planes operating from the flying service where he worked, he had never observed or heard of any protective equipment being available. The subject of respiratory or other protective equipment or precautions, such as not handling organic phosphorus insecticides with the bare hands, had never been discussed with him by the management of the flying service.

Very soon after taking off with his first load, he noticed that clouds of dust periodically entered the cockpit from the leaky hopper; in a short time his clothes and exposed skin were completely covered. On his first and third loads he had to make an abrupt pull-up at each end of the field to avoid trees and a power line; on the second load the ends were open or without any obstruction. He was through with the third load and back at the airport by approximately 9 a. m.

He was unaware of anything actually being wrong with his flying but did notice two rather puzzling incidents. One, while taxiing beside the bean field preparatory to take-off on the third load, he passed too close to a stack of baled hay and struck it with the tail of his ship as he turned. Though chagrined at the time, he dismissed the incident from his mind.

The second situation of which he was aware but couldn't understand was a series of bad or inaccurate passes while laying the third load. He cut off and pulled up too soon on some passes and extended the insecticide well beyond the bean field on others. Although he was able to make the necessary abrupt pull-ups just beyond the end of the field to avoid trees and a power line, he knew he was having considerable trouble telling when he actually reached the end of the field. This difficulty was attributed at the time to dust on his goggles.

No other difficulty was noted until after returning to the flying field at about 9 a. m., when he was aware of a "gravelly soreness" in his eyes, diminution of vision, headache, and nausea. It happened that, on this day, the manager of the flying service, who is also a pilot, was out-of-town. The manager's wife requested the pilot to immediately take care of two hop fields which were to be dusted with TEPP. His difficulty in seeing caused him to refuse to go although he was told there was nothing in the insecticide that could possibly hurt him.

A few drops of oil were placed in his eyes, and he was instructed to work on engines in the shop. About 9:15 a. m. he washed his face and hands, but continued to wear the same clothing although it was saturated with dust. The headache. and nausea became worse, but he remained at the airfield until early afternoon. Quite by chance, his attention was drawn to a bag of the same insecticide used that morning which happened to be on the pickup truck as he passed. For the first time he carefully read the label, noting the content of TEPP and the reference to precautionary measures.

Recalling some of the information he had been given at the State College airplane dusters and sprayers short course, he became concerned about his symptoms and returned to his home. About 2 p. m. he took a bath and went to bed. His wife remarked that his hair, ears and clothes were loaded with insecticide dust. When awakened at 5 p. m., he was still nauseated, had difficulty in seeing and suffered from a persistent headache.

About 7 p. m. he noted that he was unable to drive his car to a nearby community because of diminished vision, and a relative had to do the driving. They returned about 8:30 p. m. About this time some difficulty in breathing, wheezing, discharge from the nose and throat, and coughing up of mucus were noted; his headache became more severe; the nausea increased. Later in the evening, after going to bed, he complained of being cold, although the room was very warm; of a pressure feeling over the chest; and of gas distension without abdominal cramps.

The following morning he felt somewhat improved but was still aware of dimness of vision. He called the flying service to see if some other pilot could complete the unfinished work on the hop fields. Considerable pressure was applied by the manager to get him to come back to work; his illness was minimized, and he was told it was "all in his head." If the manager had not returned in time to do the work, C. N. stated he probably would have gone back to work despite his visual difficulty.

Instead of returning to work, he attempted to see physicians in two different communities without success, returning home shortly after noon. A gradually increasing numbness in hands, feet, and legs was noted, and the pilot's wife became worried by the fact that her husband "looked bad" and seemed to be confused mentally, not making sense in what he said, as she put it.

About 2:45 p. m. he was taken to a physician who noted that his patient had markedly constricted pupils, numbness of hands and feet, difficulty in breathing, marked cardiac irregularities (extrasystoles), and that he appeared to be somewhat "groggy" and depressed. One intravenous dose and 5 intramuscular doses of atropine were given during the next 4 to 5 hours. Atropine every 4 hours by mouth was continued for several days at home.

The plasma cholinesterase was found to be markedly depressed on June 25. Upon returning home the patient continued to be somewhat confused, and was very restless throughout the night. Except for a recurrent numbness of the right index finger, marked improvement was noted by the next day, followed by virtually complete recovery by June 28, 4 days after the poisoning.

He was again urged to return to work on June 26 and 27, but was forbidden by his physician to do so. Marked depression of the red cell cholinesterase was observed in specimens collected on June 27 and 28. By July 7, the blood plasma cholinesterase had returned to normal, but the red cell level was still depressed on July 12. Return to flying was delayed until approved by his physician, but there was a firm resolve by this pilot never to have anything more to do with organic phosphorus insecticides. There was a very deep conviction that on this occasion he was most fortunate to have escaped a crash that might have taken his life.

The investigation of this case brought about a review of the entire subject of the hazards connected with airplane application of the organic phosphorus insecticides, what protective measures were available, and to

what extent they were being used by pilots.

It occurred to the author that at least some of the fatal and nonfatal airplane accidents which were occurring all too frequently during crop dusting operations might be the result of organic phosphorus effects. The value of investigating all fatal and nonfatal crashes occurring in the State during crop dusting operations was considered. Conferences were held with the Safety Division of the Civil Aeronautics Administration and the State Department of Agriculture to learn more about agency areas of responsibility and programs. Stimulated by the above reported case, a fatal crash involving a crop-dusting operation on June 27 was investigated with the assistance of a county health officer.

Case Report

The pilot crashed as a result of a wing tip striking a tall tree which was allegedly difficult to see as he pulled up from a pass over the field being dusted. This explanation of the crash was supplied by the flying service manager, not the pilot. At the time of the crash he was applying 10 percent DDT with 25 percent sulfur, so that it did not appear as though there could be any relationship between the crash and the effects of the insecticides being used.

No information regarding any complaints of the pilot as to visual difficulty could be obtained from the flying service manager. The latter stated that it was his practice to observe the pupils of the eyes of his flying personnel just before take-off to see whether they were constricted. However, the manager was not at the airport for the 2 days preceding the crash and therefore could not give any information about the flier's eyes during this most important period.

Of special interest was the examination of the flier's worksheets available at the airport which disclosed that during the 6 days immediately preceding the day of the crash this pilot had dusted a total of 5,500 pounds of a TEPP dust preparation and 335 gallons of TEPP spray. Earlier in the day of the crash he had sprayed 105 gallons of TEPP insecticide. No protective equipment of any kind was used. Unfortunately, a cholinesterase test was not obtained.

Discussion

Though not possible to prove, it is believed by the author that there may have been a definite relationship between the accumulated organic phosphate effect and the crack-up. The duration of the miosis in two helicopter applicators of TEPP reported by Abrams and Leonard (*2*) was 72 hours in 1 and 4 days in the other who crashed.

The relatively long duration of miosis in these cases certainly indicates the necessity of thoroughly investigating the pilot's insecticide exposure history for at least a number of days prior to the day of the crash if the true relationship between organic phosphorus insecticides and both fatal and nonfatal pilot accidents is to be adequately explored.

