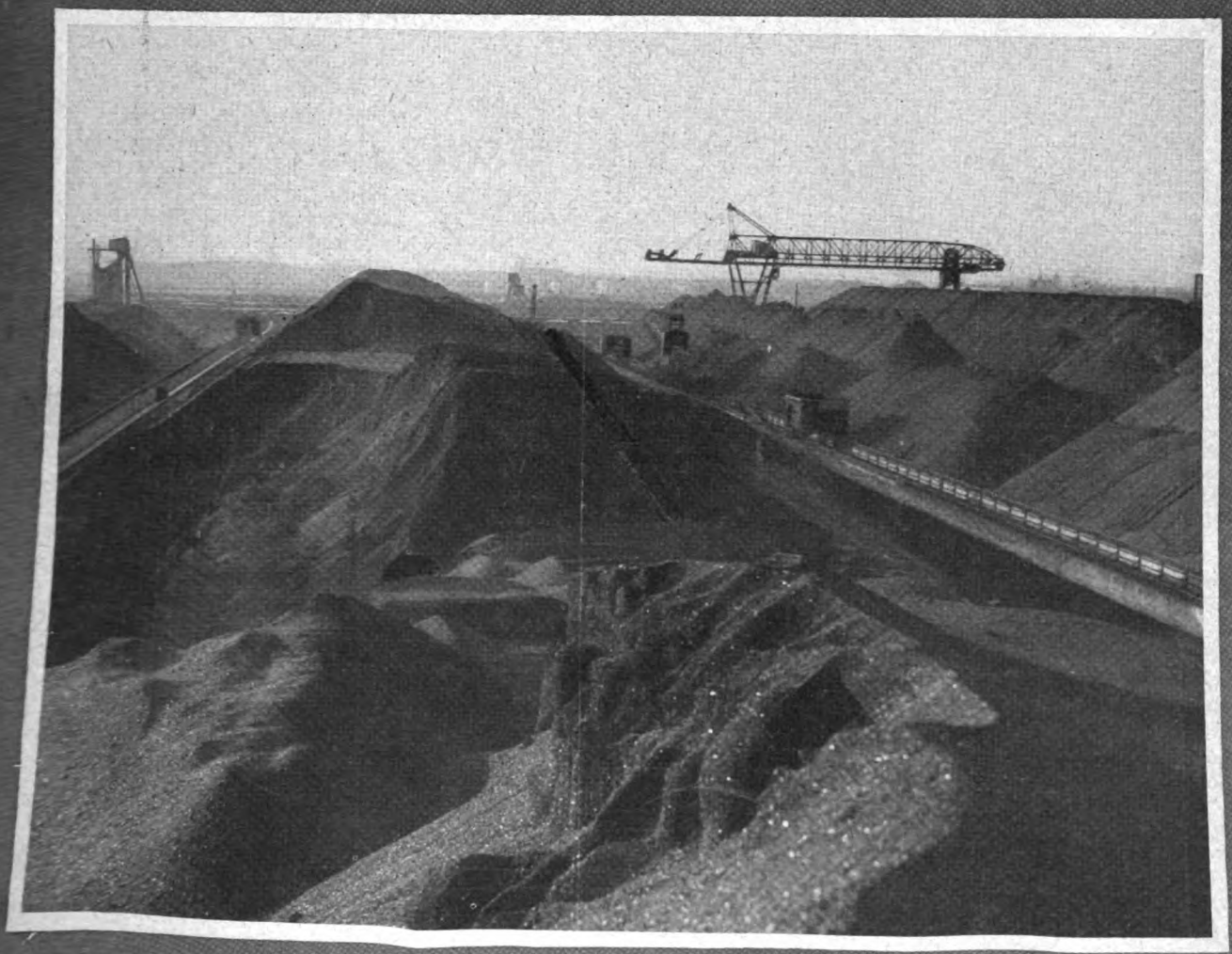
The Industrial Hygiene newsletter



OCCUPATIONAL CANCER PAGE 7 DECEMBER 1949

FEDERAL SECURITY AGENCY Public Health Service

INDUSTRIAL HYGIENE NEWSLETTER

Volume 9 December 1949 Number 12

Issued monthly by
FEDERAL SECURITY AGENCY
Public Health Service
Industrial Hygiene Division

FEATURES

This publication is free to persons engaged in industrial hygiene in governmental agencies (Federal, State, or Local). For sale by Superintendent of Documents, Government Printing Office, Washington 25, D. C. Rates—$1 a year (Domestic); $1.25 (Foreign).

Approved March 29, 1946, by Director, Bureau of the Budget, as required by Rule 42 of the Joint Committee on Printing

Public Health Service Plans Further Study Of Medical Care Plans

With the approval of the Advisory Committee to the Division of Industrial Hygiene, USPHS, and the addition of several members to the staff, the Division is expanding its study of industrial medical care plans. Miss Margaret C. Klem, who has been conducting studies of prepaid medical care plans and related subjects for the past 20 years will be in charge of this program. Assisting her will be Dr. Walter J. Lear and Miss Margaret F. McKiever.

In accordance with the recommendations of the Advisory Committee the objective of the expanded program will be to assemble and interpret authoritative information on various aspects of medical care for industrial workers. As existing and available data are frequently lacking or scanty on many important aspects of these plans, a comprehensive research program is planned. On the basis of the information thus obtained, it will be possible to provide essential data and consulting services to those State and local industrial hygiene units, management and labor groups which request help in establishing, administering and evaluating industrial medical care plans.

In both the research studies and the consultation services, extensive cooperation with both governmental and nongovernmental agencies is contemplated. Although some studies will be done independently, certain ones will be made in conjunction with the major investigations of the division, and others will be conducted as part of an interagency study of employee benefit plans under collective bargaining which is being made jointly by the division with the Bureau of Labor Statistics, Department of Labor, and the Division of Research and Statistics, Social Security Administration.

The studies will attack such basic problems as the volume of service provided in industrial medical care plans, the cost of service, the quality of service, and the organization and administration of the plans. Intensive studies of these subjects will be made jointly with the staffs in a few selected plans. Other plans will be asked to cooperate in broader types of surveys through the analysis of financial and medical service records utilizing basic items and standard units.

Advisory Committee to Public Health Service Makes Extensive Recommendations

Seated, left to right: Dr. R. H. Hutcheson, Mrs. Margaret Lucal, Mr. Paul Scharrenberg, Dr. J. G. Townsend, Dr. Harold A. Vonachen, Mr. J. J. Bloomfield and Mr. Andrew Fletcher.

Standing, left to right: Mr. Harry Read, Mr. Nelson H. Cruikshank, Dr. Harry Heimann, Dr. Leo Price, Dr. H. H. Schrenk, Mr. Theodore F. Hatch, Dr. Lewis J. Cralley and Mr. William Connolly (Guest).

In its first meeting, September 26 and 27, the Advisory Committee to the Public Health Service on industrial hygiene met in Washington, D. C., and discussed many industrial health problems. Representing labor, management, research groups, physicians, nurses, and State government, the committee brought to the round table a wealth of experience and a wide variety of viewpoints.

Dr. J. G. Townsend, chief of the Division of Industrial Hygiene, Public Health Service, explained the need for the advice of this committee on broad policies. Surgeon General Leonard Scheele traced the progress of industrial hygiene activities pointing out that the concept of industrial hygiene has been expanded to include the promotion of full health for the worker rather than concentrating solely on protection from occupational diseases. The importance of group participation is also realized more keenly at the present, he said, and all channels of activity are being integrated in an effort to bring optimum health to the worker. For such a comprehensive program, Dr. Scheele said, there also has to be increasing cooperation between labor and health agencies on both the national and State levels.

The following recommendations were the result of the 2-day conference:

1. The committee recommends that the Surgeon General enter into consultation with the Secretary of Labor, looking toward the solution of conflicts in the field of industrial hygiene.

An agreement should be reached giving full recognition to the proper function of the Federal and State labor departments in the enforcement of laws, codes, and regulations affecting the safety, health, and well-being of workers in industry.

The agreement should also give full recognition to the highly important functions of the United States Public Health Service and the State departments of health in the technical and medical fields of industrial hygiene. These two important groups should jointly integrate these efforts to insure the good health and well-being of workers in industry. When such agreement is reached, it should be circulated to the appropriate State agencies as to suggested policy in the field of industrial hygiene.

2. It is the opinion of this committee that the introduction of ionizing radiation in industry carries with it new and virtually unknown hazards to the health of workers employed in such industries.

We therefore urge greater dissemination of information now available upon its use in industry. We also recommend to the Federal and to the State departments of health, as well as to qualified universities, to augment facilities for research and study of the unknown hazards accompanying the use of ionizing radiation in industry.

3. Basic research establishing criteria for various toxic substances in connection with atmospheric pollution should be made a part of the general industrial hygiene service of the Division of Industrial Hygiene, Public Health Service. It is the opinion of the committee that this problem is of sufficient importance to justify every means to expedite the study.

4. The committee recognizes the need for collecting data on the industrial medical care program, and therefore recommends that the Division of Industrial Hygiene, Public Health Service, collect data on all industrial medical care programs and that these programs be evaluated as to cost to the employee, cost to the employer, efficacy of the service, and extent of service (hospital, surgical, home-and-office medical care, and nursing care).

