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### REGULAR DEPARTMENTS



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Industrial Health

A Department for Physicians and Laymen

# Lesser Known Facts About Occupational Diseases

By ROBERT B. HUNT, M.D.

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PROBABLY the leader in the parade of industrial diseases is an acute or chronic inflammation of the skin which we call dermatitis. This disease may present itself in any type of shop, factory or foundry. Any paste, powder, gas or liquid which comes in contact with the employee's skin, even the water supplied by the town in which he lives or works, may be the potential cause of such a skin disturbance.

The wide diversity of causes, together with the varying susceptibility of different individuals, makes the problem of control difficult.

Much investigation is under way to determine why one person may be susceptible to a certain substance while another is not. It has been proved many times that a poisonous substance formed within the body has been able to prolong the action started by some external influence. A printer developed a marked dermatitis from ink which persisted for two years. Finally food tests were made and showed that he was susceptible to lettuce. Removing this from his diet cleared the skin. He returned to his usual occupation without a return of symptoms.

The poisoning of allergic substances is usually an accumulative process. It takes time to produce a manifestation of disease, but let any other substance cause the disease, and the irritating food may be of sufficient strength to magnify its action.

All cases of dermatitis cannot be cured by eliminating offending foods, but further investigation along these lines may give us a clue with which to lessen the loss of time from work and the discomfort now produced by industrial dermatitis.

## Metals

LEAD: The distribution of lead poisoning is quite extensive.

The skin of the body is a protective covering, and as long as it remains intact it does a good job except in the case of tetraethyl lead, which is used in blending gasoline and which is readily absorbed through the skin, having a tendency to create changes in the nervous system. The effect of other forms of lead, through that avenue of entrance, is practically nil, which explains the extremely low poisoning rate in typesetters, painters and others who continually come in contact with metallic lead.

Lead in any form, introduced through the mouth, acts rather slowly when compared with the inhalation of lead dust or fumes. However, no matter what the portal of entry may be, lead is acted upon by the body fluids and so converted that it may eventually be deposited within the bones.

Those bony safe deposit vaults may retain their lead contents for days or for years, and if the exposure is removed, may also free the employee of all signs and symptoms of lead poisoning. But imagine the surprise of that supposedly cured person when years later, perhaps following some type of infectious disease or the excessive use of alcoholic beverages, he awakes to find that he suffers the aches and pains and paralyses of an acute lead poisoning. As the body fluids alter lead that it may be deposited, so may those fluids attempt to de-lead the body, and too rapid absorption may produce the original disease with all its discomforts.

One can readily see, then, that in some cases investigation of previous occupations is quite necessary to determine the original contact with lead.

Heating of molten lead causes a black scum of lead suboxide to form on its surface, and the heat from the metal disburses the fine powder into the air. Hence, in the process of smelting ores such as zinc, copper and silver, mixed with lead, we find a rather high lead poisoning rate.

Those engaged in the manufacture of lead wire and cables, batteries, glass, pottery and rubber industries, plumbers and users of dry colors offer their share of lead poisoning cases.

Probably the greatest source of lead poisoning may be found among those who sandpaper, scrape, chip or burn lead paint, for the dust and fumes caused by those activities are rather rapid in their action. Such workers may become incapacitated in a few days because the inhalation of lead dust causes the maximum amount of absorption into the blood stream in the minimum space of time.

CHROMIUM: Chromium is a metal widely used as a foundation for colors, and dusts from its various salts may produce lesions of the skin and mucous membranes of the nose. Chromium plating by electrolysis may cause fumes which are similarly irritating. Although chromium poisoning does not usually cause death, the number of days of absence from work on account of incapacity which it causes is gradually increasing.

OTHER METALS: The most efficient portals of entry of foreign substances into the body are the nose and mouth. The smaller the dust (the size of smoke particles for example, the greater the speed of absorption by the blood. Fumes from hot metals carry not only poisons but numerous minute dust particles. This explains the incapacities occurring

...ing those employed in acetylene ... electric cutting and welding.

When men are so employed over a prolonged period of time, the constant inhalation of fumes and dust might produce symptoms of the metal upon which they work. In the shipbuilding trade, particularly in the construction of metal ships, we find occasional cases of metal-fume fever. "Brass chills" and "spelter shakes" from zinc are names applied by the lay people to such diseases. The terrific heat applied to some of our common metals and alloys by acetylene torches produces sufficient fumes to cause a temporary incapacity in 24 hours. Permanent disability from such causes is rare, however.

## Diseases Due to Dust

Twenty-five per cent of all workers exposed to high concentrations of inorganic dust are expected to develop changes within their lungs due to that agency. We are at a loss to explain why the other 75 per cent are not so affected.

