The Industrial Hygiene newsletter

INSECTICIDES PAGE 10 **APRIL 1950**

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INDUSTRIAL HYGIENE NEWSLETTER

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• FEATURES

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Static Eliminators Containing Polonium Hazardous to Workers

In the last few months there has been much concern regarding the safety of radioactive static eliminators which contain polonium as the source of alpha rays. These, as well as another type containing radium, have been installed on printing presses to remove the static charge from the paper as it passes through the machine. They are also used in textile mills and on other machinery where static electricity is generated and is undesirable.

Since polonium emits no beta radiation and practically no gamma radiation, the only health hazard that these devices can create would arise from the ingestion or inhalation of polonium. Polonium is a very dangerous material with a toxicity of about the same order of magnitude as radium.

Essentially these devices contain polonium plated on nickel or other base metal over which is electroplated a layer of gold one to two microns thick. The gold layer is plated on to protect the polonium and to prevent it from escaping from the surface of the bar. Polonium has the ability to migrate, an exceedingly small opening being sufficient to allow it to escape from the surface. It is necessary, therefore, to use great care in manufacturing these devices in order to be sure that all of the polonium is sealed in and cannot be removed by contact or other usual handling.

A defective bar will release polonium-bearing dust into the workroom air and also produce an ingestion hazard when the bar is cleaned. It is necessary to clean the active surfaces periodically to insure proper operation of the devices.

The Division of Industrial Hygiene, USPHS, has conducted a limited investigation of these devices to study the health hazards created by their use. To date, the Division has results on nine static eliminators that have been tested at various laboratories.

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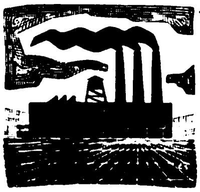
COVER PICTURE—An approved (by the Bureau of Mines) respirator should be worn during many outdoor operations with toxic insecticides.

INDUSTRIAL HYGIENE—A NEW FRONTIER IN PUBLIC HEALTH AND INDUSTRY*

By Leonard A. Scheele, M. D., Surgeon General, PHS, Federal Security Agency

As Surgeon General of the Public Health Service, I find that one of my biggest jobs is to talk about health—health as an individual problem, health as a research problem, as a State or community concern, health as a national social aim or an international aspiration.



All of us accept—even though many still do not practice—the principle that good employee health is fundamental to increased productivity. Good health obviously means less lost man-hours. For industry as a whole this is an excellent thing. For workers it means fatter pay checks and increased purchasing power.

Such increased productivity is not, of course, the only desirable feature of better industrial hygiene, but it is important—highly important. As industrialists, you need to keep that concept in mind. You have a responsibility for working toward better national health, however, in a much larger sense. It is a social as well as a corporate responsibility.

Health Programs in Industry

There are two broad fields of health activity in which you have responsibility and in which you can contribute: First, you can work toward promoting better health among the employees in your own plants and factories and set examples of good practice for those who are lagging; second, you can assume an increasing share of responsibility for the quality of the health services in your own communities.

We in the Public Health Service have increasingly come to realize that the whole, traditional concept of industrial hygiene is rapidly changing.

We are as much concerned with the early discovery and treatment of tuberculosis and other chronic illnesses as we are with the control of health hazards within the plant itself.

Modern industry is the logical partner of the health department in bringing to workers and their families all of the new and rapidly growing fund of knowledge for preventing illness and improving health.

Industrial plants provide unique facilities for reaching large groups of people in our urban communities. Diagnostic clinics and, indeed, programs for treatment services, are an old story in many industries. We will have moved far along toward building better health, however, when all of industry awakens to the fact that programs for the prevention and early detection of illness among industrial workers are a good investment; that they contribute greatly to improved efficiency and productivity as well as to building a healthier body of citizens.

Help From States Available

Today nearly every State in the Union has a functioning industrial hygiene program, and four of our cities have set up units in their local health departments. Twenty years of research and a dozen years of promoting the use of that research by the Federal Government have borne that much fruit.

Now a new development is taking place. During the war years and through the postwar years of conversion literally hundreds of new manufacturing processes have been created. Hundreds of new uses for old processes are being discovered and applied. Few of us realize, for example, how many uses are being made in industry of X-ray and other ionizing radiation. Powerful new insecticides, like parathion—a dozen times more potent than DDT—are also being brought into use. All of these processes develop their own hazards and create their own problems.

Industry is doing a large variety of research into these new processes. The Industrial Hygiene Foundation in Pittsburgh, which was formed by business leaders, and the Kettering Laboratories of the University of Cincinnati, as well as corporations such as the Standard Oil Co., are engaging in basic research to protect workers. They are beseeching us for help, however, principally into the health dangers emerging from new chemical processes and we are frankly hard put to keep up with the dozens of new problems that arise daily.

First, we must jointly seek to keep up with these new developments, and intensify the missionary work of the past 10 years in order to bring into the fold those industries which are not discharging their responsibilities. At the same time, like an army which must turn its attention to another part of the battle line, we must hold the line on the progress we have made up to now.

You can help in that effort. As a member of one of the most competitive businesses in the United States, you all have topflight advertising and promotion departments. You work daily with a dozen or more advertising agencies. I know perfectly well these experts are paid for another purpose. They can, however, do much to help in further emphasizing the necessity not only of cleanliness as a health habit but in reiterating the need for other good basic health habits among workers.

Dermatitis Causes Absenteeism

For instance, despite all of our joint efforts—yours and ours—dermatitis is still the number one in-plant cause of lost time in industry. Figures from State compensation boards list dermatitis as the cause in 65 percent of all such cases.

You can certainly help in reducing that total of preventable illness. The best way to cut down this high rate of illness is to help the worker avoid contact with the irritant, whatever it is. After that, the best weapon is personal cleanliness.

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*Excerpted from a speech given at the 1950 convention of the American Soap and Glycerine Manufacturers Association at the Hotel Plaza in New York, January 25, 1950.

DETERMINATION OF PARATHION IN AIR

By Russell Frazier, Chemist, Division of Industrial Health, Minnesota Department of Health

The introduction of parathion into the field of economic poisons has also introduced a new health hazard. Parathion, especially in concentrated liquid form, has been found to be very toxic to man. Rigid control of exposure in all stages of processing is necessary to protect the health and provide for the safety of the worker.

In the evaluation of control measures, a method for determining the concentration of parathion in air is necessary. The method should be capable of determining parathion whether present as a vapor, mist, or absorbed on dust, and it should be a very sensitive method, since the self-imposed standard of at least one manufacturer is that there should be no parathion in the atmosphere.

Two laboratory methods are now being used. One consists of determining the parathion by ultraviolet absorption after collection in an air scrubber charged with pure ethyl alcohol. This method is simple and sensitive, but it requires an ultraviolet spectrophotometer. The second method is a chemical method described by Averell and Norris (estimation of small amounts of 0,0-diethyl 0,p-nitrophenyl thiophosphate, *Journal of Analytical Chemistry*, vol. 20, August 1948), and was designed to measure parathion residual on sprayed material. It requires no special apparatus, and consists of reducing the nitro group to an amine, diazotizing the amine and finally coupling with another amine. The method requires one filtration, and is sensitive to about 20 micrograms of parathion.

Since our laboratory is not equipped with an ultraviolet spectrophotometer, we could not use the first method. The second method did not give the sensitivity we wanted, so we decided to look for a new method. It occurred to us that it might be possible to destroy the organic part of the parathion molecule and oxidize the thiophosphate to ordinary phosphate. The molybdenum blue test for phosphorus is well established, and is sensitive to well under a half microgram of phosphorus. This would give good results with less than 5 micrograms of parathion.

Several combinations of oxidizing agents and collection solvents were tried, until we found a combination that would give consistent results. We collect the parathion in dioxane and oxidize it with bromine in hydrobromic acid. Tests with absorbers in tandem indicate that an ordinary midget impinger is between 80 and 85 percent efficient for parathion vapor when used with dioxane. A detailed description of the method follows:

Collection of Sample

Collect the sample in a midget impinger tube charged with 10 to 15 milliliters of dioxane. An all glass impinger tube is most satisfactory. If a rubber stopper is used, keep the contact between the rubber and the dioxane at a minimum. If vapor alone is to be collected, substitute a fritted glass bubbler for the impinger jet, and reduce the sampling rate to about 2 liters per minute.