5. The committee deplores the present lack of adequate reporting of occupational diseases, which lack greatly cripples the planning and effectiveness of industrial hygiene programs. This

(*Continued on page 12*)

35th Anniversary of Industrial Hygiene Section Commemorated at APHA

Dr. J. G. Townsend, chief of the Division of Industrial Hygiene, USPHS, addressed the Industrial Hygiene Section of the American Public Health Association October 25, in New York City on the subject, "The Government in Industrial Health." The occasion was the thirty-fifth anniversary of the founding of the Industrial Hygiene Section. During the same year, 1914, the Office of Industrial Hygiene and Sanitation was established in the United States Public Health Service.

Dr. Townsend said in part:

"There is real cause for celebration because industrial hygienists have come a long way in that time. We not only had humble beginnings but also experienced hostile reactions when we tried to promote our programs.

"And this despite the fact that men were dying of silicosis, lead poisoning, and other occupational diseases. It was the dogged persistence of Government agencies that finally overcame this resistance.

"Today, of course, the pendulum has swung in the opposite direction. Whenever an industrial hygiene survey is undertaken, there is complete, wholehearted support from management and labor. In fact, both these groups are increasingly taking the initiative and coming to us for assistance in solving industrial hygiene problems. Previous apathy and downright rejection have been generally replaced by an enlightened understanding of the importance of industrial hygiene. That is a glowing tribute to the record of the industrial hygienist, as he looks back upon thirty-five years of uphill work.

"During these years there was being built up a huge reservoir of scientific data, knowledge which would be invaluable to industry. But this information lay virtually untapped because there were inadequate outlets to distribute it throughout the country. Until 1936 only six States had official agencies which carried on some form of industrial health activity. The passage of the Social Security Act in that year provided the funds that finally enabled the Office of Industrial Hygiene and Sanitation to encourage the initiation of industrial hygiene programs in State and local areas. Stimulated and assisted by these grant-in-aid funds, the State and local health departments gradually developed industrial hygiene units until today there is at least one in nearly every State.

"The chief contribution of the Federal Government has been the development of the know-how and leadership in a highly complicated and technical field and of a Nation-wide network of industrial hygiene units. Direct responsibility for protecting the health of the worker, however, rests with these State and local industrial hygiene units, of which there are 58 at present. These agencies employ approximately 400 professional personnel.

"Most of the field activities of the State and local industrial hygiene units are devoted to routine investigations and evaluations of environmental health hazards and recommendations for their control. The services also include medical evaluations of industrial diseases and improvement of in-plant health programs. Last year, these agencies reported 37,336 different services to 25,700 industrial establishments, covering about 6 million workers.

"These offices have done more than a commendable job with their small staffs, but the limited coverage which they have been able to achieve means that, at present, 90 percent of the entire labor force receives no service from an official agency in any one year. This is all the more serious when we consider that over 90 percent of the industrial plants in this country employ less than 100 workers and that the vast majority of these small plants do not even have the most elementary industrial health services. Some even lack a cigar box first-aid kit, however primitive that may be and however much it may leave to be desired. As we advance toward other anniversaries, we can see therefore that one of the big problems still confronting us is the need to extend industrial hygiene services.

"Let us have a brief look at the future. One of the problems which looms large at present in the mind of the general public as well as of the industrial hygienist is air pollution. The Donora incident, in which 20 persons lost their lives, and almost 6,000 were made ill, last fall, gave conclusive evidence of the grim potentialities of smog. We can no longer think of air pollution solely in terms of a nuisance. The comprehensive data compiled in the Donora study made by this Division should facilitate other studies and help to solve what are still unanswered questions.

"The Division is also training its research efforts on the field of chemical insecticides. As yet, there is little knowledge of the toxicity of practically all of these potent insecticides, which include parathion, chlordane, 2-4D, organic mercury compounds, methyl bromide, benzene hexachloride, DDT, toxiphene and tetraethyl pyrophosphate. Additional basic research is needed. Close liaison between public health agencies, agricultural agencies, and chemical manufacturers and distributors will not only foster the helpful exchange of data but also promote the funneling of information to the industrial worker and the farmer.

"The field of radiant energy is daily presenting new facets which demand the attention of the Division of Industrial Hygiene. Only last month, for example, in response to a request from the State health department, the Division sent a consultant to Colorado for a preliminary exploration of health hazards associated with the mining and milling of uranium.

"Another important project on which we are embarking is the collection and analysis of reports on occupational diseases. The Division is stepping into the role of a central collection agency because of the absence of any systematic scheme for reporting occupational diseases on a national scale.

"The Division has also extended its activities on industrial medical programs. The primary objectives of this expansion are to assemble and interpret authoritative information on various aspects of medical care for industrial workers and, upon request, to provide information and consultation services on these subjects to State and local industrial hygiene agencies, management and labor.

(Continued on page 13)

NEW YORK HELPS PLANTS WITH VENTILATION PROBLEMS

Engineers Save Money for Plants

In New York State, the labor law requires that blueprints for ventilating systems be submitted to the labor department for examination and approval. No new system may be installed in a plant or an existing one modified without this official approval.

The Engineering Unit of the Division of Industrial Hygiene is responsible for this work of plan examination and approximately 2,000 such plans are studied each year. Because of this unusual experience, their technical assistance is frequently sought. A few recent examples may be of interest:

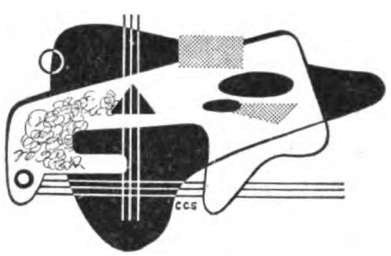
In a plant manufacturing and packaging drugs, vitamins and cosmetics, the submission of plans for examination and approval by the Engineering Unit provided an opportunity to assist the plant in getting more effective ventilation at a lower cost. Plans were submitted for an exhaust system on a hair-bleach powder-packaging machine which included high-velocity piping, a pressure centrifugal blower with a large motor and a cloth-screen dust arrester. The plans showed two high-velocity side hoods at the open hopper top and filling nozzle. These plans were disapproved for insufficient control of the dust.

The Engineering Unit recommended as an alternative that the packaging machine be completely enclosed with a sheet-metal housing having a partial opening. A low velocity through this opening is sufficient to control the dust. The housing acts as a low-velocity plenum dust-settling device. Since velocities and resistance are low, a disk fan with fractional horsepower motor could be used.

The savings effected were as follows: (1) An expensive pressure fan was replaced by an inexpensive disk fan; (2) less horsepower was required; (3) a very expensive cloth separator was completely eliminated; (4) material loss was reduced; (5) heat was saved because less air was exhausted; and (6) better dust control was provided.

An upstate dairy equipment manufacturer proposed the installation of a battery of overhead hoods to collect the fumes arising from furnaces and quench tanks. The Engineering Unit was able to demonstrate that the use of these hoods would require twice as much air and twice as much sheet metalwork as was necessary. The use of partially enclosed quench tanks and connection directly to the furnaces through draft diverters, which was recommended as an alternative, saved the plant considerable money not only in the original installation but in operating costs.

In another instance a New York city greeting card manufacturer proposed to control tinsel dust by an elaborate exhaust system that would have been quite costly to run. In reviewing this proposed system, the engineering unit recommended the use of an enclosure around the tinsel-applying machines, which almost completely eliminated the necessity for exhaust ventilation.



New Problems Occur In Silicosis Prevention

New plant problems are constantly arising in the field of silicosis prevention. Among these, the following two were of special interest:

(1) *Sand blasting.*—A small concern, engaged in stripping paint from old trucks and vans, did this work on a part-time basis by sand blasting them in a large room using sand (free silica) as the abrasive. It was necessary to provide exhaust ventilation to protect the workers from this toxic material, and it was also necessary to clean the exhaust air since the plant is located in a residential neighborhood.

A standard sand-blast exhaust system would have been prohibitive in cost and insistence on its installation would have forced the small concern out of business. Since the operations are performed intermittently in a very large room, the following rather unorthodox arrangement was worked out which appears to have solved the problem:

Two inexpensive propeller fans of slightly higher capacity than required were installed in the rear wall. A wall-to-wall and floor-to-floor partition was installed between the fans and the working zone of the room. This partition contained a bank of replaceable air filters. This filter bank was sufficiently far from the sand-blast operations so that most of the dust dropped out of the exhaust air to the floor by gravity before the air reached the filters. A simple gage was then set up so that when the filters are sufficiently clogged to reduce the air flow to the minimum requirements the gage would register this fact and the filters could be replaced. This installation, because of novelty of design, is being watched carefully to evaluate performance.

(2) *Water spray with patented wetting agent.*—In a large stone-crushing plant, the primary crusher and three secondary crushers were equipped with spray nozzles, using water and a patented wetting agent. The great value of this method is its economy and flexibility, as compared with usual dust-control systems. Plain water sprays have not been too successful for dust suppression in the stone-crushing industry because large volumes of water are necessary. Also, control with water alone has been poor in the past because a large percentage of the fine dust escaped getting wet, and it is the fine dust which causes silicosis. With the special wetting agent under consideration, however, smaller volumes of water can be used with greater wetting efficiency.