Mining, quarrying, foundry work, grinding, sandblasting, abrasive soap manufacturing, asbestos work, the making of emery and carborundum products and many other occupations offer opportunities for employees to inhale microscopic dust particles and create a foundation for possible future incapacity.

We are interested particularly in those men who work with sandstone, quartz, flint, granite, and sand, because they expose themselves to silica, and the chemical changes between that dust and the body fluids, in the presence of tuberculosis, may and usually do lead to a fatal ending.

It is safe to say, in light of our present knowledge, that the action of other inorganic dusts is much less virulent and incapacitating. That, however, does not allow us to lower the vigilant methods to improve dust control and protect employees, because all dusty occupations are potential trouble makers.

Although the actions of various dusts differ within the body, the exposure to asbestos fibres, present in the weaving and grinding of dry asbestos material, offers another type of dust which may cause fatalities among workers.

The organic dusts from cotton, silk, wool, tobacco, flour and similar substances are practically harmless. Such dusts rarely reach the lungs but may cause irritation of the windpipe and larger air-tubes and result at the most in a mild bronchitis.

... mind, particularly when dealing with silicosis and asbestosis, relates to the progression of such disease. When changes occur within the lungs as a result of the presence of such dusts, nature forms scar tissue to heal such lesions but may fail to stop when the job is finished. As a result, the continuation of that healing process may lead to such structural changes within the lungs that partial or total incapacity may follow months or years after the employee has been removed from his dusty occupation.

## Benzol-Benzene

Benzol is a distillate of coal tar used extensively in industry. It is an essential ingredient in the manufacture of explosives. It is an excellent solvent for grease, oils and cements, and because of that property it is important in many phases of the rubber and cleaning industries. In the manufacture of shoes benzol may be an ingredient of the dressing applied to the leather and of the cement which fastens the heels and soles. Not only in the shoe trade but in other branches of industry where employees work with gummy, sticky material, the workers soon learn of the solvent and cleansing action of this liquid and use it freely for that purpose upon themselves. The subsequent outbreak of skin afflictions may be the first indication of such unauthorized use.

Benzol is extremely poisonous, entering either through the nose or mouth or absorbed through the skin. Its action within the body is varied and may produce a multitude of signs and symptoms. The bone marrow becomes affected which in turn alters the character of the blood; hemorrhages are common; it may cause death.

The fumes from benzol are heavier than air and lie near the floor, which is an important point in the engineering problem of ventilation.

The members of the benzene group are absorbed through the skin, and more cases of poisoning are found when men perspire than when their bodies are cool. Probably the answer to that is that the fumes may solidify as they cool and the powder may settle on the skin. The sweat on the body may dissolve this dust so that it is more readily absorbed through the increased surface blood supply.

## Chlorinated Hydrocarbons

This group of petroleum derivatives has been known to science for years but the industrial field has been widely distributed and most important. Led by carbon tetrachloride and its chemically associated members, it has furnished industry with refrigerants, excellent solvents for rubber, wax, oil and grease, thinners for lacquers and a very fine household necessity for the removal of spots from clothes. Hospitals have been using it more and more for the removal of adhesive plaster.

Due to the non-flammability of carbon tetrachloride, it is used in fire extinguishers. The rapid evaporation produces fumes which may smother a small blaze, but we must not forget that excessive heat of the actual fire may bring about combustion sufficient to produce such by-products as hydrochloric acid and phosgene gas . Like its associated member, choloroform, it may produce sleep when inhaled by an individual, and only 1/350 of an ounce in a quart of air is necessary to produce such action. That thought must be remembered when a large quantity of those liquid products is spilled on the floor, perhaps accidentally. Action should be started at once before the liquid gasifies, and employes should be notified to keep their heads up to avoid the low ceiling of gas.

Chemists have developed and introduced to industry many new products, the basis of which is the chlorinated hydrocarbons. These derivatives of petroleum distillation are frequently combined with those from coal tar to form valuable chemical combinations. They have been placed on the market so rapidly that medical science has been unable to determine their physiological effect upon the health of man. We have known that some of these chemicals are capable of creating changes in the liver, and only recently in a city in Massachusetts one of these newer products caused the death of two employees and a battle to retain life among two others.

## Carbon Monoxide

You remember the adage: "Where there is smoke, there is fire." We might add to that, "Where there is fire there is carbon monoxide."

This odorless but poisonous gas may occur in any industry or in any home but the poorer the ventilation the better the chance of producing physical incapacity.

Since the advent of the motor car whose exhaust pipe may pour forth as high as six per cent of carbon monoxide, we are all exposed to that gas, particularly in crowded cities. The colin-

...ary passenger car liberates about two cubic feet per minute, and one can readily estimate the physical damage that may be done if such a motor is allowed to run within the doors of a poorly ventilated garage or shop. Fortunately, serious cases of such poisoning are not common among those employed in public garages, but many employes are likely to complain of headache and faintness at the end of a day's work, especially in colder weather when doors and windows remain closed.