Analysis of Sample

Reagents:

(1) 1–4 dioxane. Redistill the commercial product.

(2) Bromine in hydrobromic acid. Add 20 milliliters of bromine to 100 milliliters of 40 percent hydrobromic acid.

(3) 3.6 N sulfuric acid. Dilute 10 milliliters of concentrated sulfuric acid to 100 milliliters with distilled water.

(4) 4N sodium hydroxide. Dissolve 16 grams of NaOH in 100 milliliters of distilled water.

(5) Phenolphthalein indicator. Dissolve 0.05 grams phenolphthalein in 100 milliliters 80 percent alcohol.

(6) Ammonium molybdate reagent. Dissolve 10 grams of ammonium molybdate in 100 milliliters of distilled water. Cautiously add 150 milliliters of concentrated sulfuric acid to 150 milliliters of distilled water. Cool and mix the two solutions. Protect from light.

(7) Stannous chloride. Dissolve 20 grams $SnCl_2.2H_2O$ in 20 milliliters of concentrated hydrochloric acid. Dilute to 50 milliliters with distilled water.

(8) Concentrated nitric acid.

(9) Parathion standard. Dissolve 1 gram of pure parathion or its equivalent in commercial product in 100 milliliters of ethyl alcohol. Dilute further with 80 percent alcohol or with dioxane for use.

Procedure

The sample to be analyzed should consist of 8 to 12 milliliters of dioxane containing from 0 to 50 micrograms of parathion. Transfer the sample to a 250-milliliter beaker, add 2 milliliters of the bromine-hydrobromic acid mixture and cover with a watch glass. Allow to stand 1 hour. Add 100 milliliters of distilled water and 2 milliliters of 3.6N sulfuric acid. Evaporate slowly on the hot plate to about 2 or 3 milliliters, cool somewhat, and then cautiously add 1 milliliter of nitric acid to destroy the hydrobromic acid. Evaporate to dense white fumes, adding a drop or two of nitric acid if necessary to decolorize the sulfuric acid residue. Cool and wash down the sides of the beaker with 5 to 10 milliliters of water. Add 1 drop of phenolphthalein indicator and 2 milliliters of 4N sodium hydroxide. Add sulfuric acid dropwise until the pink color disappears. Transfer the solution to a 25-milliliter glass stoppered graduate, add 0.5 milliliter of molybdate reagent and make up to 25 milliliters with water. Mix and add 2 drops of stannous chloride. Mix again and compare the blue color developed with that of standards prepared the same way. The comparison may be made visually, or it may be made with a photometer, using a red filter.

This method, of course, measures the total amount of phosphorus collected, without distinguishing between inorganic and organic phosphorus. If contamination with inorganic phosphate is suspected, it is possible to check for it. The parathion may be driven off from an aliquot of the sample by evaporating it to dryness with twice its

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Schools and Plants Ask for Help on Air Pollution Problems

With the searchlight of public opinion directed toward air pollution, New York engineers have had an increasing number of requests from schools, plants, and cities for help in cleaning the air of industrial pollutants.

Engineers and chemists of the Division of Industrial Hygiene and Safety Standards, New York Department of Labor, have had experience in a wide variety of problems in this field. Most of this work is limited to giving assistance on request only. The following examples illustrate the types of investigation the industrial hygienists have been asked to make.

Schools

Requests for assistance were received during the past year from two upstate communities which were contemplating new school building construction and were disturbed to find that the school site selected in each case was near an industrial plant giving off chemical effluents from its smoke stacks. One of the plants was manufacturing various insecticides, the other, glass.

The Division was requested to make surveys of these plants; provide information as to the nature of the effluents coming out of the stacks; meet with management and school officials to discuss the problem; and advise as to whether school children would be safe at the prospective school locations.

Careful studies were made of plant operations, chemical processes, and ventilating systems in both plants. Inspections were also made of roofs, discharge piping terminals and of the grounds between the plants and the school sites. Meteorological data were obtained as to prevailing wind direction in the area and other pertinent matters.

On the basis of the information thus obtained it was possible to assure school authorities in the vicinity of the glass plant that the silicon fluoride coming out of the stacks of this plant would not be present in the surrounding atmosphere in amounts sufficient to constitute a health hazard.

In the case of the other school, at a meeting of all parties concerned, plant management agreed to provide efficient cloth arresters for all of their exhaust systems and do everything necessary to reduce to safe levels the chemical effluents discharging from their stacks. The chemicals involved at the time of this investigation were principally lead and calcium arsenate and lead oxide dust. While it was anticipated that contemplated manufacture of some of the newer insecticides would soon complicate this chemical picture, it was agreed that the discharge of all contaminants into the surrounding atmosphere could and would be properly controlled.

The school authorities were satisfied to proceed with their school building plans as a result of these assurances.

Hydrofluoric Acid Mist

A request was received from the Division of Industrial Safety Service to assist a plant which was exhausting hydrofluoric acid mists into the atmosphere of the neighboring community.

Since hydrogen fluoride is extremely soluble in water, the plant was advised that the discharge air could be very readily cleaned by the use of a water wash unit, which would provide intimate contact between the wash water and the discharge air. The use of an alkali, such as sodium bicarbonate, was recommended to be added to the wash water to neutralize the acid, thus making the hydrogen fluoride much less volatile and reducing the corrosiveness of the water discharged into the plumbing and sewer system. A list of manufacturers of water wash units was left with the plant.

Wood Dust

An engineer from the Division, visiting a sporting goods manufacturing plant on another matter, observed that large quantities of wood dust were being discharged into the atmosphere, constituting a considerable nuisance to the community. All woodworking exhaust systems are required to have dust collectors so that wood chips, shavings, and the like will be removed from the discharge air of the plant before they are released outdoors. Otherwise, great piles of refuse would soon accumulate around the plant. The cyclone separator, which is efficient for large dust particles, is ideally suited for most woodworking installations where large chips, shavings, and sawdust are created. The cyclone is rugged, inexpensive and requires little or no maintenance. However, a delicate adjustment must be made within the cyclone so that the dust and refuse, which has been separated from the air, remains separated at the point the clean air begins to leave the cyclone.

Observing the air pollution created by this plant, the engineer climbed to the top of the cyclone to investigate. There, he noticed that the inner adjustment baffle had been fixed in the worst possible position so that large quantities of dust, which would ordinarily be retained, were being discharged into the atmosphere. It was a simple matter to properly readjust the baffle, and there was an immediate and dramatic halt to the discharge of dust.

Cities

During 1949, the engineering unit, upon request, assisted the New York State Department of Health, and the cities of Dunkirk, Middleport, New York, Poughkeepsie, Utica, and Yonkers with their atmospheric pollution problems. In New York, Poughkeepsie and Yonkers, assistance was provided in connection with the drafting of legislation and administrative regulations.

PARATHION—

(Continued from page 4)

volume of ethyl alcohol. The residue may then be taken up in 2 milliliters of 3.6N sulfuric acid. This acid solution is then treated in the same manner as the acid residue from the oxidation process in the regular procedure. The color developed in this way will be from inorganic phosphate. It may be read in terms of its parathion equivalent from the regular curve, and subtracted from the total parathion found. In our work thus far, we have not found any air samples contaminated with inorganic phosphorus.

PRESIDENT CALLS AIR POLLUTION CONFERENCE

President Truman has called a conference on air pollution—the first Government-sponsored conference of its kind—to be held in Washington, D. C., on May 3, 4, and 5. The best-qualified scientists of Government, industry, and education will participate in this conference. It will be called the United States Technical Conference on Air Pollution and will be held in the Wardman Park Hotel.

Municipal and State governments in all sections of the country have become more concerned with the health hazards of their populations, destruction of growing crops, dangers to air travel, blighting of recreational areas, loss of valuable resources, and damage to property, and have been working independently toward a solution to these problems.

In recent years new industrial process developments, particularly in the chemical, radiological and bacteriological fields, have created serious air pollution problems. Federal agencies have been called upon more and more to assist private, State and municipal interests in finding a solution to these problems.