Air samples for dust counts were taken at various points in the plant, both with and without the sprays. The dust counts showed that the sprays were effective in suppressing dust. This is a new development of great importance, which may be applicable to many similar situations in the future.—**Contributed by the Division of Industrial Hygiene and Safety Standards, Department of Labor, State of New York.**

MERCURY POISONING FROM FINGERPRINT PHOTOGRAPHY

AN OCCUPATIONAL HAZARD OF POLICEMEN*

By John N. Agate and Monamy Buckell

Methods of Developing Latent Fingerprints

Police methods of recording and comparing fingerprints have not greatly changed since they were first used. Prints are still taken from the fingers of suspects by covering them with printer's black ink and pressing or rolling them on cards. Dark-colored powders have occasionally been used. The process in either case is simple and without risk. Detection by fingerprints depends on the comparison of such inked impressions with latent fingerprints left on furniture, doors, or movable objects at the scene of a crime. Such prints, left by the film of sweat and grease on the finger tips, have often to be developed and photographed for greater ease of comparison and recording.

Developing is done by applying a finely divided powder—a light-colored powder on a dark background, or a dark powder on a light background—with a soft, flat squirrel-hair or camel-hair brush, and the excess is brushed or blown off. Insufflators have been used, but with less success. The powders used in the past have included aluminum, willow charcoal, acacia black, lampblack, powdered graphite, and white lead. The last named was the cause of a case of chronic lead poisoning reported by Nyfeldt (1937).

This man had worked for the police in Denmark for 26 years developing fingerprints. He was thought to have inhaled the white-lead powder. Six years after starting to use it he developed colic and neuritis. Twenty years later, while still using it, he suffered from arthralgia and swelling of one knee, and punctate basophilia was found in his blood.

The powder most commonly used in British and United States police forces is mercury-with-chalk or gray powder (hydrargyrum cum creta B. P.), prepared in the usual way by triturating one part by weight of metallic mercury with two parts of chalk in a mortar. This powder seems to have a particular affinity for the sweat-formed latent prints, and produces a good image for photographing. A competent police authority estimates that 99 percent of all developing of latent prints in Great Britain is now done with this powder.

Mercury as a Hazard

Poisoning by metallic mercury probably dates from its first use as a therapeutic substance over 2,000 years ago (Almkvist, 1929). It has been known as an occupational hazard since Roman times, when quicksilver was mined in Spain. Mercury amalgams were used in refining precious metals and in fire-gilding in the Middle Ages, and their use gave rise to tremors. In the nineteenth century there were serious outbreaks of mercurialism in makers of mirrors and among workers in the felt-hat industry (Hamilton, 1925), where the condition is known as "hatters' shakes." More recently the disease has been studied in the hatters and furriers trades by Hamilton (1921) and Neal et al. (1941), and among thermometer makers and chemical workers by Buckell et al. (1946). Other trades in which there is a risk of mercurialism are the recovering of the metal from ore, the manufacture and servicing of electric meters, the making of surgical dressings, containing mercury salts, the bronzing of field glasses, photoengraving, the making and use of laboratory apparatus, and the preparation of pharmaceutical products containing mercury.

Clinical Investigation

When the possibility of mercurialism arising from fingerprint work in the Lancashire constabulary was recognized, the officer in charge of the men and 31 out of the 32 members of his staff volunteered for examination. Mercury excretions were determined by analysing 24-hour specimens of urine.

A record had been kept of the number of crimes investigated by each man in the past few years, and, since the developing of latent fingerprints takes, on average, 1 to 1½ hours per crime, some estimate of the degree of exposure can be attempted. In practice this must vary greatly with the circumstances of each crime. Each man kept an accurate record of his exposure during the fortnight preceding the examination.

Of the 32 men, 7 exhibited tremor, with or without other evidence of mercurialism. This tremor, which was coarse and distinctive though usually not very severe, affected the hands in every case. In three cases it affected also the lips and tongue, and in three the eyelids. One man had so severe a tremor that he could not lift a full cup to his lips without spilling it.

Discussion

The abnormalities discovered among this group of policemen must be attributed to chronic mercury poisoning. Thus an occupational disease of great antiquity appears in a new form, for we can find no published reference to a similar outbreak. Fortunately most of the cases were mild. If there was a danger of chronic mercurialism in the developing of latent fingerprints by this method, it is reasonable that evidence of abnormality should have appeared, as it has done, in members of this particular bureau, for it is unlikely that exposure like this would be encountered in many other police forces in Great Britain. Nevertheless, from time to time a great many men engaged on such duty must be at risk to a lesser degree, and the possibility of unusual individual susceptibility, so often met with in toxicology, must not be overlooked.

Prevention

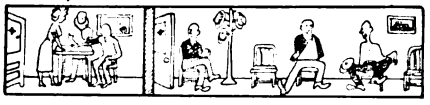
Masks and gloves are not a practical solution to this problem. It seems best that the use of gray powder for developing latent fingerprints should be abandoned, provided that a good substitute can be found.

(*Continued on page 12*)

*Excerpted from *The Lancet*, London, September 10, 1949.

OCCUPATIONAL CANCER HAZARDS FOUND IN INDUSTRY*

By W. C. Hueper, M. D.,
National Cancer Institute



The various occupational cancer-producing agents can be divided into two main groups. The cancer-producing agents of physical nature are ultraviolet rays present in the spectrum of the sun rays, X-rays, and the rays emitted by radioactive material of natural or artificial origin.

It appears from investigations of recent years that excessive exposure of the skin to the rays of the sun may be responsible for a majority of cancers of exposed skin, such as of the face, neck, hands and forearms, and the lower lip, particularly in fair complexioned people working outdoors in dry, sunny climates—farmers, oil field workers, prospectors, cowboys, mailmen, sailors, road workers and ranchers.

During recent decades roentgen rays and radioactive material have found rapidly increasing uses in laboratories and workshops concerned with mining, chemical, pharmaceutical, rubber, metallurgic, aviation, radium, dial painting, refining and shipbuilding industries, bringing occupational cancer hazards to certain groups of workers and technicians employed in or near these specialized operations. Depending upon whether the contact is directly to the skin or by ingestion or inhalation, persons exposed to these rays may develop cancers involving the skin, subcutaneous connective tissue, bones, blood-forming organs, and lungs.

The second main group of environmental agents possessing recognized or suspected cancer-producing properties includes both chemicals of well-established identity and ill-defined chemical mixtures. These different cancer-producing chemicals vary a great deal in their potency, while again as with the physical agents, the type of contact as well as the chemical characteristics of the particular substances decides the location within the body of the resulting cancers.

Inorganic Chemicals

Among the inorganic chemicals having cancer-producing qualities, the ingestion or inhalation of arsenicals may cause cancers of the skin in apparently predisposed individuals. Recent observations indicate that inhalation of arsenical dust may favor the development of cancer of the lung. Inhalation of chromate dust likewise is responsible for a high incidence of cancer of the lung among chromate workers, while the inhalation of vapors of nickel carbonyl results in cancer of the nasal sinuses and of the lungs among nickel refinery workers in plants using the Mond process of refining.

There is increasing evidence indicating that exposure to asbestos dust may create an increased liability to lung cancer in the presence of an asbestosis of the lung. It is still too early to know definitely whether or not contact with beryllium and its compounds may lead to the development of cancer affecting the lung or the bones. So far, no evidence exists suggesting such future developments in humans, although rabbits when injected with several beryllium compounds reacted with cancers of the bones.

Organic Chemicals

While these metallic carcinogenic agents are relative newcomers, and thus our knowledge concerning them and their effects is still highly incomplete, there is much more definite information available concerning the cancer-producing organic chemicals including the undetermined and complex mixtures of such chemicals existing in tar, pitch, asphalt, petroleum and its various processed products, soot, crude paraffin oil, creosote oil, and crude anthracene oil. Among the many thousands of chemicals which modern chemical industry has produced there are only a few for which definite cancer-producing properties have been demonstrated.

There can be no doubt that contact with two important dye intermediates, namely beta-naphthylamine and benzidine, elicits, in exposed workers, cancers of the urinary bladder. Some 1,000 cases of this particular occupational cancer are on record from Europe and America. If such contact is sufficiently severe and prolonged it appears that cancers may develop in all exposed workers. Fortunately such conditions of exposure are not likely to exist now in modern and well-managed dye works. Derivatives of these compounds are used as anti-oxidants in the natural and synthetic rubber industry. In operations in which latex is made and processed, if the anti-oxidants used are contaminated with free beta-naphthylamine left in the compounds during their manufacture, a cancer hazard may be created.

Under certain conditions of exposure, benzol used in the rubber industry as well as in other industries, is strongly suspected of causing cancer of the blood-forming tissues. These diseases are known as leukemias and lymphosarcomas.

Extensive Research Carried On

Cancer research has uncovered several hundred chemically related substances, many of them specially synthesized, and some of them dyes, which produce cancer in experimental animals. To date, none of these compounds has been demonstrated to have causal relation to the development of cancer in man under environmental or occupational conditions. During the past two decades, this intensive search for specific cancer-producing chemicals has been carried on. The initial stimulus for this phase of cancer research can be attributed to the work of two Japanese investigators who, in 1912, showed that tar applied to the skin of rabbits elicits, after prolonged treatment, cancer of the skin. Later, a group of English workers headed by Cook and Kennaway, isolated a chemical, 3, 4 benzpyrene, from large amounts of tar. They found that this chemical causes cancer in mice when painted on their skins. These two discoveries meant that definite proof of the cancer-producing properties of certain types of tars, product of the incomplete combustion of coal, was established.