The investigation of both of the cases reported herein brings out rather forcibly the lack of knowledge or application of knowledge relating to the safe use of the organic phosphorus insecticides by airplane applicators. The author has visited quite a few air as well as ground crop-dusting and spraying operations, discussed the subject of protective measures with applicators, managers, county agricultural agents, and the sales of representatives of respiratory protective equipment manufacturers.

Despite the excellent educational efforts of one of the major organic phosphorus insecticide manufacturers and the precautionary measures listed on the package label in all cases, however small the print, the response has not been encouraging, particularly in respect of the use of full-face gas masks and respirators. Unfortunately, until recently there has not been a respirator effective against TEPP.

(Editor's Note: Recent information obtainable from the U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine discloses there is now such a respirator approved. It is Willson's Agritepp respirator and it has had wide distribution.)

Pilots have repeatedly explained to the author that they absolutely cannot use either a full-face gas mask or a respirator because of conditions of operation peculiar to small area dusting and spraying. They point out that in order to have maximum visibility for the abrupt pull-ups required, the seat must be propped up so that the pilot has an acute angle of vision off the nose of his plane. In most cases this means his head is above the windshield and it is contended that the 60 to 70 miles per hour slip stream tears off the regular respirator or full-face gas mask unless the straps are so tight as to be unbearable.[2]

It is rather significant to note, however, that many pilots still wear ordinary flying clothes instead of repellent clothing, handle organic phosphorus insecticides with bare hands, fly planes with leaky hoppers, and fail to read labels. There also appears to be too little appreciation of the extremely high toxicity of the entire group of organic phosphorus insecticides and the relative toxicity of the different members of the group.

Many fail to appreciate that TEPP is considerably more toxic than parathion,[3] as pointed out by Lehman (*3, 4, 5*). The term parathion poisoning seems to be used too frequently as a generic term in place of organic phosphorus poisoning, thus giving the impression that parathion is the prime or perhaps the only offender in the group. There also appears to be a tendency for users to form their own opinions as to the relative toxicity of the different types of organic phosphorus insecticides, guided perhaps by the statements of salesmen rather than other sources of information.

As the final phase of this discussion, it is believed important to consider the methods or means available, particularly to public health departments, for safeguarding the health of airplane applicators of the organic phosphorus insecticides and their ground crews.

(Continued on next page)

Editor's Notes:

[2] Pilots from the U. S. Department of Agriculture tested the respirator now available and found that the slip stream did not blow them off even though they were not excessively tight.

[3] According to A. J. Lehman this is true only of acute toxicity and is questionable on an occupational hazard basis. TEPP acts more rapidly, however, than parathion and, on that basis, could cause more crashes. Reference: *Association of Food and Drug Officials of the United States*, 16: 1 (January) 1952, and 16: 2 (April) 1952. Reprints are available for 30 cents each from Mr. Evan Wright, secretary-treasurer, Association of Food and Drug Officials of the United States, care of Kansas State Board of Health, Topeka, Kans.

Another very important related aspect of the subject—that is, the protection of residents from organic phosphorus insecticide drift—will not be included. The methods available here, as in other areas of public health concerned, are regulations and education.

Considerable effort has been expended in disseminating information to all users, including the airplane applicators, with strong emphasis on the extreme toxicity and the absolute necessity of observing all the precautions for the protection of the user's health. This has been done by insecticides manufacturers, by Federal and State regulatory officers, by local health and agricultural agencies, by the American Medical Association Committee on Pesticides, by the Civil Aeronautics Administration, and by the daily press, farm and other journals.

In Oregon the State college established a short course of 1 week's duration specifically for aerial dusters and sprayers, the first being held in January 1951. The observations of aerial and ground application in one State during the past summer would indicate that much more intensive educational effort is essential. These special precautionary measures include the following:

Special Clothing for Pilots

Wear waterproof or dust-tight clothing covering all exposed skin surfaces. The clothing should be snug-fitting at the wrists and ankles to prevent the entrance of dust. A flannel scarf should be used to cover the neck. A plain canvas helmet is recommended because it is easily laundered. Change to clean clothing each day. If rubber gloves cannot be tolerated during flying, canvas gloves can be used.

Personal Hygiene

Wash hands, arms, and face thoroughly with soap and water after handling insecticides and before eating or smoking. Bathe promptly after each day's spraying or dusting. Wear fresh laundered clothing, including underwear, each day. If clothing becomes saturated with the liquid or dust mixture, immediate showering and change to clean clothing are necessary. ***Remember that organic phosphorus insecticides are absorbed through the skin.*** Prompt removal from the skin of any appreciable amount of these insecticides is highly recommended.

Respiratory Protection

Respirators or gas masks of approved types are available which will afford adequate protection to pilots (current list may be obtained from the U. S. Department of Agriculture and the State boards of health.) Pilots should not assist in the loading of hoppers, which should be done by a loader wearing a gas mask.

Mask types of goggles do not give a tight fit over the nosepiece of a respirator, hence if a respirator is worn, the pilot should use care in selecting goggles to make sure of a tight fit over the nosepiece.

Equipment Safety

Hopper and spray tank doors should be carefully sealed with a sponge-rubber or felt gasket. ***Don't fly a plane with a leaky hopper when using any type of organic phosphorus insecticide.*** An airtight baffle should be provided across the fuselage behind the cockpit to prevent entrance of dust through the tail wheel insert. If there is no windshield, a fairing should be fixed between the hopper and the cockpit to prevent, during loading, the lodgement of dust, which will later blow into the cockpit.

Operational Procedures

When filling the hopper or spray tank, in accordance with the recommendation of the Civil Aeronautics Administration, pilots should shut off the engine and get out and away from the cockpit. Clean the cockpit and aircraft frequently. Mechanics working on planes which have flown organic phosphorus insecticides must exercise precaution against inhalation of dust and skin contact. Dust or spray from a previous pass should be avoided as much as practicable. Fly cross-wind, beginning at the down-wind side of the field.

Health Supervision

Pilots should know what insecticide is being used and must be particularly alert to the onset of visual difficulty when applying any of the organic phosphorus group. They should immediately terminate their flying when they become aware of diminished vision or other early symptoms and should be seen by a physician. Periodic (weekly) blood cholinesterase tests are advisable for all airplane applicators during the period when they are using appreciable amounts of the organic phosphorus insecticides.

The recommendation of a weekly blood cholinesterase test for all airplane applicators during the period when the organic phosphorus insecticides are being used to an appreciable extent may be questioned by some. Considering the difficulties experienced by pilots in wearing respirators and the apparent reluctance to carry out other precautionary measures, the periodic cholinesterase test may prove to be the only means of protecting the health of the sprayers and other employees exposed to the organic phosphorus insecticides.

Bidstrup (*6*), a British investigator, in an article on this subject, recommends that "routine estimations of cholinesterase activity of plasma and red cells should be made at weekly intervals in all persons exposed to parathion, HETP and TEPP."

In respect of regulations for the protection of airplane applicators and their ground crews, several points are of special interest. Civil Aeronautics Administratfon, although concerned with its primary responsibility of determining the air-worthiness of aircraft, is interested in bringing about corrections of such an important defect as leaky hoppers in planes used for dusting or spraying of toxic insecticide.