The conference is being sponsored by an Interdepartmental Government Committee. Agencies participating are: The Bureau of Mines, Department of the Interior; Public Health Service, Federal Security Agency; United States Weather Bureau and the Bureau of Standards, Department of Commerce; Army Chemical Corps, Office of the Surgeon General, United States Army; Office of the Surgeon General, USAF; Bureau of Medicine and Surgery, United States Navy; Research and Development Board, Defense Department; Atomic Energy Commission; and the Department of Agriculture.

Last year, the Public Health Service and the Weather Bureau made a thorough investigation of the Donora, Pa., smog disaster and the health hazards involved. The Bureau of Mines has long advised industry regarding air contamination problems resulting from ore smelting, combustion of fuels, and the operation of automobiles.

The Atomic Energy Commission has become concerned with the radiological contamination of the atmosphere, and for many years the Army Chemical Corps has conducted exhaustive research in smokes and the spread of toxic gases. The Bureau of Standards is interested in aerosols, and the Department of Agriculture in the injury to forest, farm crops and domestic animals by atmospheric contaminants.

Chairmen and cochairmen for the various panels are as follows:

Meteorology: Dr. E. W. Hewson, Chairman, Massachusetts Institute of Technology; Dr. Harry Wexler, cochairman, United States Weather Bureau.

Health: Dr. J. G. Townsend, Chairman, United States Public Health Service; Dr. Robert A. Kehoe, cochairman, Kettering Laboratories, Cincinnati.

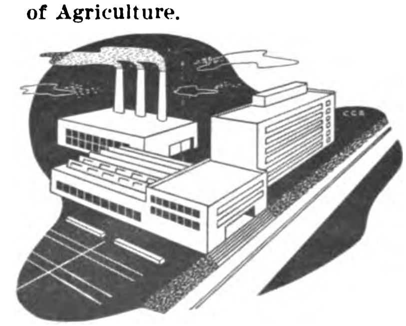
Instrumentation: Dr. Bernard Lewis, Chairman, Bureau of Mines, Pittsburgh; Dr. Arnold Beckman, cochairman, National Technical Laboratories, South Pasadena, Calif.; Dr. Cledo Brunetti, cochairman, Stanford Research Institute, Stanford, Calif.; Dr. M. D. Thomas, cochairman, American Smelting and Refining Co., Salt Lake City, Utah.

Equipment: Arthur E. Gorman, Chairman, Atomic Energy Commission; Dr. William P. Yant, cochairman, Mine Safety Appliance Co., Pittsburgh.

Analytical Methods and Properties: Dr. S. D. Silver, Chairman, Chemical Corps; Dr. Martin Shepherd, cochairman, Bureau of Standards; Dr. H. F. Johnstone, cochairman, University of Illinois.

Legislation: Mr. J. F. Hofflund, Chairman, Chief Counsel, Bureau of Mines, Department of Interior; Mr. Harold W. Kennedy, cochairman, County Counsel, Los Angeles County, Calif.

Agriculture: Dr. P. W. Zimmerman, Chairman, Boyce Thompson Institute, Yonkers, N. Y.; Mr. V. Webster Johnson, cochairman, Bureau of Agricultural Economics, U. S. Department of Agriculture.



EXPERTS DISCUSS WORKER HEALTH EDUCATION

Plans for extended research into the field of workers' health education, including underlying purposes, barriers to successful health education, and its techniques, were made at a 2-day meeting of the joint A. M. A.-Public Health Service Ad Hoc Committee on Worker Health Education held in Chicago on January 30–31 at the Palmer House.

This conference was a result of a recommendation for intensive appraisal of the status of this field of health work made by the Tenth Annual Congress on Industrial Health last year. A committee of more than a dozen experts in a wide variety of fields, including management, labor, industrial hygiene, education, public health, and sociological and psychological research, met to discuss the problems facing health educators today and to make a number of recommendations for study.

Specifically, the committee narrowed its discussions to five major areas of interest for future research, namely:

(1) The objectives of health education in industry in the larger sense;

(2) The factors that favor or hamper the health education program in industry;

(3) The specific methods and techniques of carrying out a health education program;

(4) The large question of scope and methods and relation to other programs and extension outside of industry, and

(5) An over-all evaluation of the impact of health education programs.

Out of the 2-day discussions came a number of specific recommendations for research to be done by interested groups, in universities and other places, which were turned over to the American Medical Association industrial health section and the Public Health Service divisions of health education and industrial hygiene.

Members of the committee included the following:

Dr. Dorothy Nyswander, professor of health education, University of California; Dr. Alvin Zander, professor of community education, University of

Michigan; Dr. Clyde W. Hart, professor, sociology department, University of Chicago, and director of the National Opinion Research Center; Dr. Antonio Ciocco, professor of biostatistics, School of Public Health, University of Pittsburgh; Dr. Dale Yoder, director, Industrial Relations Center, University of Minnesota; Dr. John Lentz, Young & Rubicam, New York;

Also Mrs. Myrna S. Bordelon, secretary of the Community Services Committee, Chicago Industrial Unions Council, CIO; Dr. Fred Slobe, chairman, Chicago Industrial Health Association; Mr. Dexter Keezer, Assistant to Mr. McGraw of McGraw-Hill, and chairman of the Consumers Advisory Board; Dr. Lester M. Petrie, director of the Division of Industrial Hygiene of Georgia State Department of Health; Dr. Jean S. Felton, medical director, Oak Ridge National Laboratory; Dr. Thomas D. Dublin, executive director, National Health Council, New York; Mr. Adolph Held, director, Welfare and Health Benefits Department, International Ladies' Garment Workers' Union, New York; Sara P. Wagner, director of nurses, Standard Oil Co.; Mr. Kenneth L. Kramer, director, Insurance and Health Department Textile Workers' Union of America, New York.

Recommended Reading

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CHROMIC ACID MIST FROM OPEN WASHER CAUSES ILLNESS

By George M. Hama,
Industrial Hygienist,
Detroit Department of Health

An unusual chromic acid exposure with resultant nasal irritation in the workers occurred from a poorly operated spray washer. The product moved on an automatic conveyor plating line from a chromic acid plating tank to the spray washer.

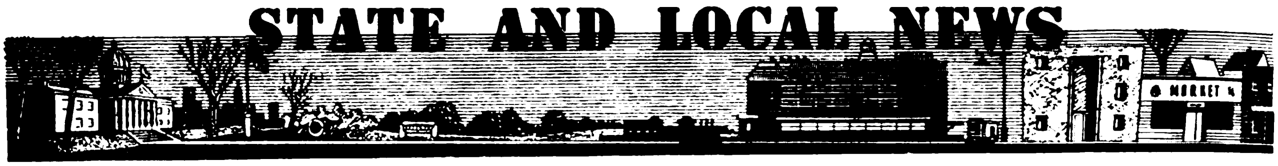
Before the plating line was put into operation an engineer made a check of the chromic acid plating tank and found that the ventilation was more than sufficient to control the chromic acid exposure.

However, after the plating line had been in operation for several weeks, the workers complained of nasal irritation and nose bleeding. Upon investigating, the engineer found that a recirculating-type spray washer had been installed to rinse off the parts coming out of the chromic acid plating tank. This spray washer consisted of ten spray nozzles which atomized the water and impinged it on the surface of the freshly plated parts. The fine water droplets containing the chromic acid produced a fog above the spray tank, and this fog was blown over to the working area by cross drafts. A large number of punch-press operators were exposed.

Air determinations in the vicinity of the workers indicated that high concentrations of chromic acid mist were present.

The recirculated water in the spray tank was not changed until concentrations as high as 2 ounces of chromic acid per gallon of water were obtained. Use of this recirculating spray washer resulted in a saving of chromic acid cost to the company of about $2,000 a month, so it was desirable to continue the use of the spray washer.

This was accomplished and the exposure was controlled by reducing the velocity of the spray nozzle, and enclosing and ventilating the spray-washer operation.



BALTIMORE, MD.

Administrative—The industrial hygiene unit has been elevated from a division to a bureau in the Baltimore City Health Department.

New members of the staff are Mr. Charles H. Borcherding, Jr., Miss Margaret Galbreath, and Mr. Henry G. Schober.

DETROIT, MICH.

Personnel—The following new members are now on the staff of the Bureau of Industrial Hygiene, Detroit Department of Health:

John Stephens, formerly industrial hygienist of Carbide & Carbon Chemical Co., Oak Ridge, Tenn.; Chester Ura, formerly chemical engineer, Research and Development, Clinton Laboratories, Oak Ridge, Tenn.; Philip Diamond, formerly health inspector, New York City Department of Health; and Louis Rottenberg, recent chemical engineering graduate, Wayne University, Detroit, Mich.