For five decades these substances had

*Delivered September 14, 1949, at the Congress of International Chemical Workers Union, Mount Royal Hotel, Montreal, Canada.

been suspected of causing skin cancers in workers having occupational contact with them. The rather extensive statistical data collected by the chief inspector of factories on the occurrence and incidence of tar cancer in English workers include a great variety of occupations that have a liability to this occupational disease. Included in the group are exposure to pitch, asphalt, creosote, soot, and anthracene oil, which contain tar or tarlike material as the active principle.

While the majority of the more than 1,500 tar cancers observed involve the skin, recent observations made among coke-oven stokers in Japan and Canada suggest that the inhalation of hot tar fumes may cause cancer of the lungs. The industrial use of tar, pitch, asphalt, creosote, soot and anthracene oil is very widespread and varied. Coming mainly from gas works and coke ovens which furnish the most potent types of cancer-producing tar and related substances, they enter into the manufacture of fuel, dyes, plastics, paints, insulating material of cables and electrical equipment, impregnation materials of wood, paper and textiles, building materials, such as tiles, cork brick and linoleum, road-building materials, embedding material of optical goods, rubber, inks and brushes.

Cancer-producing agents of a chemically similar nature seem to be generated when oil shale is heated in retorts to high temperatures for the production of shale oil. The crude shale oil, as well as its processed fractionation products used extensively as lubricants in English textile plants and for the manufacture of paraffin, has given rise to the development of cancer of the skin in approximately 1,900 workers employed in English industries during the last 35 years. Since the production of shale oil has been carried on almost exclusively in England, only isolated cases of shale-oil cancer have been observed from contact with imported shale oil in the United States. However, this picture may change in coming years, unless proper precautionary measures are taken, because for several years shale oil production has been underway on a smaller scale in Australia and may assume large proportions in the United States following the completion of the experimental work carried on in the Rocky Mountain region.

There is definite evidence on record showing that some of the crude petroleums as well as a number of the fractionization products of petroleum, such as heavy oils used for lubrication, fuel and obtained during the production of paraffin as well as petroleum tars, asphalt and coke, possess cancer-producing properties. Such observations have come from Austria, France, England, Czechoslovakia, and the United States. Since exposure to these agents is mainly to the skin, the great majority of the oil cancers rarely affects other organs such as the lung or the stomach. The total number of oil cancers recorded from all sources is about 100, which is astonishingly small when considering the relatively large number of persons exposed to such products either during their manufacture or during their extensive and varied use especially in the consumer field.

While several recent observations suggest that other and previously unsuspected types of chemicals may be involved in the production of occupational cancers, I hope the data presented have given you an adequate although brief panoramic view of the various physical and chemical agents which may cause cancer under certain occupational conditions. These may affect the skin, nasal sinuses, lungs, bones, urinary bladder, blood-forming organs and connective tissues.

Protection for Workers

However, in listing various occupational agents as cancer-producing, it would be incorrect to conclude that the mere presence of any of these agents in a particular operation is proof of an active cancer hazard for all persons employed there or entering it at regular or irregular intervals. If, for instance, proper precautionary measures are taken and if particularly a perfectly working closed system of production exists, there is no danger for the workers, since there is no exposure to the cancer-producing agent handled. Cancers developing in workers of such operations therefore cannot be charged to an occupational exposure to cancer-producing agents.

Length of Exposure

Past experience, moreover, has shown that there exist rather definite and constant relations between the site and the time of appearance of an occupational cancer on the one hand and the type, intensity and duration of exposure to a particular occupational agent and the nature of the agent on the other hand. Occupational cancers, for instance, require as a rule a minimum time of exposure varying from 1 to 5 years, although occasionally a shorter duration may be recognized as being effective when special conditions are present. Similarly, occupational cancers often develop many years after an exposure to a cancer-producing agent has ceased.

This period of delay in the appearance of an occupational cancer after the start of the exposure may range from 5 to 50 years depending on the type of agent and the intensity of exposure to it. It is, on the other hand, not essential that there be a continuous exposure to a cancer-producing agent. Many observations indicate that discontinued or intermittent exposures, if sufficiently strong, may be quite effective in eliciting cancerous reactions. In evaluating alleged occupational cancer hazards and in adjudging claims made in such matters, the time and type of relations are important and deserve competent and critical consideration for medical and medico-legal reasons.

Proof of Cause

The demonstration of cancer-producing hazards in industrial operations depends on two types of evidence. If epidemiologic studies including a statistical analysis of the disease and death records from cancer show that workers employed in a certain plant or one of its operations have an excessive incidence rate of cancer and that cancer of one or two organs accounts for most of this excess, one must conclude that most likely an occupational cancer hazard exists. Such investigations must cover a period of at least 10 years of plant operation and must take into consideration the length of time elapsed since the plant started to operate. It takes usually some 10 to 15 years after a plant containing an occupational cancer hazard has opened before a statistically significant number of occupational cancers is demonstrable. Even this evidence may be completely obliterated by a rapid labor turn-over, unless the final fate of workers formerly employed in such a plant can be ascertained.

Another epidemiologic approach which is now extensively used in the United States and England is through an analysis of death certificates. In such investigations the occupational history of all persons dying during a

set period from cancers of certain organs is ascertained by various means. With this information available it is possible to obtain through field studies detailed data on occupational exposures sustained by the deceased individuals. From a critical evaluation of this evidence it is possible to spot cancer producing occupational agents. Such surveys are obviously highly complex undertakings which require the participation and teamwork of competent specialists of various types and the wholehearted cooperation of industry. Whenever such a combination of factors can be obtained, the results are generally gratifying and make up for the expense and labor expended.

The second type of significant evidence is of a medical nature. Many, while not all, cancer-producing agents leave some sympotomatic telltale footprints along the trail before cancer becomes apparent. Such warning signs when recognized and correctly interpreted by the plant physician can lead to the discovery of a cancer-producing hazard even before any actual cancers have made their appearance. For this type of competent medical care it is essential that the plant physician be intimately familiar with the technical operation of the plant, the products used and manufactured, including impurities and wastes, and that he possesses special knowledge concerning the acute as well as the delayed effects which may be produced by them in human beings through various routes, contacts and physical conditions.

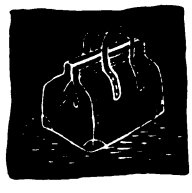
Unfortunately, occupational cancers affecting internal organs are not preceded by any characteristic or appreciable warning symptoms. In fact, in some of them the general health may remain remarkably good, although the cancer may have reached an advanced stage. Thus, while thorough and competent medical studies of workers and the analysis of their medical records may render valuable information on the question of occupational cancer hazards, our knowledge of such matters is at present still too defective to make this a reliable procedure in all cases.

The discovery and study of occupational cancers and of industrial cancer-producing operations and agents is of a practical and scientific importance greatly transcending the rather narrow limits of the industrial field. Results from such investigations add to our knowledge of agents that may cause cancer in man and that may be quite different in part from those that elicit cancers in animals. Such data are of immediate value in ascertaining the role which environmental agents may play in the causation of cancer in the general population. Only to the degree that we discover definite causes of cancer are we able to apply rational and effective preventive measures. Since occupational cancers are practically the only cancers for which well-defined cancer-producing agents are known, the study of these cancers represents one of the main avenues for finding the causes of human cancer. It is to be expected that many of these prospective causes will turn out to have no relation to industry or industrial environment.

In the meantime, in the face of a rapidly expanding industrial activity, it is essential that research into all phases of occupational cancer be carried on with increased energy, so as not only to conquer the recognized industrial cancer hazards, but also, to keep ahead of future developments and to discover environmental and occupational cancer-producing agents before any major damage can be done by them.

A. M. A. Reports on Study Of Aluminum Therapy For Silicosis

The Council on Industrial Health and the Council on Pharmacy and Chemistry of the American Medical Association have made a report on the present status of aluminum in the therapy and prophylaxis of silicosis.* The report was printed in the *A. M. A. Journal*, July 23, 1949.



Dr. Ernest W. Brown, executive officer, Committee on Scientific Development and Education of the Council on Industrial Health, and Dr. Walton Van Winkle, Jr., secretary, Therapeutic Trials Committee, Council on Pharmacy and Chemistry, summarize their report as follows:

1. Studies on the therapy of silicosis thus far have been inadequately controlled. The majority of subjects have reported subjective improvement, apparently of psychic origin. No convincing evidence of objective improvement either of pulmonary function or by roentgen ray has been forthcoming. Certain cases have shown eventual progression by roentgen ray subsequent to aluminum therapy under present conditions of dosage.

2. It is too early to expect evidence of the effectiveness of aluminum prophylaxis in men who do not have a history of exposure to silica dust prior to the beginning of the treatment. It is a fact that certain Canadian miners with a history of previous exposure have shown roentgenologic progression despite treatment with aluminum, although statistical data are not as yet available.

3. Aluminum is apparently not harmful to the normal or silicotic human lung in the dosages given for the therapy and prophylaxis of silicosis. Whether or not it increases susceptibility to tuberculosis is unproved. As far as we can ascertain the mass administration of aluminum in the United States and Canada over the past 5 to 6 years has not had an unfavorable effect in this respect, although again statistical data are not yet provided. However, great care should be taken to exclude the tuberculous in selecting persons to receive aluminum therapy.

4. It is not believed that a scientifically controlled experiment in industry is feasible for the evaluation of aluminum for the prophylaxis of silicosis. This follows from the uncontrollable variables inherent in the industrial situation and other factors which have been discussed. For these reasons, it appears improbable that any research agency would consider it advisable to undertake such a project except under special conditions already discussed, and which may not be attainable.