The Agricultural Chemical Control Act, passed by the 1951 Oregon Legislature, provides for the regulation of aerial application of any materials for agricultural purposes, including licensure of the applicators. The applicants will be required to pass an examination as a prerequisite to licensure and short courses will be set up for training and preparation of pilots desiring to be licensed under the act.

The Oregon State Board of Health, Industrial Hygiene Section, has cooperated with the Department of Agriculture in two important aspects having to do with the implementation of the act's provisions: (1) Preparing, upon request of the State department of agriculture, the section of a proposed

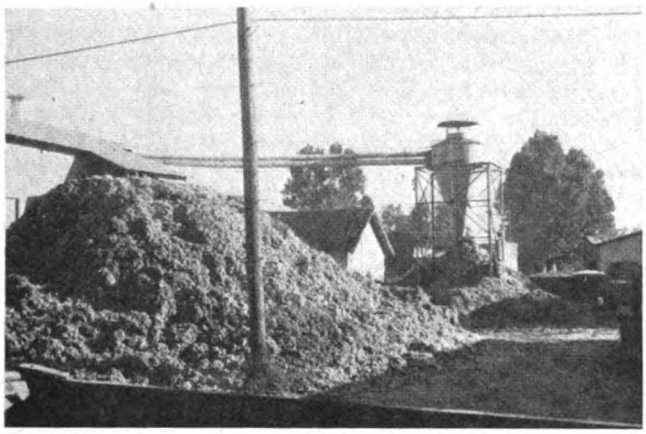
(Continued on page 104)

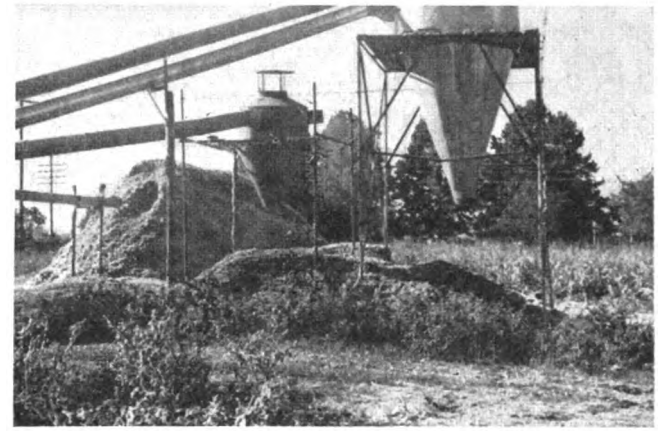
INSECTICIDE SPRAYING AND COTTON DUST NECESSITATE CONTROL MEASURES

At least four or five pilots were killed in Louisiana during the 1951 season while dusting cotton with insecticides, according to a report from Louisiana's Industrial Hygiene Section of the State Health Department.

Another problem that is reported frequently is that of dust drifting to nearby houses when the planes climb to make turns around the field. Claims of illness have been made, but no case has been verified as due to insecticides. Studies of atmospheric concentrations and water in nearby cisterns are being made to determine any possible hazard.

Recommendations have been made to minimize exposure of citizens and pilots.





Trash and dust from cotton gins.—Cyclone dust collectors are used to settle dust from the discharged air, but some is still blown away. Gin workers may have transient effects from dust, but short seasonal operation prevents the more permanent effects that sometimes develop in cotton mills.

Cotton hull and trash piles such as these were much larger than usual in 1951 because much cotton was pulled with the hulls instead of being picked from hulls.

Fatality Results From Spraying With Unknown Chemicals

By Chester L. Ura [1]

CARBON TETRACHLORIDE claimed a painter as one of its latest victims when orthodox degreasing procedures were considered too tedious to be used for preparing machines prior to painting them. Twelve men were involved in the operation which produced one fatality and three illnesses when a mixture containing carbon tetrachloride was sprayed on machines and then wiped off to facilitate the removal of grease.

The men involved were employees of a firm which was under contract to paint machinery in a manufacturing plant in Detroit. Work was done on these machines on successive week-ends. No trouble was encountered the first week-end because an alkali-type degreaser was used to perform the task of preparing the machines for painting. On the following week-end, however, other degreasing methods were tried in order to speed up the operation.

Solvents, among them kerosene and other petroleum derivatives, were tried but were unsatisfactory for various reasons. Toward the end of the operation, someone made the suggestion that a solvent mixture which was on the plant premises be tried, since it was found to be very effective on other similar applications. Eight gallons of this mixture were sprayed onto the machines before one of the men engaged in wiping the degreasing solution from the machines collapsed and was taken to a hospital where he died. Three other employees became ill. The solution in question was found to contain a 50–50 percent mixture of carbon tetrachloride and naphtha.

The work was done on a week-end when most employees were absent and the mixture was used near the completion of the job, otherwise, the consequences could have been much more severe and a greater number of workers might have been affected. The fatality was diagnosed as "uremia, lower nephron nephrosis" brought on by carbon tetrachloride poisoning, further complicated by pneumonia after 1 week in the hospital. Death occurred 15 days after admission to the hospital.

[1] Mr. Ura is industrial hygienist, Bureau of Industrial Hygiene, Detroit Department of Health, 1151 Taylor Ave., Detroit 2, Mich.

We Need the Older Worker—Let's Keep Him on the Job

By Winifred Devlin [1]

THE TREND toward increased health services for the general population magnifies the question of how health needs of older people can be most adequately met, in terms of employment and employability. In our civilian labor force of over 64,000,000 workers, there are now over 22,000,000 persons 45 years of age or older. As the number increases, several challenges confront all health personnel concerned with industrial medicine.

We need to study normal senescence of middle-age and elderly people to adequately approach the problem of chronic illness. We need to expand our knowledge of heart disease and cancer. We need to know the response of bodily organic systems to occupations, to determine work capacity. We need to develop criteria to evaluate health status and to test therapeutic regimes designed to minimize disabilities that develop with increasing age.

Medical departments of industrial establishments constitute the laboratories for clinical research in these areas. The well-established ones are already engaged in assembling data. We shall, however, not move forward as rapidly as we should unless we reevaluate more carefully the potential capacity of every health discipline in this field. This suggests consideration of the role of the nurse in clinical research.

If well-planned longitudinal studies are to be undertaken in industry, to provide information on the incidence and progress of chronic illness, the nurse is one of the most logical persons to participate in collection of data. No one person with specialized health knowledge has as many contacts with the worker as the nurse in an industrial establishment. This gives her unparalleled opportunities to observe patterns of behavior, general physical fitness, and symptomatology of potential disability.

Complete and adequate recordings of critical observations which will provide a basis for continued study can be made by the nurse under a well-planned research design. It would be folly not to put to scientific use the special knowledge of workers which nurses have acquired over a period of years in working directly with them. Moreover, the nurse's understanding of health and disease, her ability to observe objectively, and her skill in successful interviewing make her a valuable asset to the research team.

The current emphasis on community-wide action in meeting the health, social, and economic problems of older persons suggests the need for close cooperation and coordination of all health facilities—hospital, public health, and industry. Here, again, the nurse is the logical person to assist in developing successful methods of referral that will synchronize efforts toward better care of older people.