ILLINOIS

Publication—*What's New in Industrial Nursing* is the title of a new monthly periodical, written by the consultant nurses in the Division of Industrial Hygiene, Illinois Department of Public Health. The eight-page publication contains a variety of news, information, and advice for industrial nurses.

KANSAS

Shoe-fitting Machines—The Kansas State Board of Health adopted a regulation requiring warnings to be placed on all fluoroscopic shoe-fitting equipment in use in Kansas. The warnings, to be distributed by the board for attachment on the machines, states that repeated exposure to X-rays "may be harmful."

The placards state that shoe fittings by means of fluoroscopic machines should be limited to not more than three exposures of not more than 5 seconds each in 1 day or 12 such exposures in 1 year. The warnings state the use of fluoroscopic equipment for fitting shoes on children under 6 years of age is not advisable. Customers are warned not to operate the machines themselves.

Air Pollution—Three hundred copies of the November issue of the *Industrial Hygiene Newsletter* have been distributed in the State by the industrial hygiene office to legislators, city officials, chambers of commerce, and industrialists to promote interest in adequate air pollution legislation for Kansas. Early reports indicate that this material is being favorably received throughout the State.

Personnel—Mr. J. Lee Mayes became a full time employee February 1 as an industrial hygiene engineer. Mr. Mayes is a recent graduate in civil engineering (sanitary option) from the University of Kansas and has been employed on a part-time basis by the division.

MASSACHUSETTS

Bulletin—Commissioner John J. DelMonte of the Department of Labor and Industries has announced the adoption of rules and regulations relative to the labeling of receptacles containing benzol, carbon tetrachloride, and other substances hazardous to health and which contain more than 1 percent of either of the above-named solvents. Copies of these rules and regulations may be obtained as Industrial Bulletin No. 11 from the Division of Industrial Safety, Massachusetts Department of Labor and Industries, State House, Boston.

Lectures—The Division of Occupational Hygiene was responsible for presenting a series of five weekly lectures, illustrated by movies and lantern slides from the Division's collection, at the University of Massachusetts beginning February 9. Topics under discussion were: "Introduction to Industrial Health Matters" by John B. Skinner, division director, "Industrial Health Hazards" also by Mr. Skinner, "Evaluation of Hazards" by Engineer Richard I. Chamberlin and Mr. Skinner, "Methods of Control of Hazards" by Engineer Harold Bavley, and "Medical Control and Summary" by Clarence M. Maloof, M. D.

Conference—John B. Skinner, Director of the Division of Occupational Hygiene, has been invited to serve as chairman of the industrial hygiene session at the annual meeting of the Massachusetts Safety Conference to be held in March, at the Hotel Statler, Boston. Among the speakers will be Harry E. Tebrock, M. D., medical director of Sylvania Electric Products, Inc., on the control of the common cold through the use of antihistaminic drugs, and Harold Bavley, engineer of the Massachusetts Division of Occupational Hygiene, on radiation hazards from the use of fluoroscopic X-ray shoe-fitting machines.

Nurses Meet.—An all-day meeting of regional industrial nursing consultants of the New England area, with invitations extended also to New York and New Jersey, was held on January 6, at the State House, Boston.

The second of its kind to be given (the earlier one was held in January 1947), this work conference had as its theme, "The Routine Plant Visit." Mr. William Wood, chief coordinator of Health Education of the Massachusetts Department of Public Health, led the discussion on "The Approach—Meeting Our Public." Other speakers included the following: Mrs. Sarah E. Almeida, R. N., of the Massachusetts Division of Occupational Hygiene, on the "Content of the Visit"; Miss Marjory Wilbur, R. N., Rhode Island industrial nursing consultant, on "Recommendations"; and Mrs. Helen P. Cranton, R. N., industrial nursing consultant of Connecticut, on "Follow-up—Appraising One's Own Program."

Miss Winifred Devlin of the Division of Industrial Hygiene, United States Public Health Service, summed up all the material covered in the work conference from the observer's viewpoint, and praised the group for getting together and holding such an interesting and stimulating discussion.

MINNESOTA

Nurses' Course—The Tenth Annual Continuation Study for Industrial Nurses is scheduled for May 18–20, 1950, at the Center for Continuation Study, University of Minnesota, Minneapolis. This is a cooperative project of the Division of Industrial Health, Minnesota Department of Health, the University of Minnesota and Minnesota Nurses in Industry, Inc. In addition to regular members of the university faculty, out-of-State leaders in industrial health have been invited to join the teaching staff for this study. Registration is open to any industrial nurse. For the duration of the study, registrants may live at the Center at nominal rates. Complete information regarding the program can be secured by writing the Center for Continuation Study, University of Minnesota, University Campus, Minneapolis 14.

Personnel—Dr. W. E. Park has been named director of the Division of Industrial Health of the Minnesota Department of Health. He assumed his new duties January 16. Dr. Park came from Chalk River, Ontario, Canada, where he was medical director of the only atomic energy installation plant in Canada. The Division of Industrial Health has been without a medical director since Dr. Leslie W. Foker resigned at the end of 1945. Mr. George Michaelsen, who has been acting director since that time, is associate director of the division.

MONTANA

Meeting.—Mr. Henry N. Doyle, chief of the Field Station in Salt Lake City, was one of the main speakers at the December meeting of the Montana Safety Council. Mr. Cyril Ainsworth of the American Standards Association, who gave the keynote address, spent a major portion of his talk in stressing the importance of industrial hygiene.

Acid Mist.—The Industrial Hygiene Division has been doing some research work in conjunction with a company on the control of acid mist in electrolytic zinc refining using a surface tension depressant. Because of the encouraging results, further work on this problem will soon be started on a small scale in a pilot plant.

PENNSYLVANIA

Personnel—Dr. Joseph Shilen, director of the Pennsylvania Bureau of Industrial Hygiene, has announced that the initial personnel of the Division of Air Pollution Control, recently established within the Bureau, is as follows: Mr. J. S. Sharrah, chief; Mr. C. D. Robson, meteorologist; Mr. W. A. Sassman, chemist; Mr. John Coyne, chemist; and Miss Eloise Lane, secretary.

TEXAS

Radiation Course—A radiation monitoring seminar was held in Austin under the joint sponsorship of the United States Public Health Service and the Texas State Department of Health. The course was conducted by Mr. Duncan Holaday and Mr. Norman Modine, of the Division of Industrial Hygiene, USPHS, and was similar to courses conducted in other parts of the country by this same team.

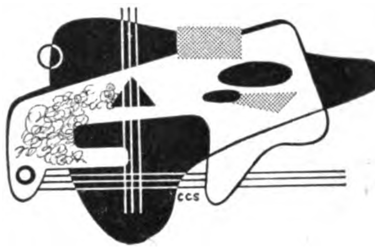
The course consisted of atomic theory, the nature of radiations, the biological effects of radiation, calibration of radiation detection instruments and application of detection instruments. The lectures on biological effects of radiations were given by Prof. G. S. Rabideau of the Biology Department of the University of Texas.

Approximately 30 engineers, chemists, and public-health workers attended the 5-day session. They represented insurance carriers, military installations, educational institutions, and Federal and State agencies in Texas, Oklahoma, Arkansas, Missouri, and New Mexico.

WISCONSIN

Personnel.—Mr. William Z. Fluck, industrial hygiene engineer for the State Board of Health, resigned to accept a position with the United States Navy in a civilian capacity. His new assignment will involve industrial hygiene procedures at the Navy aircraft installation on North Island, San Diego, Calif. He had been with the industrial hygiene division of Wisconsin since its formation in 1937.

Nurses' Institute.—The third biennial industrial nursing institute sponsored by the industrial nurses section of the Wisconsin State Nurses Association in cooperation with the Wisconsin State Board of Health was held February 3d and 4th in Milwaukee. The opening day included a joint session with the Wisconsin Council of Safety. The program covered new drugs used in industry, psychology, and human relations, and a panel discussion on chronic diseases.



USPHS Urges States to Develop Industrial Dental Program

Increasing interest in industrial dental programs prompted the Division of Industrial Hygiene, USPHS, to draw up an outline for procedure in the development of such a program by the dental divisions of the State health departments.