In the steel industry, where gas is used as the heating agency in the blast furnaces, care must be taken to provide proper ventilation. Within the mines, workers are warned to allow enough time following blasts for the escape of this gas.

## Infection

The skin is a protective covering of the body against infection and is extremely efficient as long as it remain intact, but allowing it to be broken or punctured introduces bacteria, and a battle ensues between the offensive agencies of infection and the defensive powers of the body. The winner of such a struggle may determine the presence or absence of incapacity. Infections are common throughout industry, but two types are particularly prominent—infection resulting from anthrax and infection among meat packers and fishermen.

Many of our fur, hair or wool-covered animals may contract anthrax. The germs of that disease defy the ordinary methods of sterilization and may linger on hides, bristles or hairs for long periods of time. Tanners, wool sorters, and hair or bristle workers may introduce the anthrax spore beneath their skin and undergo much physical suffering and sometimes death.

Infections are frequently found among meat and fish packers and those engaged in deep sea fishing. Although death rarely occurs, the loss of fingers, hands and nasty septic wounds are the result.

## Summary

I feel that the time has come when an employer must demand of a manufacturer the answers to two questions:

1. How will your product affect my business?
2. How will your product affect the health of my employees?

That employer is entitled to honest answers based upon sufficient chemical and physiological examinations of the questionable product. Too many lives have been lost or jeopardized by too little knowledge of a product's action ...those who handle it.

# Ferrosilicon

Industrial Data Sheet D-Chem. 20

## A. Problem

1. What are the hazards of ferrosilicon and what precautions are necessary in its use?

## B. Hazards

2. The principal hazard is that of poisoning by inhalation of the gases that may be given off, especially in the presence of moisture.

## C. Discussion

3. Ferrosilicon is prepared by melting iron ore or steel shavings with coal or coke and ganister or quartz at a temperature of about 2,000 degrees centigrade (3,632 degrees Fahrenheit) in an electric furnace. In making steel, ferrosilicon is used for removing objectionable gases and oxides and also as an alloying element. When alloyed with cast iron, it affects the carbides and renders the iron soft and gray. More concentrated silicon alloys are sometimes used in certain processes for making hydrogen gas and in the manufacture of explosives.

4. The hazard in connection with ferrosilicon results from very small percentages of phosphorus together with other elements which may be present as impurities originating in the raw materials used. In the presence of moisture the phosphorus compounds react to form phosphoreted hydrogen or phosphine. This is a gas which in sufficient quantities is decidedly poisonous. It has a strong and distinctive odor somewhat resembling garlic so that its presence can be readily recognized. The stability of ferrosilicon depends upon its silicon content, grades below 48 percent and above 65 percent being entirely stable and ferrosilicon in these ranges does not give off any appreciable quantities of phosphine, even in the presence of moisture. It is, therefore, only in the intermediate range between 48 percent and 65 percent that there is any appreciable hazard.

### Symptoms of Poisoning

5. When a person has breathed poisonous gases liberated from ferrosilicon, the symptoms of poisoning usually develop quite suddenly and are characterized by general and abdominal pains, nausea, vomiting, diarrhea, hemorrhages, loss of consciousness, dilated pupils, cold clammy perspiration and coma. Cases of poisoning have been mistaken for cholera, gastro-enteritis, ptomaine poisoning, pneumonia and influenza.

### First Aid

6. When a person displays any symptoms of poisoning because of the inhalation of the poisonous gases liberated by ferrosilicon, he should be promptly removed to the fresh air and, if conscious, be given a mild alkali drink. If unconscious, the prone pressure method of artificial respiration should be started immediately after the patient has been removed to the fresh air. In all cases of poisoning the services of a doctor should be promptly obtained.

### Precautions

7. Ferrosilicon should be stored away from such places as offices and work rooms or living quarters of any description.

8. All buildings in which ferrosilicon is stored should be well ventilated and dry. *(See Note X.)* Ordinarily, in an open factory building the natural ventilation through monitors in the roof or through windows is sufficient if the ferrosilicon is kept dry.

9. If men are required to handle wet ferrosilicon in a confined space, artificial ventilation should be provided.

10. In case phosphine has been allowed to accumulate in a closely confined space such as a closed room or box-car, so that a strong odor of the gas is noticeable, no one, unless he is wearing a suitable gas mask or fresh air hose mask, should be allowed to enter the room until it has been thoroughly ventilated. *(See Note Y.)*

NOTE X. Detailed information on ventilation will be found in National Safety Council *Safe Practices Pamphlet* No. 37 "Industrial Ventilation."

NOTE Y. Detailed information on fresh air hose masks will be found in National Safety Council Safe Practices Pamphlet No. 64 "Respirators, Gas Masks, Hose Masks and Breathing Apparatus."

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