The establishment of geriatric clinics in hospitals and health departments as diagnostic and treatment centers will call for an efficient network of communication with industrial medical departments. Health examination of potential workers by health departments or hospital clinics for part-time employment further emphasizes the need for an efficient two-way communication system of referral. Study of workable patterns fall within the function of nursing.

Once the specific objectives of the study are defined, the nurse may participate in the construction and evaluation of check-lists, questionnaires, or schedules designed to assemble data. Her knowledge of workers and her understanding of the philosophy of employer and labor union place her in a position to make suggestions that may facilitate the conduct of the study. Likewise, the worker's confidence in the nurse makes her a valuable person to assist in the selection of employees to participate in studies.

Validity of reporting is fundamental in all studies. The records kept by the nurse can provide morbidity statistics on occupational and nonoccupational illness. They may also afford correlation between the working span of rehabilitated and nonrehabilitated workers. The study of cardiovascular illness and work capacity is an example.

The nurse's contribution to the study of cancer may include her role in obtaining occupational and family health and illness histories. Nurses were successfully used in this capacity by the Public Health Service in the air-pollution study made in Donora, Pa., in 1948, as well as in other clinical investigations.

[1] **Miss Devlin is an industrial nursing consultant with the Division of Occupational Health, USPHS, Washington 25, D. C.**

AIRPLANE PILOTS—

(Continued from page 102)

agricultural chemical applicator's manual which deals with toxicology and health protective measures, and (2) serving on the advisory council set up by the department of agriculture.

Undoubtedly, similar laws for the control of agricultural chemicals application have already been or will be passed in other States within the near future.

It would also appear quite logical that State health laws and regulations pertaining to occupational health and including the control of occupational diseases are applicable and effective when brought to bear on this problem. It is believed, however, that a thorough and persistent health education program aimed at pilot applicators, ground crews, and flying service managers will be more productive than regulations.

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Hazards Anticipated From Fission Product Use

By P. J. Valaer [1]

MANY MILLIONS of curies of radioactive fission products contained in waste from nuclear reactors are available and will increase in number as more nuclear reactors are built. According to a market analysis study made by the Stanford Research Institute (*1*), there will be a tremendous demand for fission products as low-cost radiation sources when certain technological and marketing problems are solved.

All of the radioactive isotopes produced by fission are beta emitters, and some emit gamma rays also, but no alpha particles are emitted by fission products. Many of the fission products have short half-lives and would have but limited usefulness in industry in spite of their initial high activities. Some are of doubtful value because of the low energies of the radiations emitted.

According to the Stanford report, the industrially important fission products are strontium 90, which has a half-life of 25 years, and cesium 137, having a half-life of 33 years. Many other fission products present in the mixture have been eliminated for probable use due to short half-lives or low energy emissions.

Where beta emission is desired, strontium 90 is the isotope of choice. Its usefulness is due to the relatively high energy beta emission of its daughter product, yttrium 90.

Static eliminators utilizing strontium 90 have been developed and operated successfully. This use of strontium 90, in competition with radium and polonium, is estimated to have a potential market of several thousand curies annually.

A very small amount of beta emitter in a fluorescent lamp improves its starting characteristics. Fluorescent lamps operating on this principle have already been developed, and the total annual market for this use is estimated at 1,000 curies.

The potential market for beta emitting fission products as a substitute for radium in luminous paints for instrument dials, markers, signs, exit signs, highway sign markers, house markers, outdoor advertising, and other luminous applications is estimated to exceed 10,000 curies annually.

There are many other potential applications of beta radiation for which the market cannot or has not been estimated. Among these are portable high voltage power supplies, aids to grinding small particle sizes, and aids to flame propagation which can be used in internal combustion engines and jet engines, for elimination of polarization overvoltage in electrochemical reactions, for activation of chemical reactions in the gas phase, and for surface sterilization of foods.

Where gamma radiation is desired, the logical choice among the available fission products is cesium 137. This isotope emits weak beta particles as it decays to metastable barium 137, which then undergoes transition to ground state with the emission of 0.66 Mev gamma radiation. The principal proposed use of gamma radiation from fission products is the cold sterilization of drugs, antibiotics and foods. Sources of unprecedented intensity must be used. For example, a proposed plan for sterilization of penicillin at the rate of 100 vials per minute calls for 500,000 curies in order to provide the required 2,000,000 rep exposure in the time allotted. In a single proposed installation for the sterilization of canned peas, a 15,000,000 curies source will be needed.

The magnitude of the foregoing figures may be better understood by comparison with the amount of radium in use in the United States, which is estimated to be less than 1,000 curies.

Each potential use of fission products must be evaluated in terms of its occupational and public health hazard. Health and safety problems can be expected in the preparation, transportation, use, and ultimate disposal of these materials. The health hazards associated with strontium 90 are both internal and external, but the internal hazard is the greatest. Strontium taken internally concentrates in the bone. Radioactive strontium deposited in the bone will destroy the bone tissue. It therefore falls into the "very dangerous" category and quantities of this material of the order of 100–500 microcuries, are referred to as "high level" in National Bureau of Standards Handbook 42.

Curie for curie, it is exceeded in toxicity only by the alpha emitters, radium, plutonium, and polonium. Weight for weight, it exceeds radium and plutonium in toxicity. The prevention of internal hazards arising from some uses of strontium 90 will be technically difficult because the source will necessarily be packaged in thin material to permit penetration by beta particles. Where beta radiation is utilized as a substitute for alpha radiation, the hazard will be magnified many times because beta particles have so much less ionizing power than alphas that a far greater quantity of active material must be used.

Most of the proposed gamma ray uses of fission products will require massive sources. Assuming the packaging of these products is adequate to prevent leakage of the active material, there remains a potentially severe external radiation hazard due to the high gamma intensity produced. No insurmountable difficulties are anticipated in the protection of the public or the workers from this radiation.

As has been said many times before, there is no reason to fear the industrial use of any material, no matter how toxic or how dangerous, if proper handling methods and safety practices are used. When large-scale utilization of fission products by industry gets under way, as it undoubtedly will, the responsibility for safety of the public and the workers will ultimately fall with State and local health departments and will be taken in stride as many other problems have been in the past.

[1] Mr. Valaer is electronics scientist with the Division of Occupational Health Field Headquarters, Public Health Service, 1014 Broadway, Cincinnati 2, Ohio.

REFERENCE

(*1*) Industrial Uses of Radioactive Fission Products. SRI Project No. 361. Stanford Research Institute, Stanford, California (Sept.) 1951.

Air-Pollution Findings Reported at Industrial Health Conference

BECAUSE OF THE importance of air-particle size in evaluating epidemic diseases caused by inhaling polluted air, technicians must prove that size and weight distribution of sedimented material is constant at various sampling stations, Bernard D. Tebbens, School of Public Health, University of California, told the 1952 Industrial Health Conference.

"Only in this," he said, "can dustfall weight data be successfully correlated with epidemiologic information on respiratory diseases."

Speaking to members of the air pollution division of the American Industrial Hygiene Association, Dr. Tebbens presented a critical evaluation of dustfall technique for determining air pollution. He explained that in experimental studies conducted under both field and laboratory conditions, sedimented matter composed of several particles has an average particle size similar to that of the air-borne particles from which the fall-out is derived.