The objective of this program is the fostering of good oral health among the industrial workers by determining the effect of industrial environmental conditions upon the oral structures and by encouraging proper dental health practices.

Recommendations to the dentist in the dental division putting this program into effect include the following advice:

(1) Work with the industrial hygiene division in conducting plant surveys to determine the effects of the environment on the oral structures of the employees.

(2) Promote educational programs in an effort to teach the industrial worker the value of good oral health for himself and his family.

(3) Work with responsible groups (labor, management, local industrial hygiene and safety engineers, local dental societies) and the State industrial hygiene division in assisting in the development of dental programs in industry.

(4) Survey dental programs already in operation. Offer consultative services for their evaluation and, when necessary, recommendations for improvement.

IMPORTANT ORGANIC INSECTICIDES
Physiological Effects and Suggested Treatment

By J. Walter Hough, M. D., USPHS

Several of the insecticides which have been introduced to the American dairy, agricultural, and fruit growing industries were an outgrowth of the testing and development of military chemicals. It is difficult to classify the newer insecticides into distinct groups based upon their chemical composition, since many of them are relatively complicated in structure. In the following discussion, however, it will be convenient to divide the insecticides into such groups as (*a*) the organic phosphates, (*b*) the halogenated compounds, (*c*) the organic sulfur compounds, and (*d*) the miscellaneous organic substances.

Information covering the symptomatology, physical findings, and treatment is somewhat limited for certain of the compounds. It may be stated that general or symptomatic treatment is always indicated when specific remedies are unknown or unavailable. It would be practical to consider gastric lavage, the use of emetics, and thorough washing of the skin in the early treatment of poisoning with the insecticides depending upon the mode of entrance. Where pulmonary edema has appeared, it has been suggested that oxygen be used alone (where it seems to be indicated) rather than in combination with carbon dioxide.

ORGANIC PHOSPHATES

Hexaethyl Tetraphosphate, HETP, Bladan, or Hexotine

This substance was discovered in Germany during World War II, and contains tetraethyl pyrophosphate which is believed to be the active toxic agent in commercial hexaethyl tetraphosphate (*1,2*). It is made by reacting triethyl phosphate with phosphorus pentoxide or phosphorus oxychloride (*1*). The compound is a heavy, syrupy liquid readily miscible with water and highly effective in killing insects as well as being toxic to warm-blooded animals (*1,2*). It is a potent anti-cholinesterase agent (*3*). (Cholinesterase is a plasma and red blood cell enzyme.)

Physiological effects commonly observed are contracted pupils, impaired vision, and chest constriction (*8*). Congestion of eyes, throat congestion, and dermatitis may also occur but these effects are attributed to the action of the oils or other diluents.

Since the other organic phosphates used as insecticides have a similar toxicological effect in that each acts as an anticholinesterase substance, atropine sulfate in 1 to 2 milligram doses would be the antidote of choice. Thorough washing of the eyes and skin, general symptomatic and supporting treatment with replacement of lost fluids may be likewise indicated.

Tetraethyl Pyrophosphate, or TEPP

This substance is also found commercially designated as agrifume, bladex, fosvex, hexate, hexatone, hexcide, hexidust, killex, Niagara hexide—200, nifos-T, phosphofume, pyphos, tetra-chem, tetracide, tetra-tone, tetron, or vapatone.

Tetraethyl pyrophosphate is a heavy, syrupy liquid, prepared as early as 1854 (*2, 3*), and introduced during World War II by the Germans as a wartime offensive agent, but was subsequently found to be an excellent insecticide. It is a potent anticholinesterase agent. The administration of this compound by any route causes a rapid fall of the cholinesterase activity of the plasma to nearly zero and a somewhat less striking depression of the cholinesterase activity of the red blood cells. It has been stated that 0.5 milligram (1/130 grain) will kill a rat by skin absorption (*2*).

Symptoms, in order of prevalence, are anorexia, nausea, and giddiness; insomnia, headache, and abdominal cramps; excess dreaming, heartburn, and diarrhea; hot flashes, poor distant vision, and slight increase in frequency of urination; and drowsiness and mental confusion.

Physical findings, in order of prevalence, are increased sweating, restlessness, tremor, paresthesia, increased salivation, dyspnea, pin-point pupils, and bradycardia (*3*).

In a summation taken from several case histories, the following additional physiological effects were noted: Eye congestion, lacrymation, throat irritation, tightness of chest, syncope, and dermatitis (*8*).

Repeated treatment with atropine by any route has a moderate to marked inhibitory effect.

It has been noticed that the onset of toxic effects resulting from exposure to the organic phosphates has been relatively sudden, and at times the effects become rapidly overwhelming. In a communication, the following recommendations have been made (*17*):

"Whenever the use of chemicals, such as tetraethyl pyrosphosphate, involves the risk of accidental poisoning, all personnel working with or around the material should be instructed and trained in the methods of administering first-aid should an accident occur. First-aid supplies should consist of an adequate supply of ampins each containing 2 milligrams of atropine sulfate. Yellow laundry soap, or bicarbonate of soda and water should be available for decontaminating the skin. Heavy rubber gauntlet gloves and other rubber protective clothing, such as boots and aprons, should be on hand. First-aid treatment, which should be started as quickly as possible after poisoning occurs, is outlined as follows:

(1) Contaminated clothing should be removed and the skin decontaminated with soap or an alkali and water. Personal protective clothing and equipment should be used by those engaged in this procedure.

(2) The contents of one ampin of atropine sulfate (*2 milligrams*) should be injected subcutaneously as quickly as possible by one of the individuals who has been instructed *in the first-aid* procedures. If the victim is alone and recognizes *the onset*

of symptoms of poisoning, he should inject the atropine himself. Repeated injections up to three ampins should be given within a matter of minutes if the patient does not respond to the treatment. It is not recommended that more than this amount of atropine be given by nonmedical personnel.

(3) If the victim is not breathing, artificial respiration should be started at once and continued until breathing is restored. A physician should be called without delay.

"Treatment given by the physician consists of continuing the subcutaneous administration of atropine, being guided in the amount given by the response of the patient, since its administration is essentially a process of 'titrating' atropine against the poison. In severe poisoning, a total of 30 milligrams or more may be required. The patient should be watched carefully for a 24 or 48-hour period during which it may be necessary to give additional atropine to maintain a balance between its effects and the toxic effects of the poison."

In addition the physician should consider the use of postural chest drainings or bronchial aspiration if signs of pulmonary congestion are present.

0,0-Diethyl 0-p-Nitrophenyl Thiophosphate, or Parathion

The following trade names for material containing this insecticide are also in use: alkron, aphamite, durathion, genithion, niran, par, paradust, parakill, paraphos, penphos, phos kil, planthion, thiondust, thiophos, and vapophos.

This substance is a brown, sirupy liquid with a mild garlicky odor. It was first synthesized in Germany where it was developed as a wartime offensive agent. Subsequently, it attracted considerable attention because of its effectiveness in the extermination of plant insects. Physiologically it exerts an antichlolinesterase action. It is very toxic to warm-blooded animals, and deaths have occurred to workers during the preparation of the wettable powders, and to those in outdoor fields and orchards. Numerous cases of mild to severe effects with ultimate recovery have been reported.

In eight workers engaged in "cutting down" pure parathion to a range of 15 to 25 percent in a wettable clay powder, varying states of poisoning occurred, from a mild dermatitis to one death. Seven of these workers had changed from their street clothes into work garments, consisting of rubber boots, rubber apron, cap, gauntlets, and goggles. Only three had used their respirators, and the latter were of indefinite description. All the clothing used by these workers was washed at quitting time and clean clothes provided in the morning.

Seven workers (all except the one who had dermatitis) bathed before putting on their street clothes. All the employees washed their face and hands before lunch and ate food away from the place where the parathion was handled. All smoked on the job. The degree of temperature in the workroom in all but two cases ranged from 98° to 110° F. In two cases, the temperature was recorded as 80° F. Half of the days were moist and sultry, with a breeze blowing. The number of consecutive working hours expended before the first symptoms occurred was recorded in 6 cases as 4, 8, 40, 40, 107, and 24. The approximate total number of hours to which the worker-patients were exposed to parathion was 168, 238, 40, 40, 107, 103, 8, and 24.

