

LEAD INDUSTRIES ASSOCIATION

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"THE DIAGNOSIS AND TREATMENT OF LEAD POISONING—SOME NEW CONCEPTS"

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Since I last talked to you some five or six years ago, there have been some very interesting new and noteworthy developments both in the diagnosis and treatment of lead poisoning.

While many others and I actually engaged in keeping men physically fit and able to continue at work in lead-exposed trades still rely largely on the simple and relatively inexpensive examination of the gums for lead line and the qualitative examination of the blood for hemoglobin and stippled cell determination, there is constant pressure for more exact and specific methods in some quarters. This involves not only the quantitative determination of lead in urine but also quantitative blood lead analyses. While such definitive studies are certainly advisable for research and medical-legal purposes, I am still convinced that they are not absolutely necessary for keeping the worker safely at work in the lead trades. Certainly such refined studies are not a substitute for the older methods because even quantitative findings of lead in blood do not of themselves make a diagnosis of lead poisoning.

In fact I have continued to see a large number of men under my supervision in different lead trades and I have successfully controlled their lead exposure and absorption by making only a careful study of the gums for lead line as well as by examining the blood for hemoglobin and stippled cells. With this system of medical control the plants under my supervision have so little lead intoxication that it is difficult to find any cases for demonstration to medical students. When occasionally due to a breakdown in engineering technique we do have lead exposure and absorption, we find physical evidence of it long before the man goes into a lead intoxication with disability. If we find lead line of the gums, which is easily demonstrable under a lens, or a mounting curve of 15 to 20 stippled cells per 50 fields, we have ample time either to move a man entirely from his exposure or supply him with a positive-pressure respirator which is the equivalent of moving him. This method is surely much simpler for the doctor and the technician involved as well as less expensive for the company which is paying the bill.

Two or three years ago a very simple qualitative indicator of increased lead absorption was brought into rather wide usage, namely the porphyrin test of urine. This test involves the use of a small ultraviolet light costing about

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#25. The test is really so simple that it can be done by any technician and interpreted by any doctor very rapidly within half an hour. It has also an added value in that it shows evidence of early lead absorption before the stippled cells appear. However, besides being somewhat non-specific, it has the disadvantage that once positive it may remain so for several weeks after the stippled cells have almost returned to normal. Therefore, it too cannot replace the stippled cell count and the examination of the gums for lead in addition to a careful evaluation of the man's symptoms. The test for porphyrin in the urine is simply another evidence of probable lead absorption in the face of known lead exposure. Though like the stippled cells the porphyrin test is not specific, I believe from my experience with over 3000 determinations that it is an additional useful diagnostic tool when applied carefully and judiciously.

When British Antilewisite or BAL was found to give such remarkably effective results in the treatment of acute mercury and arsenic poisoning, it was hoped that it would lend itself to the treatment of lead poisoning also, as lead is one of the group of these heavy metals. However, it has been found by a number of investigators and it is in line with my own experience that BAL is of very little help in the treatment of either the acute or chronic type of lead absorption. It is, moreover, a rather difficult and unpleasant material to work with and is toxic in its own right. It may actually make a lead case definitely worse so that in general we do not advise its use for lead cases at this time.

Within the past few months much investigative work has been done on the use of EDTA or ethylene-diamine-tetra-acetate. This forms a very stable compound with lead which is then rather promptly excreted safely in the urine to the amount of 50 or 60 per cent within 48 hours according to some recent experiments. Very careful studies on animals have been done on this subject by Dr. Martin Rubin of Georgetown University, a young scientist with whom I am personally acquainted and in whom I have great confidence. He is one of the first, with Dr. Harry Foreman of the University of California, who conceived the idea of clearing lead from the body in something of the same way that it and other heavy metals are cleared industrially from various solutions. I am aware also that Dr. Robert Bauer, et al., introduced by Dr. George L. Mason, Department of Pharmacology, Boston University School of Medicine, Boston, Massachusetts, gave a paper April 14, 1952 in New York on experimental work regarding calcium EDT used to protect chickens from experimental lead poisoning.

Dr. Rubin reported his original results on EDTA ten days earlier at a recent meeting of the American Chemical Society in Milwaukee during the week of March 31st to April 4th. Also, I have favorable information from him regarding the apparently successful use of this substance about a year ago in the case of a child who had severe lead poisoning with brain involvement.

Since that time I have had the opportunity to apply EDTA in the treatment of three industrial cases of severe lead absorption and intoxication. One was an instance of brain involvement or encephalopathy, one of lead colic and secondary anemia, and one without symptoms though with marked evidence of lead absorption and marked anemia. You would probably be interested in the types of lead exposure of these three cases.

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The first case, where there was definite brain involvement, was the accidental exposure for several months due to inhalation of lead arsenate by a worker who baled scrap paper for a junk concern. Neither the worker nor the employer was aware that the dust evolved in great quantities as he tramped it down in the baler was a lead dust. Therefore he was not supplied with a respirator of any kind.

The second case involved a man who was cutting painted steel in repairing boats in a shipyard down deep in the hold with no respirator or exhaust protection. This is a major type of lead exposure brought about by the fuming of the lead with the burning torch.

The third case, who had rather marked anemia as well as heavy lead absorption, was a man who poured brass in a brass foundry without adequate protection from the inhalation of the lead fumes.

All of these cases had marked lead lines and stippled cells of more than 200 per 50 fields, the equivalent of 20,000 per million red cells. Two of them required blood or urine lead determination to make the diagnosis once the gums and blood smears were examined. All three were in small plants, not under my supervision, where there was in fact no medical examination program of any kind. These are the situations and cases which we do use to demonstrate to our medical students.

Under treatment with EDTA all three patients have improved symptomatically. Their lead absorption has also improved objectively as seen by disappearance of lead line, marked reduction of stippled cells and sharp drop in porphyrin excretion. Moreover, the material is easily given intravenously and is not toxic according to our hospital blood chemistry studies. Bone marrow studies will be reported on later. The quantitative study of lead in urine is somewhat complicated after the use of EDTA because with this material the union of the lead and the chemical is so tight that special analytical methods have to be worked out. These are now being carried forward in Columbia Hospital laboratory with the cooperation of Dr. Rubin. They will be reported upon later. Then I can pass a more considered judgement on EDTA. In the meantime I believe that EDTA promises to be one of the most important discoveries in the treatment of lead poisoning since the use of calcium salts intravenously to relieve lead colic originally reported in the outstanding 1926 monograph of Aub, Fairhall, Minot and Resnikoff. I believe this work was originally sponsored by the Lead Industries through funds given to the Harvard Medical School.

Since 1926 though much additional definitive work has gone forward in the treatment and diagnosis of lead poisoning, the average physician is still quite uninformed as to the mechanism of lead exposure, absorption, and intoxication due to inadequate instruction in most medical schools on this subject. He therefore often treats such cases in a somewhat unenlightened manner. If a standard teaching film on lead could be made available for instructing not only medical students but members of county societies, the widespread public dread of lead poisoning could be largely mitigated. One must educate the family physician correctly if public opinion is to be brought abreast of the scientific facts on lead absorption.

Some time ago I outlined such a teaching film for your Association to sponsor. I trust that eventually you will find it expedient to go forward with this project.