"However," he advised, "the statistical distribution of sizes is appreciably different in the air and in the fall-out, with the sedimented material containing a high proportion of the larger sizes. From the established relationshp between distribution of particles by count and weight distribution of the same sample, a sedimented sample analyzed by measuring its weight fails to characterize adequately the size range of air-borne material from which it was derived."

Report Issued on Air Pollution Control in Los Angeles County

The smoke-like haze and irritating gases created by the low-temperature oxidation in the air may be considered as the end products of "cold combustion," according to the second technical and administrative report on air pollution control in Los Angeles County.

Recently released, the report says that preliminary studies indicate that vapor losses from processing and storage of gasoline at refineries and the exhaust of automobiles account for the major portion of hydrocarbons found in the atmosphere.

The findings open a new field of investigation to provide a means for reducing these contaminants, said Smog Control Director Gordon P. Larson. The reports have been issued by the Los Angeles County Air Pollution Control District.

The earlier technical report outlined the role of smoke, dust and fumes in reducing visibility and explained the methods for reducing these contaminants at the source. It further presented the investigations that were under way to explain the causes of crop damage, eye irritation, and reduced visibility.

Public Health Service Releases a Film on Training X-ray Workers

YOU CAN BE SAFE from X-rays, a filmograph designed as a training aid for X-ray personnel, was recently released by the Division of Chronic Disease and Tuberculosis, Public Health Service.

Done in cartoon style, the film shows Ike Isodope, an X-ray technician, as an excellent worker who has never burned out an X-ray tube before its time. But he is a man who is harming himself every day because of his carelessness in protecting himself from exposure.

The purpose of the film is to prove that a photofluorographic unit can be a safe place to work, but that it is safe only when those who work in it take every precaution against X-ray exposure.

The film will be available for preview loan from Audio-Visual Production Services, Communicable Disease Center, U. S. Public Health Service, Box 185, Chamblee, Ga., or from one of the Federal Security Agency regional offices. Prints may be purchased from United World Films, Inc., 1445 Park Avenue, New York 29, N. Y., at a cost of $14.09 each, less 10 percent to schools, health agencies, hospitals, and other nonprofit users.

The film is 375 feet long, runs for approximately 10 minutes, and is a 16 mm., black-and-white, sound film.

Claims for Industrial Parathion Poisoning in Florida Average $59.50

The following information on claims for industrial parathion poisoning in 1950 was assembled by the Florida Industrial Commission and the Division of Industrial Hygiene of the Florida State Board of Health:

Summary

Number of deaths	0
Number of allowed claims	119
Average cost per claim	$59.50
Average days lost per case	5

Number of claims

Allowed	119
Disallowed	21
Total claims	140

Occupation of workers

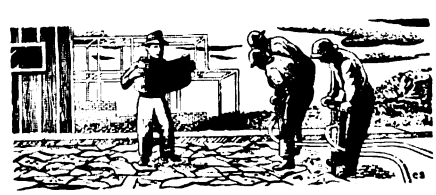
Sprayers and grove laborers	105
Blending plant workers	14
Total workers	119

Costs of claims

Medical fees	$2,434.36
Hospital fees	1,298.69
Compensation	1,222.85
Noncompensable time (354 days at $6 a day)	2,124.00
Total cost	7,079.90

Medical data

Number of patients:	
Hospitalized	59
Blood cholinesterase	5
Oxygen inhalation	4
Iron lung	1
Total hospital days	116



Health for the Industrial Worker—A Joint Responsibility[1]

By A. J. Hayes[2]

WE ARE CONSTANTLY facing new and greater challenges and responsibilities in the world crisis. The health of our workers in the factories and on the farms and the general health of our Nation will substantially affect the manner in which we deal with these responsibilities and challenges.

I believe that the problems of industrial health can be dealt with more constructively if we recognize that they are pieces of our national health picture. An industrial worker does not pick up his heart or his lungs or his body at the factory gate when he checks in. Neither does he leave them there when he checks out at the day's end. His health on the job is one-third of the picture of his health throughout the day. Industrial health is tied up with home health. The worker's health cannot be separated from a larger consideration of the health of his wife and his children and, indeed, the health of his neighbors and the community and the Nation in which he lives.

We lose approximately 500,000,000 man-days a year, according to Dr. Howard Rusk, chairman of the health resources advisory committee of the Office of Defense Mobilization. To workers and their families, this represents 4.2 billions of dollars in lost wages. And there is a corresponding loss in production and profits.

The medical profession could prevent much of this waste of human life and economic loss caused by ill health if the miracles of modern medicine could become available to all. If we could insure a system whereby the full measure of modern medical care would become available to every worker and to his family, our Nation would be immeasurably strengthened.

Within the ranks of organized labor, there is complete unanimity on this point—the problem of paying for medical care is a pressing one. We are also in full agreement as to the urgency of arriving at a solution.

One of the obstacles to better industrial health is the lack of an adequate health program and adequate facilities in a large number of our industrial plants and shops. While some of our large plants and industries do have adequate programs and facilities, the smaller plants, with some exceptions, do not.

This condition, which is much too prevalent, results in various consequences and complications. In some cases workers do not report their sickness or accident because of the long trip to the doctor's office or hospital, or because of all the forms they are required to fill out. In other cases, injured or sick employees accept treatment from some fellow employee who has a magnifying glass, a sharp toothpick, a bottle of iodine, and some soiled gauze in his clothes locker. Notwithstanding bulletins and directives to the contrary, this is done in practically all of the shops and plants where the facilities for full or first aid are inadequate.

I remember that management did not always mean what they said in their bulletins and directives. I will cite you just one experience to prove my point: I was the so-called "eye-man" in a medium-sized shop in Milwaukee some years ago. In another shop of the same employer, one of the employees sustained a rather severe eye injury as a result of the probing of a fellow-employee. Because of this, the master mechanic caused bulletins to be posted in every shop prohibiting any kind of aid by shop employees in case of accident. The eye incident in the other shop was mentioned in the bulletin.

About one week after the posting of the bulletin, the master mechanic visited the Milwaukee shop, and during his tour a sharp cinder became lodged under his eyelid. Instead of being governed by his own directive, he came rushing in to me and asked me to remove the cinder.

I also recalled an incident which involved my father. One day he had a "slight" accident on the job; he was struck above the eye with a flat peen hammer. He went to the dispensary in the shop, and the attendant applied a piece of gauze and tape and sent him back to work to finish the day. The next morning we found him unconscious in his bed with a blood clot on his brain. He was an invalid, confined to his home for 9 years before he died.

These are personal examples of the many and various consequences of inadequate facilities at the shop or plant level. And, unfortunately, this same condition still prevails in many of the shops and plants throughout industry.

This leads me to the conclusion that, until the time comes that a well-correlated industrial health program is developed between the medical profession and management and labor, we will never be able to advance towards a solution in the field of industrial health.

Another obstacle to better industrial health is the relationship between the "company doctor" and the company employees. This relationship in many cases is not conducive to the mutual faith and confidence necessary to proper diagnosis or effective treatment.