Numerous case reports of workers engaged in mixing and spraying with parathion in fields and orchards further indicate that there may be cumulative effects even with a very weak solution. Warm, humid days seemed to furnish an additional hazard, possibly due to a certain amount of parathion being evaporated and held in the air, or to suspended mist or fine droplets, which the employees inhaled. Rather severe symptoms were noted among workers who had been spraying during the day.

Examples of the amount of parathion used range from continuous use of mixtures containing 1 pound of a wettable powder with 15 percent parathion poured into 100 gallons of water, to another example (in which a fatal case resulted) where an average of 4 pounds of a 25-percent powder in 100 gallons of water was used. It follows that in addition to the inhaled material, varying undetermined amounts of parathion covered the clothing and exposed skin of the workers.

Instances of poisoning have been reported among picking crews going into orchards which had been sprayed many days previously with a 25 percent spray powder strong enough to give 2.5 pounds of parathion per acre. In a matter of probably 6 hours, many of these workers began to feel ill and required hospital treatment. Two cases have been reported of aircraft pilots being allegedly affected by the dusts which they were spraying from their machines over crops and orchards below.

It may be definitely concluded that parathion even in very small amounts is dangerous to workers, whether inhaled, absorbed through the skin, or ingested.

The usual physiological effects to humans from exposure to parathion in the order of occurrence are as follows: Headache, weakness; nausea, vomiting, and abdominal cramps; and dizziness, nervousness, and anxiety.

The physical findings were pin-point pupils, pallor, excessive sweating, garlic breath, dimming vision, twitching muscles, rumbling bowels, excessive salivation, rapid pulse, involuntary urination, rise of blood pressure, involuntary defecation, tension, slurring and stuttering speech; shallow, rapid, and labored respiration; inability to swallow, disappearance of reflexes and response to painful stimuli, eyeballs rolling upward, excessive bronchial secretion, Cheyne-Stokes respiration, convulsions, semicoma, and coma.

Additional physical effects have been reported in a personal communication as follows (*8*): Choking sensation, pain in chest, irregular cardiac rhythm, burning ache in upper arm, itching of skin, rash on forearms and eyelids, and collapse.

The laboratory findings were high white-blood count, low red-blood count, and low hemoglobin (*8*). It has been estimated, based on animal experimentation, that the fatal dose of parathion for man would be in the neighborhood of 12 milligrams (*13*) and a safety limit of two parts per million has been suggested in connection with the residue of this insecticide on foodstuffs.

A recent communication mentions that . . . "the treatment of parathion poisoning at present relies chiefly on atropine. By analogy to TEPP poisoning, we would suggest 1 to 2 milligrams of atropine sulfate as necessary until the muscarinic effects of parathion have been antagonized. . . . Other recommended therapeutic measures include washing the skin with a good cleansing agent, disposal of contaminated material in strong alkali, gastric lavage in case this was a route of absorption, oxygen if necessary, tracheal intubation, artificial respiration if necessary, and parenteral administration of fluids.

"There have been several instances in which symptoms due to parathion poisoning began up to 8 hours after the last exposure. Individuals exposed to parathion should be warned of this possibility and should be told that atropine is the most effective antidote (*6*)."

It is believed that the treatment suggested above (*17*), for tetraethyl pyrophosphate, would also be of use in handling parathion intoxication. An examination of a number of reports from physicians who have treated cases of parathion poisoning indicates that the physician should give very close attention to the progress of the individual case when frequent doses of atropine sulfate appear to be necessary. It seems to be the consensus, however, that one should courageously continue the administration of atropine sulfate when the patient remains in a definitely toxic condition due to muscarinic action of the poison.

Other forms of therapy which have been used in treating parathion poisoning included oxygen, administered over a period of hours—one case having been reported as receiving oxygen for 48 hours. A limited experience suggests that 10 cubic centimeters of a 10 percent solution of calcium gluconate be injected intravenously, and continuous infusion of glucose in saline intravenously may possibly be of some help. In the latter instance, one patient's abdominal cramps were said to have stopped immediately after the calcium gluconate was given. Plasma and adrenalin have also been recommended and used.

Other recommended treatments include emptying the stomach with the Levine tube, removal of bronchial mucus by suction through a catheter (not infrequently a life-saving measure), artificial respiration, and the use of alkaline solutions for bathing the skin. One physician administered 140 units of curare during a first convulsion and reported a reduction of the severity of the convulsive movements. He stated that this did not prevent a recurrence of the convulsions, but he felt that it abolished the muscular fasciculations.

HALOGENATED COMPOUNDS

Dichloro-Diphenyl-Trichloro-Ethane or DDT

This insecticide is a white powder which is tasteless and nearly colorless with a faint fruity odor. Since it is insoluble in water, it is generally dispensed in a solvent, such as xylene, or in a light oil as kerosene, or by means of a wettable powder, such as clay. Commercial preparations vary from 1 to 25 percent with 3-, 5-, and 10-percent mixtures being the most commonly used. It may enter the body by inhalation, ingestion, or by skin contact with oily emulsions.

Workers have had varying experience with DDT in respect of its physiological effects. It tends to accumulate in the fatty tissues of animals and is secreted in the fat of milk, and therefore its use is discountenanced for dairy establishments.

In reviewing a small series of cases, it appears that the following physiological effects may result from exposure to DDT (*8*): Loss of appetite, gastric discomfort, abdominal pain, itching of eyes, sore throat, circumoral pallor, circumorbital bronzing, and irritability. One text (*9*) describes the symptoms following ingestion of oily solutions as nausea, vomiting, stiffness of the joints, and mental anxiety. A child who swallowed 1 ounce of 5 percent DDT in kerosene died in 4 hours following the ingestion, after having convulsions and being in a coma.

Absorption through the skin has resulted in symptoms of lassitude, heaviness and aching in the limbs, irritability and apprehension, pain in the joints, involuntary muscular tremors, diminished reflexes, and auditory acuity, patchy peripheral anesthesia, "yellow" vision, decreased systolic blood pressure, and decreased red and white cell counts. Another authority (*10*) has stated that DDT is a mild skin sensitizer but that any skin affection is more likely to be due to the solvent being used. The estimated fatal dose of DDT for man is 30 grams (*13*). No maximum allowable concentration value for the exposure of industrial workers to this substance has been adopted.

The following treatment is recommended in cases of suspected DDT poisoning: Thorough washing of the stomach with warm water; saline cathartic, if indicated; caffein citrate with sodium benzoate as a stimulant; infusion of saline with or without glucose; and sedation if necessary, to control motor excitement. Thorough cleansing of the skin is likewise advised.

Benzene Hexachloride (Hexachlorocyclohexene), BHC, HCCH, CBH, 666, Gammexane, or Lindane

Trade names for this substance are bentox, chemhex, gammacide, gammaloid, gammoxo, gamtox, G-tox, isotox, lexone, and gamiso.

This substance exists in five isomeric forms and its insecticidal property refers to the gamma isomer (*5*). The crude chemical has a strong, musty persistent odor, but the pure gamma isomer has but very little odor. Two writers state that the odor is retained by many fruits and vegetables, and this fact greatly limits its field of usefulness (*1, 4*). Another writer further states that its effects on insects may be as a contact or stomach poison, or as a fumigant (*1*). It has been used against the cotton boll weevil, cotton aphid, cotton flea hopper, louse, flea, fly and mosquito, and as a soil disinfestant.

As far as toxicity is concerned, the crude mixture is less toxic than DDT (*5*). Some have considered its spray residue tolerance in the same class as DDT. No maximum allowable concentration value for industrial workers has been established for benzene hexachloride.

Conjunctival and skin irritation (*1, 13*), central nervous system stimulation, and convulsions have been noted as physiological effects. In a personal communication, two histories of animal poisoning resulting from exposure to BHC (24 percent in powder, 10 pounds to 100 gallons of water) have been reported (*8*). In one case, several animals and their stalls were sprayed with wettable benzene hexachloride insecticide. Many of the calves exposed developed muscular spasms within a few hours, the younger ones being by far the most seriously affected. Several young calves died. In the other case, one recently foaled colt died after being placed with its mare in a stall which had been recently sprayed with BHC.