5. The McIntyre Research Foundation, as presently organized, is not equipped to solve the aluminum prophylaxis problem in relation to silicosis. The steps considered necessary to accomplish this objective are outlined.

6. Research should be continued with laboratory animals with the object of finding a more adequate basis for application to man. Such study is now included in the program of the Saranac Laboratory of the Trudeau Foundation.

*Reprints may be secured from Dr. Ernest W. Brown, 535 North Dearborn Street, Chicago 10, Ill.

Public Health Aspects of Atmospheric Pollution[1]

By G. D. Clayton, USPHS[2]

Whenever human beings congregate there is atmospheric pollution. If we did nothing else but breathe, we would contribute to the contamination of the atmosphere, for the air which we exhale has been changed in composition from that which we inhaled. But our mode of living causes us to contaminate the atmosphere even more. Our modern civilization requires us, for example, to heat our homes and cook our foods; our industries, and our public-transportation facilities all add to the general atmospheric pollution. We cannot even take our families out for a Sunday drive without aggravating the situation.

I present these facts to you to indicate the universality of the problem as well as its complexity. In order to visualize its many facets, let us analyze two of the broad phases of the problem, namely, (1) effects, and (2) contaminants.

EFFECTS

The effects may be considered under the heading of (1) nuisance, (2) economics, (3) vegetation, (4) animals, and (5) health.

While this paper deals with the public health aspects of atmospheric pollution, these are not the only phases of the problem; and in many cases they are not the most significant. Therefore, brief mention is made of some of the other aspects in order to look at the health phase in relation to the problem as a whole.

Nuisance

The nuisance aspects of the atmospheric pollution problem are well known. Obnoxious odors, loss of visibility, and the dirt of settled particulate matter have been experienced by practically every one.

Economics

Another familiar effect of atmospheric pollution is discoloration of buildings, including stone, brick and painted surfaces. Blackened surfaces and encrustations of soot material frequently obliterate essential lines and decorations. They literally disfigure a building and seriously reduce its esthetic and decorative value.

More serious, however, is the corrosive action of acid gases on buildings. One of the effects of this reaction is the formation on stone surface of hard, impermeable skin which tends to blister and exfoliate. It has been reported that sheets of galvanized iron had a life span of 3 to 6 years in one city as compared with 7 to 14 years in a smoke-free community; and that copper would last only 10 to 20 years in the same city, whereas it would be good indefinitely where there is relatively little atmospheric pollution. The effect is well known of certain acid gases on paint, as exemplified by the blackening of white-lead base paint by hydrogen sulfide.

Vegetation

The civic beauty of a community is often reflected in the upkeep of its parks and the landscaping of its homes. The farms at its outskirts also are an essential part of a prosperous community. The effects of atmospheric pollution on vegetation are therefore an important consideration.

A polluted atmosphere may injure plant life more than it harms animal life. The effects of polluted air are shown by stunting in growth, loss of vigor, reduction in crop yield, and degradation of color. Sunlight is more directly essential to plant life than to other forms of life for the plant depends on the light falling on its leaves for the conversion of carbon dioxide.

On an annual basis the light reduction caused by pollution in the atmosphere may be up to 40 or 50 percent. Further loss is experienced by the plant because the coating of particulate matter that accumulates on its leaves makes it increasingly difficult for the life-giving rays of the sun to reach the leaf. This coating of particulate matter on the leaf surfaces also tends to choke the minute openings of the leaf through which the plant breathes. Particulate matter causes further damage to the living cells and destroys chlorophyll by holding the acid gases in the atmosphere in contact with the leaf. In many cases the leaves and tender plants are scorched beyond recovery. Further increase in acidity of the soil due to atmospheric pollution can adversely affect vegetation.

Animals

Evidence is available which indicates that animals are affected by atmospheric pollutants. The Donora investigation revealed that dogs manifested acute toxic effects during the prolonged smog conditions. There was some evidence to indicate that other species of animals were also affected.

Another effect that is not as dramatic but nevertheless important is that resulting from the ingestion of contaminated vegetation. Studies have indicated that although the concentration of a particular contaminant in the atmosphere might not be present in sufficient quantities to produce injurious results to livestock by inhalation, an accumulation or deposit of the contaminant on vegetation eaten by animals may result in lowering the vitality, stunting growth, and could eventually lead to death.

Health

For the purpose of this discussion, the problems of air-borne disease of biological etiology, and air-borne diseases of plant origin (such as allergies) will not be considered. The discussion will be limited to diseases caused by air-borne dust, fume and gas—products of our civilization.

Since the thirteenth century, attempts have been made by various investigators to show the relationship between atmospheric pollutants and illness. The results of these investigations were either inconclusive or the claims could not withstand the close scrutiny of the medical profession. Therefore, the majority of the medical men looked upon atmos-

[1] Presented at the Second Gulf Coast Regional Conference on Industrial Health at Houston, Texas, October 7, 1949.

[2] Chief, Atmospheric Pollution Unit, Division of Industrial Hygiene, USPHS, Washington, D. C.

pheric pollution primarily as a nuisance and not a health problem. As a result of the Donora episode, the question has again arisen, "IS ATMOSPHERIC POLLUTION A HEALTH PROBLEM?" To answer this question one must consider the problem from the viewpoint of both acute and chronic effects. For the acute phase, the answer is definitely in the affirmative. Our investigation into the Donora episode indicated that people died and thousands became ill during the prolonged smog conditions.

It is not simple, however, to determine what the effects on the populace are of long-term exposure to atmospheric pollution. If these effects are to be ascertained, we must have answers to certain questions, such as:

1. What effect does atmospheric pollution have on persons with pre-existing maladies such as disease of the respiratory tract, heart disease, and possibly others?

2. What effect does atmospheric pollution have on elderly people who by the aging process naturally develop degenerative diseases of the lungs and heart?

3. What effect does atmospheric pollution have on children who have an increased respiratory rate as well as increased metabolism?

4. What effect does atmospheric pollution have in lowering the resistance of persons so as to predispose them to infectious diseases, particularly of the respiratory tract?

5. What effect does atmospheric pollution have on the mental health of individuals?

To answer these questions, it will be necessary to know more about the properties and effects of the contaminants themselves such as:

1. What concentration of contaminants is required to produce acute and chronic effects?

2. Do contaminants occurring in combination act individually? Is the effect additive, or is the effect greater than the summation of the individual effects?

3. Under what meteorological conditions would contaminants increase to harmful concentrations?

These and many other questions must be answered before one can adequately evaluate the long-term effects of atmospheric pollution on the health of the general population. Only general knowledge is presently available, such as the fact that atmospheric pollution does decrease quantity of the germicidal rays of the sun and in this way may indirectly produce adverse effects. It is also known that irritating gases and large amounts of particulate matter present in the atmosphere may reach concentrations which would have an adverse effect. The extent of such injurious effects is not known.

Maximum allowable concentrations of many toxic substances have been established for protecting the health of workers in industrial plants. However, these concentrations have been established for the type of personnel normally employed in industry (aged 18 to 60 in relatively good health) during the course of an 8-hour day. Hence, the maximum allowable concentrations familiar to industrial hygienists throw little light on amounts that can be safely breathed 24 hours a day by the general population, including the very young and the aged, as well as persons with organic diseases and those with special sensitivity to respiratory irritants.

It is important to emphasize that information available on the toxicological effects of mixed irritant gases is meager and that data on possible enhanced action due to adsorption of gases on particulate matter are limited.

To obtain the necessary data will require both laboratory and field work on an extensive and time-consuming scale. Although these long-range studies are essential to the solution of the problem of atmospheric pollution, this does not mean that practical control procedures cannot be carried forward in the meantime. It does mean, however, that careful thought and planning are necessary if orderly progress is to be made.

CONTAMINANTS

Before an intelligent evaluation can be made of the atmospheric pollution problem, information, even though general, must be obtained on the contaminants found in an industrial community. For present purposes of simplification, the contaminants may be divided into two groups: (1) gases and vapors and (2) particulate matter.

Probably the most common gas found in the atmosphere is sulfur dioxide. Some of the other gases found in various amounts are carbon monoxide, carbon dioxide, hydrogen sulfide, oxides of nitrogen, hydrofluoric acid, hydrochloric acid, ammonia, and organic solvents.

Particulate matter is a term applied to dusts, fumes, mists, and fogs. The size of particulate matter plays an important part. Large particles settle readily near the source of discharge under normal weather conditions. These particles are seen daily on the floor, window sills, and porches. The smaller particles, less than a micron in size, remain suspended in the atmosphere for an extended period of time. They are the particles that reduce visibility, shut out sunlight, and adhere to the ceiling, walls and draperies. They are also, unfortunately, the most difficult to collect by known control procedures. They also serve as nuclei for the condensation of moisture resulting in fog. The types of particulate matter commonly found in the atmosphere are silica, silicates, fly ash, carbon, and the oxides of various metals. The type of particulate matter suspended in the atmosphere depends on the types of industries present.

Source

After classifying the contaminants found in the atmosphere, one next must consider the source or point of generation of these contaminants. Products of combustion, for example, emanate from such sources as manufacturing plants, homes, trains, boats, incinerators, and brush fires. Industrial operations of virtually all types add to the general atmospheric pollution load, and automobile traffic, construction, and wind storms also contribute to the over-all problem.

