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# INDUSTRIAL HYGIENE BULLETIN

PUBLISHED BY THE

NEW YORK STATE DEPARTMENT OF LABOR

124-E.-28th ST., NEW YORK CITY

BERNARD L. SHIENTAG—INDUSTRIAL COMMISSIONER

ISSUED MONTHLY BY THE BUREAU OF INDUSTRIAL HYGIENE—LELAND E. COFER, M.D., Director

Vol. I

DECEMBER, 1924

No. 6

## A WORD ABOUT TETRAETHYL LEAD POISONING

Tetraethyl lead poisoning recently has attracted so much public attention that it is most important that this type of acute poisoning should be differentiated clearly by symptoms from ordinary chronic lead poisoning. The symptoms are absolutely different.

Tetraethyl lead poisoning in its worst form gives an acute encephalopathy. Autopsies reveal an injection of the meninges of the brain, particularly at the base, with also some congestion of the cortex. The symptoms are both subjective and objective. The patient first complains of persistent insomnia, and usually of more or less nausea with vomiting. He feels restless and nervous and tired. He loses all appetite and begins to lose weight. Subjectively, one of the first symptoms noticed is a marked drop in systolic blood pressure, which frequently falls below 100 and sometimes below 90. There may be some diminution in the pulse rate, and in some cases a subnormal temperature. Lead is found in the stools, and some patients recently examined have shown stippling of the red blood corpuscles, although this is not invariably present. Considerable anemia develops, though no paralysis. In the extremely severe cases there is acute delirium of sudden onset, of the type familiar with delirium tremens. That is with violent jactitation, delusions of persecution, efforts to get up and run amuck, smashing through windows, and shouting with acute maniacal raving. Death ensues from exhaustion.

Tetraethyl lead is a remarkably active poison, taking first place among the metallic poisons. It was first made by chemists in 1854. Since that time there have been occasional instances of poisoning of greater or lesser severity among workers in chemical laboratories. Quite recently the possibility of using this substance in improving the efficiency of all gasoline motors, and thereby conserving the world supply of gasoline fuel by about one-quarter has been discovered. Moreover, the addition of this substance to gasoline would make possible the use of high compression engines. Hence, the attempt to manufacture it on a commercial basis. It should be emphasized that it only can be used in gasoline motors in extremely diluted form, usually 1 to 1000.

The possible dangers in the manufacture of tetraethyl lead, however, are three, namely: Through direct absorption through the skin, which takes place with extraordinary rapidity; second, through inhalation of toxic fumes, and finally, through accumulation of ordinary lead dust, the latter being capable only of chronic lead poisoning.

The chemical substances used in the manufacture of tetraethyl lead are lead, ethyl chloride and metallic sodium.

## THE MENACE OF PHOSPHORUS FIREWORKS

C. M. SALLS, Ph.D., Chemical Engineer

Phosphorus poisoning is the most dreaded of all the industrial diseases, not because it is the most dangerous, for the mortality is only 15 to 20 per cent, nor because it is widespread, for in this respect it does not compare with lead poisoning, nor because it is sure in its action, for in reality only a small minority of those exposed are ever affected, but because of the great and prolonged suffering caused by the local disease and the shocking deformities which almost always result.

For these reasons many states have passed laws which in effect regulate the manufacture, storage, and use of the yellow variety of phosphorus or compositions containing it. The red or amorphous variety is not poisonous.

Last June the Division of Industrial Hygiene of the New York State Department of Labor carried out an investigation to determine what hazards are connected with the use of phosphorus in the fireworks industry. It was found that the poisonous variety of phosphorus is used in a red composition that appears on the market under various trade names, such as "Spit Devils," "Son-of-a-Gun," and "Devils-on-the-Walk." When ground under the heel on the sidewalk they continue to crack and spit and sputter. The compositions have a strong odor of phosphorus. The writer has several times noted the characteristic phosphorus luminescence rising from the poisonous composition held by the chubby hands of a little child. This luminescent fume is very distinct in the dark, especially when a piece of the composition is freshly broken.

Chemical analysis of the red composition shows that it contains several per cent of yellow phosphorus. The remainder of the composition consists of four comparatively non-poisonous constituents, namely, potassium chlorate, iron oxide, magnesium carbonate, and gum arabic.

The Division has record of seven deaths of little children who have put the composition in the mouth.

It is evident, therefore, that the paper or sand coating and the magnesium carbonate in the composition which are supposed to act as a preventive and an antidote, respectively, are not effective.

In the fireworks factory the workers must handle the composition and inhale the fumes of yellow phosphorus. Three cases of phosphorus poisoning from this source have been reported.

The greatest hazard, however, that is connected with phosphorus fireworks is undoubtedly the danger of ignition and poisoning while in shipment or in storage in a mercantile establishment. If the mixture is not prepared with extreme care the finished composition is very sensitive to friction.