While I do not want to leave the impression that this is true in all cases, the relationship between the company doctor and the employee is much more impersonal than that between Jim Brown and his personal or family physician.

This is one of the principal reasons for the opposition of many labor unions, and many unorganized workers as well, to periodic medical examinations. They are fearful, with some justification, too, that the doctor's report will result in their furlough or termination.

I believe that solutions of the problems and obstacles to better industrial health are possible now. I think some changes in attitudes and policies are necessary on the part of some doctors, some employers, and some employees. I think we need more and better facilities in the shops and in the dispensaries and in the hospitals. I believe we need more medical education in our industrial plants as well as in the general citizenry. I believe we must find a method for improving the relationship between many company doctors and company employees; and, failing in this, we must find a way to permit the injured or ailing employees to go to a doctor of their own choice.

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[1] Excerpted here, this speech was presented at the Twelfth Annual Congress on Industrial Health, Pittsburgh, Pa.

[2] Mr. Hayes is President of the International Association of Machinists, Washington, D. C.

Role of Local Health Department in Occupational Health[1]

By Charles D. Yaffe [2]

INDUSTRIAL HYGIENE or occupational health can be effectively promoted only by teamwork, and the team must consist of the entire health department. Most public health programs require the combined efforts of various disciplines, and occupational health is certainly no exception. As an engineer, I feel that engineering is an indispensable part of any activity dealing with the health of our gainfully employed population. I recognize and acknowledge, however, that it is equally necessary that the physician, dentist, nurse, sanitarian, chemist, toxicologist, statistician, and the health educator also participate in such a program.

As sanitarians, you are all fully aware of the relationship between environment and health. Industrial hygiene is concerned with the effects of the working environment on health.

Let us consider, first of all, what the sanitarian can contribute to an occupational health program. A sanitarian's work, to a large extent, is in the field of environmental health. Many of the environmental factors in the industrial plant are the same as those encountered elsewhere. Among these are water supply, waste disposal, air pollution, food handling, rodent, vermin and insect control, and general sanitation.

There is nothing mysterious about these items. They involve activities which are part of the regular program of the sanitarian, and there is no question about his competence in coping with them. Yet, strangely enough, it has been my observation that local health department personnel often abstain from activity in many or all of these items where a factory is involved. For example, I have been in a number of plant cafeterias which had never been inspected by anyone from the local health department, although the food handling establishment had been in existence for many years. I believe that all of you will agree that any establishment of this type should be required to meet the same standards as those for other public restaurants.

Generally speaking, serious sanitation problems are not likely to be found nowadays in industrial plants, particularly the larger ones. Nevertheless, the sanitarian can find many opportunities to render a worthwhile service. Such service, however small, can go a long way toward gaining the confidence and appreciation of management. Such opportunities should be sought as they provide a means eventually for successful promotion of the entire public health program.

Use Opportunities to Observe

The sanitarian has more opportunities than other personnel of a local health department for contacts with industry. As a consequence, he should look upon himself as an advance man for the department, a part of his job being to stimulate the plant's interest in other phases of public health.

Health agencies for many years have utilized the schools in connection with certain aspects of their program, since the school presents a place in which a large group of children is assembled. Physical examinations, immunizations and health education are readily accomplished under such circumstances.

The industrial plant offers a similar opportunity to reach adults. Promotion of such programs as tuberculosis case finding, nutrition and health education lends itself ideally to the industrial establishment, provided that management has been sold on the value of such things, and has been convinced that dollars and cents profits will accrue from his operations as a result of the improved health of his employees.

Bringing management around to this point of view is seldom easy and usually requires considerable time to accomplish. As all of you are well aware, the promotion of public health ideas requires an attack on more than one front. Trying to win acceptance of a health program in industry is no different, although it may be somewhat more complex because of the relationships involved between employers, employees, and, in some cases, the general public.

Suitable rapport must be established with many individuals, including top management, supervisory personnel, and individuals responsible for specific activities, such as safety or nursing. It is also essential that proper relationships be established and maintained with the workers, not only individually but also through their unions.

Consider the Importance of Good Public Relations

Industry is very sensitive to the attitudes of the community and takes public relations into consideration in reaching many decisions. For example, plant operations may create a noise or air pollution problem. In most instances, this problem is not, or cannot be shown to be, definitely detrimental to health. Nevertheless, it presents a nuisance from which the public wants relief, and the health department is usually brought in.

Proper handling of such a situation can win the confidence, respect, and good will of all concerned. Unfortunately, I cannot lay down any specific rules to follow to accomplish such a task. The procedure to be followed will vary with each situation and will seldom be easy. However, I would like to point out one or two aspects which, in my opinion, require special attention. First of all, any information classified by management as confidential or restricted should be so treated, and if there is any question about the release of certain information, it should be cleared with the proper company officials.

Finding a solution to problems of this nature often requires the gathering of certain data regarding processes or operations which may be secret, or regarding quantities of materials used or produced. The release of any information of this type to unauthorized persons is considered objectionable by management in the same way that you would resent your bank teller discussing your bank balance with other people. Similarly, in most cases, specific recommendations made to the manage-

[1] Presented at Kentucky Public Health Association Conference, Louisville, Kentucky, April 9, 1952.

[2] Mr. Yaffe is senior sanitary engineer with Division of Occupational Health, U. S. Public Health Service, 1014 Broadway, Cincinnati 2, Ohio.

ment should be considered as a matter between just you and them.

This often presents situations which require the utmost tact and diplomacy. For example, you may be called in on an industrial problem as a result of a complaint from a union which may demand to know exactly what your findings were and what recommendations you made to correct the situation. If conditions detrimental to health were found, the union is certainly entitled to have the situation corrected.

The release of information on certain details, however, may not always be necessarily advisable. For example, where there is concern about exposures to a toxic agent, informing the union or individual workers that certain tests showed the presence of 200 parts per million of carbon monoxide or 5 mg. of lead per cubic meter of air often will accomplish no constructive purpose and may result in considerable harm.

The interpretation of technical findings is not a simple matter and should be left in the hands of those properly qualified. In withholding such information, the idea followed is the same as in the case of the physician-patient relationship. The doctor very often withholds information about blood pressure, blood counts and other findings, since he realizes that the patient might attach too much significance to specific figures and be upset to the point where a cure is much more difficult to effect.

Use Information Discreetly

As long as the union or the individual worker is concerned solely with the health aspects, it is usually only necessary to advise him that there is no danger to health, or to assure him that anything potentially dangerous will be satisfactorily eliminated.

There are obvious exceptions where comprehensive clinical-environmental investigations are carried out, in which the detailed findings are of wide importance. Such was the case, for example, when the U. S. Public Health Service was asked to resolve the question of potential hazards to workers exposed to sodium fluoride at open hearth furnaces. The workers suspected that sodium fluoride was harmful, and some were at the point of striking.

Representatives of both the United Steelworkers of America (CIO) and the Republic Steel Corporation requested a thorough study to get the actual facts. When our findings were made available, absolving sodium fluoride of any toxic effect in the open hearth operation, the union printed and distributed the report before our expanded public health bulletin was published.