Methods of Control

After atmospheric contaminants have been studied, the sources determined, and toxicological information reviewed, the next question is, "What can we do about it?" The methods of control of various pollutants are many. The principles used are in the main: (1) substitution, (2) conversion, (3) collection, and (4) dilution. Let us consider these four principles to see how they apply in practice.

1. Substitution.—This principle is well-illustrated by the substitution of Diesel switch engines for coal-burning steam engines. Although substitution has a limited place in industrial operations, it may be used wherever practicable to effect a substantial reduction in atmospheric pollution. In the designing of a new plant where air pollution is

a potential problem, this principle could be of primary importance.

2. Conversion.—Conversion is a term applied to the process of converting, for example, an obnoxious substance to one that is not obnoxious. Thus, organic compounds are often disagreeably odoriferous and extremely annoying even in low concentrations. It is possible to convert such materials into substances which are not particularly objectionable by passing the offending materials through furnaces for conversion into an unobjectionable substance.

3. Collection.—There are many types of collectors on the market today, among which are mechanical filters, cyclones, electrostatic precipitors, scrubbers and ultrasonic equipment. Each problem in the collection of atmospheric contaminants must be considered as a separate entity, and the engineer must take into account many factors before making recommendations. In some instances, installations have paid for themselves by the recovery and subsequent reclaiming of collected substances. However, we must bear in mind that this cannot always be expected, and that the sole benefit derived will be a decrease in atmospheric pollution.

4. Dilution.—Dilution is a very practical control measure. It is well known that a substance can be annoying, even harmful, in certain concentrations. Yet the same substance can be diluted to a point where it is no longer objectionable nor injurious to a person's health. This dilution depends on the vertical mixing, turbulences and dissipation by the wind; hence, the science of meteorology can play an important role in this method of control. For instance, if a plant were located in an area where prevailing winds disperse the contaminants away from the inhabitants, there would be no problem so far as the human factor is concerned. It is probable in the future that many companies before they erect a plant will consider the meteorology of an area, in addition to the availability of raw material, labor, transportation and other factors.

In review, there are many known principles which may be applied to the control of atmospheric pollutants. However, it is not meant to imply that the control of contaminants is a simple task. Much is yet to be learned about the control of small dust particles, particularly in the size range of less than 1 micron. Additional information is needed on the removal of small percentages of contaminants from relatively large streams of air. At the present time, the cost of controlling some atmospheric contaminants is prohibitive. It is, therefore, a challenge to the engineering profession to devise methods to increase the efficiency and economy of equipment for the collection of atmospheric contaminants.

ORDINANCES

The majority of the larger cities in the United States now have ordinances on smoke abatement and atmospheric pollution in general. In considering the adoption of an ordinance on atmospheric pollution the community should use ordinances from other cities only as a guide. The reason for this becomes obvious when it is recognized that no two cities are alike with respect to the various phases of atmospheric pollution problems.

Before an adequate ordinance can be adopted, a thorough investigation into the problem is necessary. Consideration should be given to such factors as topography, and weather conditions, such as temperature inversions, wind directions and speed, and humidity. The type, extent, and locations of industries must be evaluated. The type of fuel used in the community is also an important consideration.

Successful atmospheric pollution abatement practices have shown the need for an active civic support. The support of chambers of commerce, womens' clubs, and business and professional organizations is needed in molding public opinion for the abatement of atmospheric contaminants. Representatives of various industries, citizens' groups, public officials and medical and engineering societies, should be represented on an advisory board to the atmospheric pollution department of the community.

SUMMARY

Cooperative efforts of many groups will be required to obtain the basic information which is necessary if we are to develop a progressive atmospheric pollution program. Only by an intelligent, concerted approach to this problem can we hope to arrive at those reasonable conclusions which will permit industry the right of operation, and the community the right to have an atmosphere which is relatively free of atmospheric pollution.

MERCURY POISONING

(*Continued from page 6*)

Summary

Out of 32 men engaged regularly on such work, 7 were found to have evidence of chronic mercurialism.

This appears to be a new form of a long-established occupational hazard.

Exposures in excess of 250 hours per year are considered to constitute a definite risk.

Urinary mercury estimations were of no assistance in diagnosing individual cases or estimating exposures, but the average excretion of the group was abnormally high.

ADVISORY COMMITTEE

(*Continued from page 3*)

inadequate situation has been recognized for many years. It is recommended that the Division of Industrial Hygiene, Public Health Service, undertake a program of study and field work with State health departments and other proper agencies with a view to correcting this situation.

6. This committee recommends that the Division of Industrial Hygiene, Public Health Service, cooperate with the Council of Industrial Health of the American Medical Association, the American Association of Industrial Nurses, the United States Department of Labor, the major industry groups and the major labor organizations in devising new techniques to meet the industrial hygiene needs of small businesses and plants.

7. The committee recommends that the Surgeon General seek funds for research and pilot studies of a practical nature in mental hygiene in industry, with the view of developing such new techniques as are needed to meet the practical problems of industry.

8. The committee recommends that the Surgeon General recognize the need for a study of the problem of medical certification of temporary occupational and nonoccupational disability among industrial workers. The purpose would be to collect the viewpoint of interested agencies and organizations to develop uniform and effective criteria and standards in sickness insurance, and refer this recommendation to the proper bureau for necessary action.

Los Angeles County Industrial Hygienists Active in Many Fields

The following excerpts, taken from the annual report of the Division of Industrial Hygiene, Los Angeles County Health Department, indicate a wide variety of activities:

From July 1948 to July 1949, 341 plant visits were made. Ninety-four percent of the plant visits were at the request of either management, labor, industrial physicians, individual workers, or the State Division of Industrial Safety. The remaining group includes those in a ceramics industry survey and an industrial sanitation survey.

Twelve new industrial health services were established in plants in our area. Seven of these provided for medical service at the plant. Five provided for full-time nursing services and an on-call physician.

The county portable X-ray unit visited 23 plants and X-rayed 4,815 workers. X-ray findings which indicated pathologic conditions of the lung, heart or other organs were followed up by the X-ray survey nursing staff working through plant medical departments. Referrals were made to the worker's private physician or to the proper health agencies.

A fine example of the close cooperation between this division and other official agencies is evidenced by the joint meeting between the local industrial hygiene units and the county air pollution control district. It is now apparent that it is not only necessary to use exhaust ventilation to protect plant workers from fumes and other toxic dusts but that these same materials must not be released in toxic amounts to pollute the neighborhood atmosphere. The incentive behind this meeting was to be sure that if the air pollution district recommends a filter on exhaust outlet, it does not result in backing up the toxic material into the plant. Similarly, if industrial hygiene recommends exhaust ventilation, it should be so arranged that people living in the plant vicinity would not be subjected to a health hazard.

The industrial plants in this area vary in regard to the type of medical service available to their employees. Many have full-time physicians who spend the entire working day at the plant. Other plants have part-time physicians who are at the plant only part of the day. Some plants have on-call physicians who treat industrial patients at their private offices and only visit the plant when emergencies occur. As a service to these physicians, this division has inaugurated a medical abstract bulletin. The medical and technical journals subscribed to by our health department library are reviewed by the director of this division. Particular attention is paid to articles dealing with industrial medicine. This new bulletin will help keep the physicians acquainted with new developments in the medical field and also present to them periodically a brief résumé of the characteristic effects of known industrial poisons.

All county health department X-ray equipment was surveyed this year by this division. It is generally agreed that all harmful radiation effects can be avoided by taking the proper precautions. Dermatitis, cancer, leukemia, and sterility may result from overexposure to radiation. This year, by order of the county health officer, the division of industrial hygiene has been directed to survey the health department X-ray and flouroscopic apparatus at stated intervals. Personnel are also to be periodically checked. By this means the county will be certain that not only is our equipment properly regulated insofar as overexposure to radiation is concerned, but also that the operators are not being overexposed.

Dermatitis continues to be one of the major problems in industrial hygiene. This past year we had occasion to do dermatitis surveys in a ceramics plant and in a baking plant. Personnel managers should be discriminating in that anyone they hire with a past history of allergy or dermatitis should not be given a job which by past experience is known to have produced skin rashes or irritation. However, in one plant a man with a past allergic history spent 6 months on compensation because of severe dermatitis which occurred while working for the plant. In the other plant three workers began to develop a rash on the hands. Investigation by this division revealed that they were sensitive to some of the flavors used in baking, and the recommendation was made that they be put in jobs where they were not required to be exposed to these flavors.

Gladys Dundore, R. N., Receives Pennsylvania Ambassador Award

Mrs. Gladys Noss Dundore, R. N., executive secretary, American Association of Industrial Nurses, was one of 26 Pennsylvania citizens to receive the State's 1949 Ambassador Award. Annually the State Chamber of Commerce selects those citizens who have achieved merited success in other States or abroad for this honor. This is the first time that an industrial nurse has received this recognition in Pennsylvania. Of the 26 Ambassadors, 4 are women.

Mrs. Dundore was additionally honored by the citizens of her home town, Hazleton, at a luncheon and reception, when she was presented with the Ambassador Award. Among the distinguished guests present were Pennsylvania's Lieutenant Governor, Gen. Daniel B. Strickler and Mrs. Mary Delehanty, R. N., national president, American Association of Industrial Nurses.

