

Lead Industries Association

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LEAD POISONING RESEARCH BY DR. AUB AND OTHERS.

In 1925 Dr. Aub and his associates at the Massachusetts General Hospital, who had been investigating lead poisoning with the support of lead mining smelting and fabricating companies, published the results of the early part of their medical research, in a volume entitled "Lead Poisoning".* This work constitutes the most noteworthy advance ever made in the investigation and treatment of lead poisoning and the book has been highly praised as an eminent contribution to medical literature. It is the most comprehensive and up-to-date work on the subject, and is briefly summarized here for the benefit of those who may not be familiar with it.

The book begins, first of all, with a thorough exposition of the new methods for lead detection and estimation in biologic material. Considerations are then offered which form a reasonable basis for the conception that ingested lead is converted after absorption to a colloidal phosphate, very stable at the normal hydrogen ion concentration of the body, but passing into more soluble form if the reaction is altered even slightly. Reasons for the deposition of lead phosphate in the bones of the body and the sensitiveness of the compound to changes in acidity are discussed.

The routes by which lead compounds are absorbed are described and the reasons for the preeminent danger of inhaled lead dusts are driven home. An investigation for "normal" lead was carried out and the conclusion drawn that the usual activities of daily life cause no retention of lead in the body. It was next experimentally shown that there is no marked retention of lead except in hard bone, which is apparently unharmed by it.

A discussion of the medicolegal aspect is worthy of note.

- * Lead Poisoning. By Aub, Fairhall, Minot and Reznikoff. Published by Williams & Wilkins, Baltimore, Md. Price \$4.

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"When lead appears exclusively in the bone it must have been absorbed at some previous time, but mere storage in the skeleton is no evidence that lead was involved as a cause of death. Similarly, if lead is present only in the gastro-intestinal tract or its contents, it may merely have been swallowed and not absorbed. On the other hand, the presence of lead in the urine or in a majority of the tissues is a sign of active transportation of lead by the blood stream. This is evidence of either recent absorption or mobilization of stored lead from the bones. In either case danger of the exposure of the tissues to soluble lead is obvious, and lead may then rightfully be considered at least a complicating factor in the pathological picture."

The analogy between the metabolism of calcium and lead is next made clear. It is shown that a low calcium diet plus ammonium chloride (to acidify) cause lead excretion and that a high calcium diet favors deposition and retention of lead in bone.

A general examination of the physiology of lead poisoning considers, first, the effects on the blood. Stippling and anemia are two of the most pronounced symptoms and are fully explained. Brief descriptions of the action of lead on the germ cells and a discussion of the reasons why lead compounds cause premature deliveries are given and followed by sections on the "lead line" and on lead colic.

It is experimentally demonstrated that lead attacks the site of greatest fatigue, and that muscle, not nerve, is affected.

Very stringent conditions are set down for a positive diagnosis of lead poisoning, and these conditions are clearly stated. Say the authors, "Very little weight can be placed on the mere presence of such common persistent symptoms as constipation, anorexia, headache, insomnia, etc., unless they have markedly increased since exposure, for lead workers are no more immune to the other diseases which might also cause these symptoms than are individuals who are not exposed to lead."

The section on treatment is noteworthy because of utilization of the new information already described. The latest method of treatment is fully described elsewhere in this memorandum and is a further development of that outlined in the book.

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RECENT DEVELOPMENTS

Since 1925 Dr. Aub has continued his work and each year has thrown new light on the subject. In his last report to the companies supporting his work, which covers the years 1927-28, Dr. Aub describes his latest, quickest, and most satisfactory treatment for lead poisoning.

"When a patient enters the hospital with severe lead colic he is given a diet at first which is high in calcium in order to prevent the further liberation of lead from the bones. At the same time he is given sterile calcium chloride intravenously (a slow injection of 15 c.c. of a 5% solution). This usually stops the lead colic within a very few minutes so that the patients who have been in intense pain usually go promptly to sleep. If the colic returns in the matter of a few hours calcium chloride is again given. In the meantime the patient is given a large dose of epsom salts. On this treatment the lead colic usually completely and permanently disappears within a very few hours and continued pain means that some other abnormal condition is present. After the patient has had three or four days of freedom from symptoms he is given an acid diet low in calcium content and maintained on this for a period of about a month. At the same time he is given large doses of a salt which produces acid in the body, usually ammonium chloride. This treatment causes a liberation of calcium and lead from the bones without reprecipitating manifestations of lead intoxications. At the end of this treatment the patient is again given large quantities of calcium in his diet in order that the depleted store of calcium may be replaced. The readily available storehouse of lead in the body is thus partially removed, which largely eliminates the possibility of a late manifestation of poisoning from lead stored in the bones. This treatment, which is quite simple and which can easily be carried out at home, has had an extremely beneficial effect on practically all cases of lead poisoning. The patient can get back to work relatively quickly and the unpleasant neurosis so often seen with chronic lead poisoning is now extremely rare in our cases."