A somewhat parallel situation in which I recommend withholding information from management is found with respect to physical examination records on individual workers. Even though management pays for the plant medical program, detailed records of physical findings are confidential and should not be made available to anyone outside the medical department except the worker's personal physician, or, where communicable disease problems are encountered, the official health agency.

The only information which management is entitled to is whether or not the man's physical condition is good enough for him to perform a certain type of work. Boiling it all down, what I have tried to say is that each side has certain rights and certain responsibilities. Management has the responsibility for providing safe and healthful working conditions; and, as long as it does so, it has the right to determine for itself how the job shall be accomplished.

The worker has the right to safe and healthful working conditions and the responsibility to make proper use of safeguards which are provided. There will be special situations in which the workers will be entitled to all or much of the detailed information uncovered as a result of an investigation of a public health problem.

In such cases, the plan of procedure should be agreed upon in advance, so that there will be no misunderstanding later on. I might add that any time that the public health worker fails to limit his interest and actions to the health aspects, he is very likely to find himself, sooner or later, in a situation where he loses the confidence of most, if not all, of the parties concerned.

The principles which have been outlined here are also applicable with respect to publicity. The health authorities should have a clear understanding with management, and if necessary with labor, regarding information to be provided to newspapers or other news sources. Publicity is often very desirable and can prove beneficial not only to the management and workers of a plant but also to the health agency. It does require very careful handling, however.

Look for Health Problems in Many Occupations

My remarks thus far may have given the impression that industrial hygiene problems are limited to manufacturing establishments. I wish to emphasize that such problems are not confined to the factory, but are also found in the office, in the store, and on the farm. Occupational health encompasses any place where people work.

I wonder, incidentally, how many of you have ever thought of, or looked for, possible health hazards while visiting dairy farms, pasteurizing plants, restaurants, schools, or sewage treatment plants. You might not find serious dangers, but you could find situations requiring improvement. Every year many persons working in such places file claims for compensation for occupational disease.

Returning to the discussion of the role of the sanitarian in the occupational health program, there is no reason why he should not utilize his knowledge and experience in other fields, such as ventilation and illumination. He may not be an expert in these subjects, but he usually has more information on them than the average individual and is in a position to advise whether or not a problem requires the services of a specialist.

Call in the Specialist

I believe it is very good psychology for the local health department to call in specialists at every suitable opportunity, even though the problem in question may not be too serious or complex. Industry, particularly the small plant, will remember with gratitude the efforts of the local health department.

There are hundreds of toxic substances employed in industrial operations, but their use does not necessarily imply the presence of a hazard. The method of use, quantity involved, period of exposure, chronic and acute effects of the material, the control measures, and other factors all have a bearing on the situation.

Any use of toxic chemicals should be evaluated by industrial hygienists, however, to insure that there is no significant danger. Similarly, certain operations, such as welding, grinding and degreasing, present varying degrees of hazard.

Sanitarians, in the course of routine plant visits, may often have an opportunity to observe the nature of processes and materials used, and may pick up information which will enable the industrial hygienist to determine whether detailed investigations are indicated. State industrial hygiene staffs are usually so small in size that they cannot cover enough territory to locate all hazards in the State without assistance.

When the occasion arises, the sanitarian, and also, I might add, the health officer or other local personnel, might very profitably accompany State industrial hygiene personnel on plant visits. This affords an excellent opportunity for the development of closer relationships between the health department and the plant. It is worth emphasizing that industrial management usually occupies a respected position in a community, and is able to lend valuable support to the public health program.

Joint visits to industry also afford the local personnel an opportunity to become more familiar with occupational health problems and methods for dealing with them. They may be able, also, in some instances, to do follow-up work, thereby reducing travel and time demands on State personnel.

Where plant medical or nursing programs are in operation, it is most desirable to develop friendly relationships, since the people who operate such programs are in a strategic position to help sell public health ideas to both workers and management.

One means for obtaining their interest is to invite them to speak at one of your staff meetings. Such an invitation need not be limited to the plant physician or nurse. A member of management might give a most interesting talk to the health department.

If there are any of you who would like to become more familiar with specific phases of industrial hygiene, I am certain that your State department of health will be happy to provide information on materials for study, and to work with you on problems in your own community.

A ROUTINE METHOD FOR DETERMINATION OF TRICHLORACETIC ACID IN URINE AS AN EVALUATION OF EXPOSURE TO TRICHLORETHYLENE

By Rudolph K. Waldman and Leonard A. Krause [1]

THE TOXICOLOGY of trichlorethylene ($CHCl=CCl_2$), a colorless, easily vaporized but noninflammable liquid with a chloroform-like odor, constitutes a real industrial hygiene problem of increasing importance because of the steadily growing use of this solvent for degreasing, extraction of fats and oils, dissolving of paints and lacquers, dry cleaning, and other purposes.

Originally, trichlorethylene was considered nontoxic. Since 1915, however, several authors have described cases of poisoning and pointed out that a prolonged exposure to trichlorethylene has a damaging effect on the human organism.

The primary action of trichlorethylene is on the central nervous system. Workers exposed to excessive amounts of trichlorethylene may be rendered suddenly unconscious. The symptoms of acute poisoning are irritation of the mucous membranes, severe headache, dizziness, fatigue, and the general picture of drunkenness. These disorders are mostly of short duration but in severe exposures death may occur due to involvement of the heart or to trauma of the respiratory center.

As a matter of fact, from 1914 to 1931, among 284 cases of poisoning (202 acute and 82 chronic) reported in Germany, 25 were fatal; in England from 1923 to 1935, 3 of 39 cases reported were fatal (*1*). The toxicity of this material is attested by similar reports from other countries.

It is not astonishing that under these circumstances toxicologists and industrial hygienists have devoted much time to research in this field. Studies have been made of the changes which this chlorinated hydrocarbon undergoes in the human organism. In 1939 it was shown in dogs that trichlorethylene is converted into trichloracetic acid ($CHCl=CCl_2 \rightarrow CCl_3.COOH$). In 1945 this also was shown to be true in man.

Thus, it becomes very important to regulate length of exposure and to detect by biochemical means exposures beyond the toxic threshold. For the latter, it is necessary, as with other toxic substances, to find and measure a specific excreted metabolite.

An extensive study was completed by two Swedish investigators in 1950 to determine what amount of trichloracetic acid found in urine would indicate dangerous exposure to trichlorethylene. The results of this study (*2*) are summarized as follows: Toxic effects such as feeling of sickness and a sensation of dryness in the mouth, vasomotor skin phenomenon, increased psychic irritability, headache, sensations in the cardiac region and dyspnea from exposure to trichlorethylene could be observed in about half of the persons excreting 40 to 75 mg. trichloracetic acid per liter of urine and in almost all those excreting 100 mg. or more.

When 200 mg. of trichloracetic acid or more were found per liter of urine, the symptoms were often so pronounced that sick leave was requested. No definite effects could be found in cases where 20 mg. or less of trichloracetic acid per liter of urine were excreted. Therefore, industrial trichlorethylene exposures giving rise to excretion of 20 mg. or less of trichloracetic acid per liter of urine may be regarded as not excessive and therefore probably safe.