35th ANNIVERSARY—

(*Continued from page 4*)

"Another force has recently come to bear on the industrial hygiene picture that necessitates even more pronounced strides forward. The American worker is today more informed and more articulate about health matters. He demands recognition as part of the industrial hygiene tripod, along with management and official agencies. Labor is now mature and must be dealt with in the same frank, forthright, and impartial manner that characterizes our relationship with management. Labor wants health programs, but it also wants to have a voice in the planning and development of those programs.

"With the sudden upsurge in interest in all of these programs, we are no longer in the position of having to sell our services. We find ourselves in the opposite position—that of receiving demands for service, research, and consultation. Now it's up to us to do the job."

Jobside Chats With Charlie

EAT RIGHT, FEEL RIGHT

Charlie Craftsman says: ***A good breakfast is a good self-starter.***

Suppose you saw a railroad fireman shoveling rocks into the boiler of his locomotive. You'd want to know what gives, wouldn't you? If he told you he was firing his engine, you'd probably think he was crazy.

But maybe *you* aren't acting any smarter than this punchy fireman. Maybe *you* come to work in the morning after a breakfast of coffee and a couple of doughnuts. Well, you say, what's wrong with that? What's that got to do with rocks in the boiler? Plenty! In many ways your body is just like that engine. Do a good job of stoking and you'll have plenty of steam.

To keep your engine running right you need a man-sized breakfast. During the war some one coined a slogan that still makes a lot of sense: "You can't eat like a bird and work like a horse." Workers who skip their breakfast or eat nothing but coffee and doughnuts get tired easily. They suffer from headaches, nervousness and even dizziness. Surveys show they produce less in the hour before lunch than the man or woman who eats a good breakfast. And that means a glass of tomato or fruit juice, at least one egg with toast or bread or a dish of cereal with milk, and coffee or milk to drink—more or less of the same, depending on your job. And stay away from that pie and pop lunch. That's not enough to get you through the afternoon.

Of course there's another side to the picture too. Maybe we ought to tack some more onto that slogan so it says: "You can't eat like a horse and expect to feel like a human." With Christmas and the New Year coming up, that's a good thing to remember. I don't know why people take the joy out of their holidays by stuffing themselves to the eyebrows. They pay a bill for the "fun" too—not only headaches and stomachaches, but hard cash. I'll bet the money that comes out of the pay envelopes for cures from holiday eating would pay for a lot of real fun spread through the year.

You won't catch me missing a celebration. But, like somebody said, everything in moderation.

Merry Christmas to you. And I hope you make the day after a happy one too.

PARATHION SUBJECT OF BULLETIN FOR CALIFORNIA PHYSICIANS

The medical aspects of parathion insecticide is the subject of *Physicians' Occupational Health Bulletin*, No. 5, July 1949, issued monthly by the Bureau of Adult Health, California Department of Public Health. It reads as follows:

"The group of insecticides known as organic phosphates has come into widespread use in the past few years, and because of their efficiency as economic poisons will undoubtedly be encountered more frequently. A previous bulletin (*Occupational Health Bulletin*, No. 1, July 1948) described the pharmacology and toxicology of hexaethyl tetraphosphate and tetraethyl pyrophosphate, two compounds of this group. The present bulletin is concerned with a third member, parathion (O, O-diethyl O-*p*-nitrophenyl thiophosphate) which is equally toxic and potentially hazardous if improperly handled.

"During the past year (1948–49) the Bureau of Adult Health has received reports of seven cases of parathion poisoning occurring in California. Undoubtedly there have been others which were not reported. Three parathion deaths and one near fatality have recently been reported in the East. Since parathion (also commercially known as *Thiophos*) has only recently come into widespread use, symptoms of its toxicity may not be familiar to all physicians, who are encountering cases, and possibly cases have occurred in which the true etiology has been unrecognized.

"Parathion is a deep brown liquid of low vapor pressure, some samples of which possess a characteristic odor. It is slightly soluble in water, but is completely miscible in many organic solvents including ethers, alcohols, and animal and vegetable oils. It is stable in a neutral solution but is rapidly hydrolyzed in the presence of alkalies, including soap. In actual application as an insecticide, the material may be used as a wettable powder or a dust.

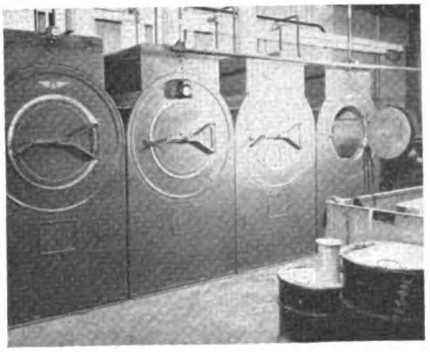
"Cases of poisoning have occurred in people engaged in the manufacture of the material, in those compounding solutions, in agricultural workers applying it, and even in people who have unwittingly come in contact with it. An example of the last is the case of a welder who cut into pipe containing parathion and developed symptoms of poisoning 10 minutes later.

"**Absorption.**—In experimental animals it has been demonstrated that parathion is readily absorbed through the skin and from the respiratory and digestive tracts. Almost all clinical cases of

MISSISSIPPI SURVEYS DRY CLEANING PLANTS

A comprehensive study of the dry-cleaning industry was initiated by the Division of Industrial Hygiene, Mississippi State Board of Health in October 1948, with the assistance of Mr. A. D. Hosey, USPHS. This survey is being conducted to ascertain working conditions in the industry, using as a criterion the proposed industrial hygiene code for dry-cleaning establishments developed by the American Conference of Governmental Industrial Hygienists. Conformance with the Mississippi State Board of Health Sanitary Regulations for Industrial Establishments is also checked. This survey has not been completed since it is being conducted concurrently with services to other industries.

The findings include the following: To date, 172 of these plants have been surveyed and individual letters of recommendations on suggested improvements sent to plant managers. Conditions in only seven of these establishments were such that no recommendations were necessary. Of the 172 plants visited only 4, or 2.3 percent employed synthetic solvents (carbon tetrachloride and perchloroethylene). The remaining 168 plants utilized the less toxic petroleum solvents, known variously as "Stoddard's solvent," "mineral spirits," and "cleaning naphtha," for which the maximum allowable concentration is 500 parts per million. Only nine of these 168, or 5.4 percent, had excessive concentrations of solvent vapors at the time of the visits. However, in an additional 11, or 6.5 percent, the level was just below the MAC.



A scene in a typical dry cleaning plant showing the exhaust ducts for drying tumblers. Photograph courtesy of Pennsylvania Department of Health, Bureau of Industrial Hygiene.

Ventilation was considered inadequate in 30, or 17.8 percent of these plants. It was also found that in 73, or 43.5 percent, solvent storage and/or transfer was poor, while in a like number of cases solvent from the extractors drained into open containers. In 45, or 26.8 percent, tumbler exhausts were so located that solvent vapors exhausted reentered the workroom. Operating technique was poor in 39, or 23.2 percent, with excessive solvent spillage, washers containing solvent left open while in operation, and waste from the filter units not promptly disposed of. These practices allow unnecessary escape of solvent vapors into the workroom air, and undoubtedly a large number of these plants would have experienced excessive vapor concentrations except for their exhaust ventilation.

Sanitation in these dry-cleaning plants was surprisingly poor with 87, or 51.8 percent, lacking sanitary drinking facilities. Inadequate and/or poorly kept toilet facilities were also common, while handwashing facilities were almost nonexistent.

Statistical analysis of results in the synthetic plants is not warranted at this time, in view of the small number of such plants found in operation to date. Of the four studied, three utilized perchloroethylene solvent, which was well controlled. In the fourth, which used an antiquated and unenclosed type of equipment employing carbon tetrachloride, excessive solvent vapors were found.

Instruments used in this survey include the Davis vapo-tester and MSA combustible gas indicator (calibrated against Stoddard's solvent) for detection of petroleum vapors, and the Davis micro-gas analyzer for detection of synthetic solvents.

PARATHION—

(*Continued from page 14*)

poisoning have occurred as a result of absorption through the skin or respiratory tract, and symptoms have appeared within a very brief period after exposure, indicating rapid uptake by the body. In some cases, local dermatitis has been observed at the site of contact. If the material should be splashed in the eye there is an intense miosis, resulting in temporary blindness.

"Pharmacology.—The principal mode of action of parathion is the inactivation of the enzyme cholinesterase. This enzyme, present in blood and nervous tissue, destroys acetyl choline, and in its absence the accumulation of acetyl choline results in excessive parasympathetic nervous system activity. This muscarinelike effect is the underlying cause of the multitude of symptoms which has been recorded by various writers throughout the country.

"Signs and symptoms.—Observed cases have varied from those showing mild, transient symptoms to those with severe toxemia resulting in death. Early signs and symptoms include headache, nausea, vomiting, dizziness, cramps, and constriction of the pupils. Most severe poisoning is manifested by a feeling of tightness of the chest, difficulty in breathing, fibrillary twitching of the voluntary muscles, convulsions, pulmonary edema, and coma. There may also be diarrhea which may be bloody. Death results from a combination of pulmonary edema, and congestion and edema of the brain.

"Destruction of cholinesterase, producing the parasympathetic stimulation, results in smooth muscle spasm, excessive bronchial secretion, and capillary dilatation. Evidence concerning chronic toxicity and cumulative action is incomplete. However, studies are now underway to determine the effect of chronic exposure to dosages below those producing acute effects. It may possibly be that with chronic exposure an irreversible destruction of cholinesterase can be produced.

