

THE ROLE OF THE LABORATORY IN THE PREVENTION OF LEAD POISONING

Elinor Bormen, Ph.D.

Biochemistry Department, Cook County Hospital, Chicago, Illinois

The literature is rich with descriptions of a variety of methods and techniques by which to judge exposure to lead and evaluate the degree of toxicity produced. The description of "lead lines" on the gums of individuals with markedly elevated blood leads and of basophilic stippling of the erythrocytes of such individuals are well known signs of undue exposure to lead, but are of limited value due to the infrequency of these findings. Stippled red blood cells have been shown to be present in about 25% of known cases of lead poisoning. The anemia must be quite severe. Furthermore, there are other clinical conditions which can cause an increase in stippled red cells.

In 1880 coproporphyrinuria was demonstrated in human cases of lead poisoning in Germany. However, urinary corproprphyrin excretion is elevated by agents other than lead. Heavy metals like arsenic and cadmium can cause increased excretion; also various drug substances such as barbiturates, morphine, and even salicylates in some sensitive individuals can induce a coproporphrinuria. When employed as a screening procedure to indicate the need for further investigation, the urinary coproporphyrin determination, properly monitored, is acceptable, provided a more definitive test is used for confirmation.

Instrumentation and technical expertise evolving from modern technology are enabling us to determine elemental lead and other metallic contents in blood, urine, tissue and other materials with greater ease and specificity. The classical procedure used for

lead determination back in the 1930's involves the formation of a color complex with a chelating agent, the most acceptable being dithizone. This procedure can be set up in a well-controlled, clinical chemistry laboratory and can be easily monitored.

Atomic absorption spectrometry was introduced into the United States in 1962, and the first procedures for doing lead analysis with atomic absorption were published around 1964. The method has the advantage of being specific when one measures lead only. Since 1967, this method has been the most widely used, and in recent years analyses done with atomic absorption are the preferred method as far as the courts are concerned.