Treatment for benzene hexachloride poisoning includes general and symptomatic treatment, thorough bathing of the face and body, saline cathartic if indicated, and infusion of saline with or without glucose.

Tetrachlorodiphenyl Ethane, TDE, or DDE

Trade names for this substance are rothane D–3 and orthene.

Tetrachlorodiphenyl ethane has been used for the control of the corn borer and is also reported to be toxic to mosquito larvae (*14*). One writer has indicated that this compound does not have a high chronic toxicity (*4*). Only limited information is available regarding this substance.

The physiological effects are lethargy and slight local irritation (*13*). The estimated fatal dose of tetrachlorodiphenyl ethane for man has been stated as 300 grams and a safety limit of five parts per million has been suggested in connection with the residue of this insecticide on foodstuffs (*13*).

General and symptomatic treatment should be given as indicated.

Photos by courtesy of the United States Department of Agriculture, Bureau of Entomology and Plant Quarantine.

Dimethoxydiphenyl Trichloroethane, Methoxychlor, Dianisyl Trichlorethane, or Methoxy DDT

Trade names for this substance are anisate, marlate 50, orthotox, and Du-Pont dairy cattle spray.

This material was introduced early in 1943. It is marketed as a wettable powder. Certain comments indicate that this material is less toxic to animals and certain insects than several other insecticides mentioned above. It is used commonly as a dairy cattle spray and against flies, mosquitoes, bean beetles, lice, leaf hoppers, sweet-potato weevils, grape-leaf skeletonizers, cherry fruit flies, and other insects (*11*). It does not appear to any extent in the milk of cows that have been sprayed.

Methoxychlor has been described as a kidney poison. The local physiological effect is a slight irritation (*13*). There may be tremors and depression. The fatal dose of methoxychlor for a man is estimated to be 450 grams and a safety limit of probably 10 parts per million has been suggested in connection with the residue of this insecticide on foodstuffs (*13*).

In cases of poisoning with this substance, symptomatic treatment is advisable.

Octachloro-Methano-Tetrahydroindane, Chlordane, or 1068

Trade names are budane, chlor-dust, chlor-kil, chlorotox, chlor-spra, dow-klor, octaklor, ortho-klor, snyklor, toxichlor, and velsicol 1068.

Chlordane is an American-developed insecticide and fumigant (*1*). It has been used against houseflies, mosquitoes, ants, chiggers, ticks, fleas, cockroaches, grasshoppers, and other insects (*1, 4*). This substance has about half the acute oral toxicity of DDT for animals but is more toxic by dermal application than DDT (*1, 4*).

The following physiological effects have been noted in animals exposed to chlordane: Moderate skin irritation; central nervous system manifestations, particularly relating to the optic centers; liver damage and inanition; ataxia, convulsions, and collapse (*1*). The fatal dose of chlordane in man has been estimated to be 5 to 60 grams (*13*).

Treatment is symptomatic with cleansing of the skin, saline purge, and stimulation or sedative therapy as indicated.

Chlorinated Camphene, Toxaphene, or 3956

Trade names for this substance are hercules 3956, alltox, toxakil, penphene, phenatox, and toxatone.

The commercial product is a yellow, waxy substance. Chlorinated camphene is reported to be more toxic to man than DDT. It closely approximates the latter, however, in chronic toxicity, and the tolerances for spray residue are similar. It is currently used where it controls insects not controlled by calcium arsenate (*11*). Chlorinated camphene was found to be more toxic for white rats than DDT when either was administered in corn oil (*12*). Solutions may be absorbed through the skin and persons handling such solutions require adequate protection.

Dusting cotton for boll weevil control by means of an airplane is a common procedure in many areas. Several pilots have been reported ill from exposure to the fumes of toxic insecticides.

A six-row power sprayer equipped with one kind of dropped-nozzle spray boom is a frequently seen type of equipment on the farm. Exposure from some insecticides may be dangerous to the operator.

This substance produces local irritation with predominant symptoms of epileptiform convulsions. The estimated fatal dose of chlorinated camphene for man is seven grams and a safety limit of probably five parts per million has been suggested in connection with the residue of this insecticide on foodstuffs (*13*).

The recommended treatment is general and symptomatic with thorough washing of the skin and the use of phenobarbital.

Aldrin, Octalene, or Compound 118

Octalene is a white crystalline substance designated chemically as 1, 2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,6,-dimethanonaphthalene. It is insoluble in water but highly soluble in most organic solvents. It is readily formulated as a wettable powder, as an emulsifiable concentrate, or oil solution. Aldrin is used against soil insects, locusts, grasshoppers, crickets, cotton boll weevils, the plum curculio, alfalfa weevils, olive flies, ants, flies, and mosquitoes.

Clothing which has been contaminated with dust or solutions containing this material should be washed completely free of all contaminating insecticides. It has been recommended that the skin be protected against contamination with this insecticidal substance.

Dust inhalation must be avoided by the provision of proper ventilation facilities and the wearing of dust respirators. Spillage must be removed by washing off with a strong detergent. It must not be allowed to stay on the floor. Dust mixtures and automatic dust weighing equipment should be enclosed in a small room with proper ventilation to the outside.

No information is at present available with reference to the physiological effects of octalene in warm-blooded animals. It is understood, however, that a certain amount of animal experimentation pertaining to its toxicology is in progress.

The recommended treatment of poisoning with octalene is general, symptomatic, and supporting.

Dieldrin, Octalox, or Compound 497

This compound is a crystalline white solid designated chemically as 1,2,3,4, 10,10 - hexachloro-6,7-epoxy-1,4,4a,5,6,7,-8,8a-octahydro-1,4,5,6, - dimethanonaphthalene. It is moderately soluble in some of the organic solvents, rather insoluble in most of the aliphatic petroleum solvents, and insoluble in water. It is readily formulated as a wettable powder, or as an emulsifiable concentrate, in xylene solution, or in low percentage dust. It has been used for the control of adult flies and mosquitoes. It is used at the rate of eight pounds of 25 percent wettable powder or 1 gallon of 25 percent emulsifiable concentrate per 100 gallons of spray formulation.

Clothing which has been contaminated with solutions or dust containing this substance should be washed completely free of all the contaminating insecticide. The skin should be protected from continued exposure to the insecticide. Dust inhalation must be avoided by the provision of proper ventilation facilities and the wearing of dust respirators. Spillage must be washed off with a strong detergent and must not be allowed to stay on the floor. Dust mixtures and automatic dust weighing equipment should be enclosed in a small room with proper ventilation to the outside.

Recommended treatment in cases of poisoning with octalox is symptomatic and general, according to indications.

ORGANIC SULFUR COMPOUNDS

Thiocyanates, Rodanates

Trade names: Lethane-384, lethane-384 special, lethane-60, and thanite.

These compounds are reported as more toxic when absorbed through the skin than by ingestion (*4*). They have a rapid effect on animals, producing collapse and death within a few minutes (*1*). They have been used as household and cattle sprays, and have been reported to be specifically toxic against houseflies, granary weevils, and aphids (*4, 14*).

The principal effects of poisoning in warm-blooded animals are those of skin irritation, dyspnea, cyanosis, tonic convulsions, deep depression, respiratory paralysis and liver damage. The fatal dose of thiocyanates for man has been estimated to be 28 to 70 grams of concentrate (*13*).

The recommended treatment for poisoning is general and symptomatic as indicated with thorough washing of the face and body. In liver damage or suspected liver damage, it is advisable to give a diet low in fats, together with increased proteins, and high carbohydrates. Possibly methionine may be useful in such cases.

Phenothiazine

Phenothiazine is a light yellow crystalline substance practically insoluble in water. It is more toxic than rotenone (discussed later) and has been relatively effective against mosquito larvae and certain insects (*14*). It has likewise been reported that a combination of phenothiazine and lead arsenate is highly effective against the codling moth (*14*). Also it is reported to be effective when used alone against the codling moth (*11*). Another writer has stated that it is a very effective insecticide in concentrations which are not toxic for higher animals and man (*15*).

The principal effect of contact with phenothiazine that has been noted thus far is that of local irritation of the skin (*15*). Furthermore, its oxidation products sensitize the skin to irritation by light, frequently causing dermatitis in certain individuals.

While no specific therapy has been devised for cases of suspected poisoning with phenothiazine, it is suggested that the skin be washed completely free of the insecticide and any additional symptoms be treated according to physical findings.