"Diagnosis.—Accurate diagnosis depends upon obtaining a history of exposure to parathion. A high index of suspicion should be maintained, especially in agricultural areas where the material is most commonly used. However, cases have also occurred in the

cities, especially among workers engaged in manufacture or formulation of the insecticide. Any patient who may have come in contact with parathion, and who complains of headache, dizziness, nausea, or blurred vision, should be suspected of suffering from acute poisoning. A lowered blood cholinesterase is confirmatory evidence. Ten cc. of citrated blood is necessary for this test.

"Treatment.—Atropine sulfate is a specific therapeutic agent against the parasympathetic nervous system stimulation. Therapeutic doses (1/75 to 1/100 of a grain) should be administered early and frequently as indicated. Magnesium sulfate counteracts the hyperactivity of the myoneural junction and 10 to 20 cc. of a 10 percent solution given slowly, intravenously, should be used in conjunction with atropine. At the earliest sign of pulmonary edema, oxygen is indicated and may be life-saving when administered early. Positive pressure may also be of value (oxygen under pressure of 4 to 6 mm. of water) in the treatment of pulmonary edema.

"Prevention.—Poisoning by this compound can be prevented if proper attention is given to safe methods of handling it and if all persons concerned appreciate its extreme toxicity. All contact with the bare skin must be avoided and rubber covered cotton gloves must be worn when handling parathion. If any of the material gets on the skin it should be thoroughly washed off with copious amounts of soap and water. Workmen should be provided with freshly laundered coveralls and should wear fresh clothing each day, including socks and underwear. Inhalation should be avoided by use of a chemical cartridge respirator approved by the United States Bureau of Mines. Workers should bathe with soap and water after using the material, and contamination of food and tobacco should be avoided. Any exposed person developing symptoms should immediately be removed from the exposure and seen by a physician.

BIBLIOGRAPHY

1. Bureau of Adult Health, State of California Department of Public Health, Occupational Health Bulletin No. 1, *Summary of Information Regarding Some of the Newer Insecticides.* July 1948.

2. Technical Bulletin No. 2, *Thiophos Parathion.* American Cyanamid Company, Agricultural Chemical Division, New York, N. Y. Dec. 1948.

3. Sawitsky, A., M. D., Fitch, H. M., Ph. D., and Meyer, L. M., M. D., *A Study of Cholinesterase Activity in the Blood of Normal Subjects.* J. Lab. & Clin. Med. 33: 203–206. Feb. 1948.

4. DuBois, K. P., Doull, John, Salerno, Paul R., and Coon, J. M., *Studies on the Toxicity and Mechanism of Action of p-Nitrophenyl Diethyl Thionophosphate (Parathion).* J. Pharmacol. Exper. Therap. 95: 79–91, Jan. 1949.

5. Hamblin, D. O., *Report of American Cyanamid Co.*, New York, May 12, 1949.

STATE NEWS

MISSOURI

Symposium.—A symposium on industrial health was arranged by the Missouri State Medical Association Committee on Industrial Health and given in St. Louis and Kansas City, October 11 and October 12, respectively. Subjects and speakers were:

"Education in the Field of Industrial Medicine," by A. J. Lanza, M. D., professor of industrial medicine, New York University School of Medicine; chairman, Council on Industrial Health, American Medical Association.

"Physical Rehabilitation in Industry—Our Challenge," by Harold A. Vonachen, M. D., medical director, Caterpillar Tractor Co., Peoria, Ill.; member, Council on Industrial Health, American Medical Association; president, American Association of Industrial Physicians and Surgeons.

"Basic Science is Necessary in a Good Health Care Plan," by Dudley A. Irwin, M. D., medical director, Aluminum Co. of America, Pittsburgh, Pa. Formerly assistant to Dr. Banting, Department of Medical Research, University of Toronto, Canada.

"Broad Horizons in Industrial Medicine," by Max R. Burnell, M. D., medical consultant, General Motors Corp., Detroit, Mich.

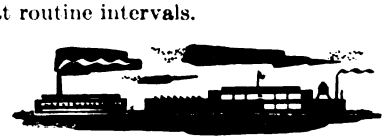
Personnel.—Mr. Clarence W. Thompson, industrial hygiene engineer, is a new member of our staff.

TENNESSEE

Soap factory.—Community problems on which advice was given concerned the elimination of offensive odors and control of high-frequency sound. With respect to odor, one problem had to do with a soap factory spewing forth objectionable odors from its boiling processes. After many complaints had been received by the local health department, assistance was requested in finding a solution. Accordingly a study was made of their processes and raw products, then consultations were held with management during which methods of control were discussed. It was recommended that the plant building be exhaust ventilated and the exhaust air prior to discharge be passed through activated charcoal to absorb the objectionable odors. This was accomplished and the stream of complaints ceased immediately.

Laboratory.—A spectrograph was placed in operation during the last month of the fiscal year and the preliminary determinations have proved that the instrument is an excellent one for use in both industrial hygiene and toxicology.

During the month the spectrograph has been in operation, preliminary work has gone forward toward the standardization of methods for the determination of lead and other metallic contaminants in the urine of workers. The first group of determinations has been completed. It was composed of 25 samples from a brass foundry. Results show that further investigation is necessary and specific individuals will be rechecked to find if their urinary concentration of lead is constant or if the spot samples were contaminated in some manner. There have been plans made to run increasing numbers of urinary leads, especially in battery plants in the State. The spectrographic method of urinary lead determination is the method of choice. It is faster and more accurate than chemical methods. It is planned that all of the workers exposed to lead in the State will be checked during the coming year. A system will be placed in operation by which the worker's individual exposure will be determined at routine intervals.



U. S. GOVERNMENT PRINTING OFFICE: 1949

INDEX—INDUSTRIAL HYGIENE NEWSLETTER

Volume 9, Nos. 1–12 (1949)

By subject, author, and locality

Key to abbreviations: January, Ja; February, F; March, Mr; April, Ap; May, My; June, Jn; July, Jl; August, Ag; September, S; October, O; November, N; December, D.

The numbers with the abbreviations for the month refer to pages. Subjects followed by States' names in parentheses are to be found in the State and Local News columns.

D

E

F

G

R

S

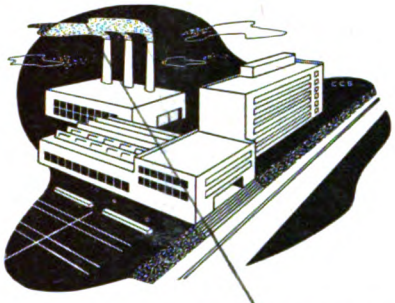
T

U

V

W

X



PHS DENTISTS PARTICIPATE IN DETROIT CLINIC

Dr. F. J. Walters and Dr. Vernon J. Forney of the Public Health Service conducted a clinic in Detroit recently under the auspices of the Detroit District Dental Society at its Eighth Annual Dental Review.

Dr. Walters, of the Division of Industrial Hygiene, spoke on the "Oral Diagnosis of Occupational Diseases." He described the interrelated activities of engineers, nurses, dentists, physicians, and toxicologists in the field of industrial hygiene. The industrial dentist, he stated, should have a knowledge of the materials known to affect the oral structures when present in the atmosphere of the working environment in sufficiently high concentrations. He pointed out that the mucosa, teeth and periodontal tissues, tongue, gingivae, and lips were the oral structures which are most susceptible to occupational influences.

With the aid of lantern slides, Dr. Walters presented a broad classification of occupational exposures reported to have caused structural and functional changes in and about the oral cavity. They were classified according to categories of exposures affecting the oral cavity, such as physical factors, radiation hazards, dusts, gases, metals, bacteria, alkalies, acids, inorganic substances, and organic compounds. An outline of the major oral manifestations of each of the categories was presented.

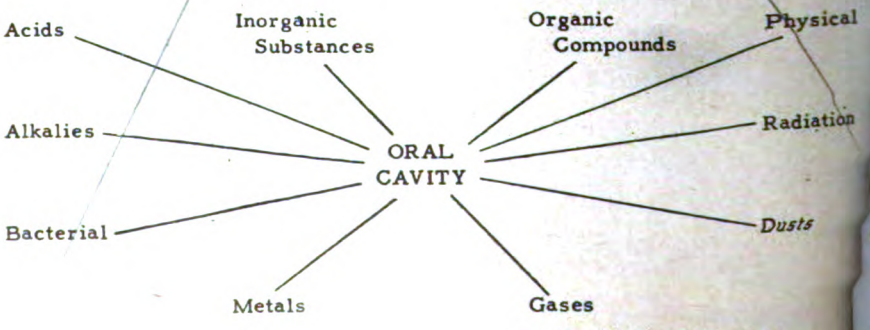
Dr. Walters concluded his talk with an exhibit of a series of color slides depicting clinical findings of oral pathology which were of an occupational origin.

Dr. Vernon J. Forney, of the Division of Dental Resources, USPHS, presented a short discussion relative to the application of public health methods to a specific population, namely, the industrial population.

He suggested that study groups from the dental societies be formed for the purpose of working with industrial hygiene and dental health personnel of the local and State health departments in an effort to learn of methods which could be applied to improve the oral health of the industrial population.

Attention was called to the fact that the industrial population of our Nation forms a huge dental need potential. He also suggested that this group of the population is not fully aware of their own dental needs and, consequently, have not fully availed themselves of the benefits of regular dental treatment.

CATEGORIES OF EXPOSURES



U. S. GOVERNMENT PRINTING OFFICE: 1949