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ACCIDENT
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Manual

• SECOND EDITION

— FOR
INDUSTRIAL
OPERATIONS



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SECTION 22

INDUSTRIAL POISONS

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The alphabetical arrangement used in this Section is similar to that used in the price listings of the "Oil, Paint and Drug Reporter." The acids and alcohols are assembled alphabetically under the generic name. Enough information has been given on each compound to permit methods of safe handling to be inferred.

Detailed directions for the handling of each compound would be repetitious; the general methods of manual and power handling of materials given in Sections 11 and 12 of this book will do when applied to the specific properties given here.

In most instances some indication is given of the signs of excessive exposure; not as conclusive evidence, but as a guide. Signs of industrial intoxication are generally not specific. It requires evidence both of actual exposure and of the absence of other adequate cause definitely to implicate a specific compound.

* * *

Acetaldehyde is a flammable liquid of low flash point and with a boiling point just at normal room temperature. It is, consequently, a fire hazard comparable to ether in intensity. If kept in any large quantity it should be stored with the precautions appropriate for ether.

Acetaldehyde processes should be well enclosed and isolated because of its intense irritant properties. It affects primarily the skin and the upper respiratory passages because of its relatively high solubility in water. A high concentration may produce sud-

den death from spasm of the throat. Lower concentrations produce coughing and inflammation of the nose, throat, and eyes.

As with other irritants an apparent tolerance is built up after a number of exposures to moderate amounts of acetaldehyde. This is not a true tolerance. It simply represents the formation of a thick adherent mucous, which protects the upper part of the respiratory system but opens the way for the material to attack the lower and more vital parts.

Paraldehyde, the solid form to which acetaldehyde polymerizes, has long been used in medicine as a narcotic and soporific. In this form its irritant properties are greatly reduced and the narcotic effect can be observed. Paraldehyde can cause a chronic form of poisoning involving fatty degeneration of the liver and cardiac muscles, psychic disturbances, and irritation and edema of the respiratory system.

The American Conference of Governmental Industrial Hygienists has recommended 200 ppm as a maximum acceptable concentration for acetaldehyde for exposure of eight hours per day.

Acetone is a flammable liquid with a flash point of 1 F, so that it should be handled and stored with precautions against fire and explosion.

In spite of the large quantities of acetone used in industry and its high volatility, there are no reports of serious industrial poisoning. Experimental work has shown that acetone is a narcotic. Overexposure will

much more common. Effects of antimony resemble those of arsenic primarily in the dermatitis, which may start as an inflammation of the hair follicles and progress through pus formation and sloughing to leave a contracted scar.

Arsenic, in the form of arsenic trioxide, is traditionally the most important of the poisonous materials used for criminal purposes. It is a profoundly irritating material which produces inflammation of the stomach and intestines, destroys the hemoglobin, and causes nervous collapse. However, cases of severe industrial poisoning are rare.

Men who handle the solid compounds of arsenic may suffer from a husky voice and cough, perforation of the nasal septum, ulceration of the skin, loss of hair and nails, warts and sometimes skin cancers which tend to follow a slow and not very malignant course. These troubles are all severe nuisances, but they are practically never fatal and seldom disabling.

Arsine. Severe and acute industrial poisonings with arsenic are likely to be the result of inhalation of *arsine*, produced accidentally when hydrogen has been generated in the presence of a material which contains arsenic. This gas has been reported in the acid cleaning of filter plates, in the handling of wet dross from a light metals plant, in the cleaning of tank cars which have held sulfuric and hydrochloric acids, in the cleaning of pipes with an acid contaminated with arsenic, in the precipitation of cadmium with metallic zinc, and in other circumstances as well.

Arsine rapidly destroys the red cells. After it has been inhaled, the first signs are those of lack of oxygen. After some time the body begins to excrete the damaged red cells which appear as a dark or bloody urine. The kidneys may then become too clogged to operate at all.

The possibility of arsine formation should always be considered when there is hydrogen formation around the active metals or around ores of the heavy metals, since arsenic is widely distributed in small amounts and only a trace of it is required to produce enough arsine to be troublesome.

Asbestos is a hydrated magnesium silicate found in the minerals chrysotile, amianthus, actinolite and tremolite. Practically all the commercial asbestos is either chrysotile or amianthus, and about 90 per cent of that

used in this country is chrysotile. It is used almost exclusively for heat insulation or for textiles which must resist high temperature, such as heat resistant clothing and brake linings.

Inhalation of excessive quantities of asbestos fiber can produce a fibrosis in the lungs similar to that found in silicosis but somewhat milder and usually not so rapidly progressive. Like silicosis, the condition develops slowly and advances slowly and is equally resistant to treatment.

Prevention is essentially dust control. A maximum dust concentration of 5 million particles per cubic foot has been suggested, precisely as for pure free silica.

Barium. The soluble salts of barium are toxic when ingested, as well as highly caustic on the skin. There seems to be little toxic hazard in the inhalation of the dust of the less soluble salts.

Barium is a heavy metal, and the dust of the insoluble salts will collect in the lungs and give rise to the condition known as baritosis. Its nodular appearance on X-ray film may be mistaken for that of silicosis. Men showing the sign of baritosis are apparently not disabled or inconvenienced in any way.

Benzene is a colorless, flammable, volatile liquid with a rather pleasant aromatic odor. Its fire hazard is between that of ethyl alcohol and that of ether. *The greatest hazard is that of chronic poisoning by inhalation of comparatively small amounts over a long period of time. It is one of the two or three most dangerous organic solvents in commercial use.*

The action is primarily on the blood-forming organs, producing severe anemia, bleeding under the skin, and great reduction in the ability of the blood to clot.

The extent of chronic exposure to benzene may be determined qualitatively by measurement of the ratio of organic to inorganic sulfates in the blood. The most convenient measurement of damage is given by a blood count.

People who may be exposed to benzene vapor should have blood counts at regular intervals. Consistent change in the blood count should be closely investigated. Particularly significant changes are diminution in the total numbers of red cells, platelets or white cells.