Phenoxathin or Phenothioxin

This compound is a colorless crystalline solid having a geraniumlike odor (*14*). It is insoluble in water and most organic solvents. The chemical is particularly effective as a stomach poison (*14*), but is also used as a contact insecticide.

While no experimental or clinical information has been uncovered that throws any light on the toxicity of this substance to animals or man, it is believed one might expect to find a certain degree of skin irritation and possibly gastrointestinal difficulty among those exposed to the insecticide.

Although no specific antidote has been recommended for poisoning resulting from this compound, it is suggested that the skin be washed free of the material and that those with gastrointestinal symptoms be given gastric lavage and other supporting treatment as indicated.

MISCELLANEOUS ORGANIC SUBSTANCES

Rotenone, a derivative of derris root.

Rotenone, a crystalline neutral principal, is the active constituent of the bark of derris root (*7, 15*). It is employed as an insecticide for spraying vegetable crops, in amounts which do not leave sufficient residue to be poisonous to man, cattle, or birds. Many of the household and cattle fly sprays on the market contain rotenoid materials (*14*), and it has been reported that ethylene glycol ether of pinene increased the insecticidal action of a petroleum base solution of rotenone against the housefly (*14*).

The physiological effects of less severe poisoning with rotenone include dermatitis, rhinitis, conjunctivitis, pharyngitis, laryngitis, and balanoposthitis (*7*). Puritus ani, loss of taste and appetite, nausea and vomiting, abdominal pain, stupor, convulsions, incoordination, muscular tremors, and respiratory depression have likewise been reported following exposure of animals and humans to this insecticide (*13, 15*). It has been described as a liver poison. The fatal dose in man is estimated to be 200 grams and a safety limit of five parts per million has been suggested in connection with the residue of this insecticide in foodstuffs (*13*).

Protection against contact with the skin and guarding against inhaling this substance or its commercial derivatives would be strongly advised.

The treatment of skin or mucous membrane irritations would be of a cleansing nature with bland supporting therapy as a follow-up. Gastric lavage would be indicated where large doses of the poison had been swallowed, and, if liver damage was suspected, diets with low fat but higher protein and carbohydrates have been recommended. Symtomatic and general therapy would be used in other contingencies.

Piperine or Piperoylpiperidide

Piperine is a crystalline alkaloid of black pepper (*14*). It occurs as colorless needles and while soluble in various organic solvents, it is only slightly soluble in water.

Piperonyl cyclonene and piperonyl butoxide have been used as synergists in combination with insecticides to provide greater toxic and killing effects. It has been stated that piperonyl butoxide combined with pyrethrum is relatively effective against houseflies, roaches, flower beetles, and cattle lice, but less so against mosquitoes (*1*). Writers have stated that these combinations are stable and safe to use in the field, as well as in the household and food processing plants (*1, 14*).

The physiological effects have not been clearly described and although it may have a low order of toxicity for warm-blooded animals, it is suspected that gastrointestinal upsets may occur in cases of heavy ingestion.

Good elimination with symptomatic and general treatment would be the method of choice in cases of illness resulting from exposure to the piperines.

Nicotine

Nicotine is an alkaloid of the tobacco plant, soluble in water and is generally marketed in the form of nicotine sulfate. Other dust and spray mixtures have been prepared and used, however. This alkaloid is a very efficient contact poison and insecticide, and kills insects by paralysis. Nicotine was used over 300 years ago to control the lacebug on pear trees. One writer mentions that fatal nicotine poisoning is increasing in frequency, chiefly from accidental ingestion of nicotine insecticides. Two hundred and eighty-eight cases were reported from 1930–34 (*15*). Additional unconfirmed information suggests that there have been additional deaths from nicotine insecticide poisoning within the past few years. Nicotine insecticides have been used on vegetable crops with success, but against the codling moth, it has not proved as useful as other insecticidal substances.

The effects of exposure to nicotine are complex and varied. Absorption of the toxic element from the mucous membranes and especially from the lungs is very rapid, but more slowly through the skin. The onset of symptoms may begin with headache, increased salivation, cold sweats, nausea, and vomiting. This may be followed by diarrhea, abdominal cramps, weakness, exhaustion, palpitation, restlessness, excitement, and confusion.

Upon examination, the observer or physician may note a number of depressing disturbances as tremor, fainting, pupils contracted and later dilated, disturbed vision and hearing, muscular twitching, dyspnea, rapid and irregular pulse, respiratory and central nervous system paralysis, clonic spasms, and convulsions. The fatal dose of nicotine for man has been estimated to be in the neighborhood of 60 milligrams.

Measures which have been recommended for the treatment of nicotine poisoning are of rather equal importance and should be instituted promptly. Artificial respiration may be needed in the field if collapse appears early. Warm applications to the body and strong tea or coffee may be useful.

Following these measures, the skin should be thoroughly washed free of the contaminant, the stomach thoroughly evacuated by means of lavage or emetics, stimulation provided by means of adrenalin or caffein-sodium benzoate, and oxygen inhalations given if indicated. Increased fluids should assist in the elimination of the poison.

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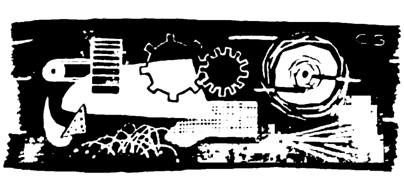

H. M. Bosch, Minnesota Industrial Hygienist, Joins Staff of WHO

Mr. Herbert M. Bosch, former chief of the Section of Environmental Sanitation, Minnesota Department of Health, has become the chief of the Section of Environmental Sanitation, World Health Organization, with headquarters in Geneva, Switzerland.

His work with WHO will involve direction of programs of world-wide scope, aiming at the control of major pandemic disease associated with insanitary environment, and the encouragement of sanitary measures of all types for promoting human health and well-being.

STATIC ELIMINATOR—

(Continued from page 2)

All of the tests showed that the bars had polonium on both the active and supposedly inert surfaces of the bars and thus were potentially dangerous.

In these tests the polonium could be removed by wiping the bar with a piece of filter paper or cotton so it is certain that any one handling the device would have contaminated his hands with the material. In one case the filter paper showed that about one microcurie of polonium had been removed by this simple test. The accepted maximum daily dosage of polonium is about one-hundredth of this amount.

Laboratories which handle alpha emitters regard any amount of such an element as polonium that is not under control as a hazardous quantity. Therefore, on the basis of present information, all such devices should be viewed with suspicion and their safety should not be assumed until it has been verified by tests.

State industrial hygienists have received information on this subject and are prepared to help any one who requests assistance or advice on this subject. Inquiries may be addressed to State health departments (in New York and Massachusetts, address the State Department of Labor) or to the Division of Industrial Hygiene, USPHS, Washington 25, D. C., for further reference.

L. A. SCHEELE—

(Continued from page 3)

Many cases of dermatitis can be avoided if the worker can be impressed constantly with the value of washing all of the parts of his body that have been exposed to any irritant as soon as possible after contact. After personal cleanliness, of course, comes shop cleanliness—care in the storage of irritants and in simple wash-ups. This kind of missionary work is made to order for you—and it is a basic responsibility.

Health Education Campaigns Urged

Most small plants, as you well know, operate pretty close to the profit line, and it is difficult to convince the manager of a plant employing only 100 workers that it is good business for him to spend money to have a part-time plant nurse—or a physician on call—or even to have extensive first-aid equipment on hand in a plant. Many of them, for that matter, have washing facilities far below the minimum standards.

A remarkably high proportion of our working population, as you know, is employed in these small plants. Because of this fact, and the fact that their health facilities are meager, a strong educational campaign for cleanliness and other good health practices could accomplish much.

The use of posters, calendars, and other media in these plants, for example, would be most helpful. You can help us and help yourselves at the same time in this effort. You may be able to get a better return for your advertising dollar in media that will get bigger coverage per unit. If you wish to perform a public service, however, this is one field of endeavor in which you can make a concrete contribution.

The job ahead in public health—and in industrial hygiene—is a big one. To get on with *our* work we need and want *your* help. Essentially, however, as I have indicated, industrial hygiene is an industry responsibility.

We can help in setting up the rules but you must play the game.

I urge you to take the field—and there has never been a better time than now.

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