A visit from one of the investigators, Dr. Axel Ahlmark, stimulated us to find a practical application of the above findings. Methods generally used to determine the amount of trichloracetic acid were rather complicated and not adapted to routine work with large numbers of urine specimens. A simplified and reliable method has now been developed in these laboratories which permits the measurement of trichloracetic acid in urine with an error of less than 5 mg. per liter.

METHOD

Principle Involved.—In this method a sample of urine is taken and proportionate amounts of sodium hydroxide and pyridine are added. This is heated to 60° C. and allowed to stand

[1] Dr. Waldman is principal biochemist and Mr. Krause, assistant biochemist, of the Bureau of Laboratories, Connecticut State Department of Health, Hartford.

for 15 to 20 minutes, at the end of which time the presence and degree of pink color in the pyridine layer denote the presence and amount of trichloracetic acid, which is then measured in a spectrophotometer.

Trichloracetic acid is decomposed by sodium hydroxide to chloroform and carbon dioxide ($CCl_3.COOH \rightarrow CHCl_3 + CO_2$). Chloroform and pyridine in alkaline solution give a pink color when heated (Ross test for chloroform, bromoform, chloral hydrate, etc.).

Equipment and Reagents—

250 ml. separatory funnel,
Spectrophotometer,
Sodium hydroxide solution (25%),
Pyridine,
Ethyl alcohol (95%).

Procedure.—Place 16 ml. of 25 percent sodium hydroxide and 4 ml. of pyridine in a test tube. To this, add 1 ml. of the urine specimens, mix and place in a water bath at 60° C. An occasional swirling will speed up the development of the color.

After allowing the mixture to stand 15 to 20 minutes for full color development, transfer to a separatory funnel and drain off the clear layer. Add 7 ml. ethyl alcohol to the pink layer, which may be slightly turbid, and shake. The turbidity should disappear. Transfer the colored solution to a cuvette or matched test tube and determine percentage transmission spectrophotometrically at wave length 460 millimicrons (Coleman Universal spectrophotometer using filter PC–2).

Determine amount of trichloracetic acid present by reference to a previously prepared calibration curve representing readings with known quantities of trichloracetic acid per liter of urine in the range from 5 to 100 mg. The color is stable for approximately two hours after full development.

The method is quick and permits the examination of large numbers of specimens in a relatively short time. In Connecticut, we are now attempting to evaluate trichloracetic acid excretion with vapor pressure of trichlorethylene.

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Vacation Athletes Told to "Take it Easy" by American Heart Association

WITH vacation days ahead, the American Heart Association today warned unaccustomed athletes against violent and sudden exercise which might strain the heart. This caution, and others regarding high blood pressure, overweight, and self-medication, were issued by five past presidents of the American Heart Association in a new leaflet titled, *Be Smart—Protect Your Heart*, to be distributed by the Association and its affiliates.

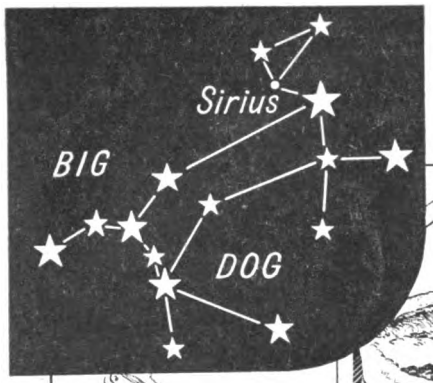
Advising vacation-time or week-end athletes against overdoing it, Dr. Louis N. Katz, Chicago, immediate past president of the American Heart Association, and now chairman of its Scientific Council, says, "Almost everyone should take some form of mild exercise, but if you don't ordinarily lift anything heavier than the telephone, or walk farther than the distance from your house to the bus stop, then you should not expect your heart to take kindly to the sudden extra strain of a fast game of tennis. No one, if he wants them to last, uses his heart or his car to the very limit of their endurance. It is wise to hold some power in reserve."

In the same vein, Dr. Tinsley R. Harrison, professor of internal medicine, Medical College of Alabama, Birmingham, points out that moderate, regular exercise never hurt anyone, but that sudden calls on the heart for all out effort—for example, a frantic dash for the train—"could cause a heart attack" if the sprinter has an unrecognized heart condition.

Concerning high blood pressure, Dr. Howard B. Sprague, associate physician, Massachusetts General Hospital, Boston, says, "Although high blood pressure is a common cause of heart and blood vessel diseases, you may have high blood pressure for years without it bothering you. Only your doctor can tell if your blood pressure is causing trouble. Doctors agree that most people with high blood pressure—or with almost any kind of heart disease—can live pretty normally if, in addition to the doctor's special instructions, they follow these rules:

Walk, don't run up stairs.
Don't eat too heavily at any one meal.
Don't get overtired.
Relax completely for ten minutes twice a day.
Keep your weight normal.
Choose sports in which winning is not important.
Keep out of arguments.
Try to do something constructive about your worries; for example, instead of worrying about your health, see your doctor and follow his advice."

Another piece of advice concerning overweight and heart disease comes from Dr. Arlie R. Barnes, Rochester, Minn., professor of medicine, Graduate School, Mayo Foundation for Medical Education and Research, "Too much weight loads too much work onto your heart and blood vessels. But whether or not you have heart disease, you will look better, feel better, work better, and you are likely to live longer if your weight is close to normal. Scientists have found the chief cause of overweight—overeating." So ask your doctor "to help you plan the right kinds and the right amount of foods to keep you in good health."



REPORTING MAKES HISTORY

Illustration by Garnet Jex, USPHS

Heat or Sun Stroke.—Heat stroke or sun stroke was associated by the ancients with Sirius, the dog star, and dog days, probably because in the summer months Sirius follows the sun and is visible in the evening twilight.

The oldest records of the disease are the biblical cases. In the Fourth Book of Kings, Chapter IV, is found: "And the child grew and on a certain day when he went out to his father to the reapers, he said to his father: My head acheth, my head acheth . . . and when he had taken him and brought him to his mother she set him on her knees until noon and then he died." In the Book of Jude, Chapter VIII is found, "And her husband was Manasses who died at the time of the barley harvest where he was standing over them that bound sheaves in the field and the heat came upon his head and he died in Bethulia his own City and was buried there with his fathers."

Reporting Promotes Health

Quite often, folk lore and provincial customs have proved to have scientific merit. The answer in many instances was long waiting recognition by the inquiring mind and observing eye.

This is pointed up in the late Dr. Shoudy's report on the prevention of heat cramps and heat exhaustion in the steel industry: "In the crucible where men were permitted between turns to leave the job, they crossed the street to get a glass of beer. We noted that they always put salt in the beer and that they returned to the job with salted pretzels. We also observed that although this was one of the hottest places, the incidence of heat exhaustion was less than in others. . . . We visited a furnace and noted that one worker would take something from his pocket every now and then and chew it. . . . What he was eating was salted peanuts, and we learned that this custom was handed down for a number of years, which was the reason for no heat cramps occurring at that particular furnace."

Many observations, no matter how seemingly insignificant, when correlated statistically and epidemiologically, can often reveal answers to perplexing problems. These facts should be reported so that all may benefit therefrom.

Report All Cases of Occupational Disease

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