

THE REPORT OF LEAD AND CALCIUM STUDIES DURING
1936- 1937

at the
MASSACHUSETTS GENERAL HOSPITAL

In my last report to you I mentioned the work which Dr. Hunter was doing in this laboratory. This work has now been published and the reprint is enclosed. It conclusively proved:

1. That the liberation of calcium from the bone also liberated lead, and therefore this has added further proof of our original conclusion that lead metabolism runs parallel with calcium metabolism.
2. It showed that the active para-thyroid extract, now easily obtained, is the most efficient method so far found to liberate lead from the bone. In fact it is so efficient that as a routine method in unskilled hands it might involve some risk.
3. It was clear that in our experiments so much lead was liberated by the first treatment that subsequent treatments yielded up increased excretion of lead.

It is obvious that this last finding is of considerable importance in the treatment of lead poisoning and we therefore have studied this problem this year as obviously these findings suggested that only a small part of lead stored

blood stream. If this were true, then eliminating the lead in this particular deposit of calcium and replacing it by pure calcium phosphate would free the patient from the danger of late acute manifestations of lead poisoning. We have, therefore, studied the source of readily available calcium in the body.

Readily Available Calcium in the Bones.

Let us first recall the anatomy of the solid bone. It is composed of hard, dense shafts of calcium salts with the center filled by bone marrow in which are interspersed fine spicules of bone. I frequently observed that when our cats died, after having been deloaded, these spicules were conspicuous by their absence, and it therefore seemed possible that here was the source of calcium easily available for general body needs. Our studies of this year have proved this hypothesis correct. When a high calcium diet is given to an animal, calcium is rapidly deposited in the spicules. When a low calcium diet is given, the spicules rapidly disappear while the hard shafts of the bone are apparently unaffected.

This is an important new conception of a source of easily available calcium and therefore, as we have previously shown, of lead. This explains many clinical facts of lead poisoning. The replacing of the shafts of bone goes on gradually, and accounts for the slow, continuous excretion of lead over a period of months and years.

But the sudden flooding of the body by lead with resulting acute lead symptoms would be due to its liberation from the more readily available deposits in the bony spicules.

In treating lead poisoning cases it is relatively easy to mobilize the lead in these spicules and then to replace them by calcium uncontaminated by lead. This explains the results obtained with Dr. Hunter when the second attempt at deleading was ineffective. These findings are of importance to you for they show:

1. The lead storage in the body, which is important in producing the acute lead poisoning, can be eliminated by proper treatment.
2. Late manifestations of acute lead poisoning, appearing several years after lead exposure, should be avoided by proper early treatment.
3. If late acute manifestations of lead poisoning occur in a patient who has been previously thoroughly delead, it is probably fair to assume that these manifestations are due to newly acquired lead.

Other work.

We tried, in a series of patients, to find the value of sodium thiosulphate in the treatment of lead poisoning. In the six patients studied we were unable to determine any definite influence of this drug on the excretion of lead. We plan to do further work along these lines, but so far our results have not been encouraging with the use of this drug

in acute lead poisoning. Much other work has been done on the control of calcium metabolism in the body, and of course this means the control of lead. We have been able to definitely establish the new fact that thyroid extract markedly increases the calcium excretion to a level which is higher than by any other method now known. We are therefore planning this next year to see what its effect is on lead stored in the body.

We have done a great deal of work on the mode of action of para-thormone and its efficiency in mobilizing the calcium stores in the body, and we have found that while it is effective at first, it gradually loses its efficiency in increasing the level of calcium in the blood and the amount of calcium excretion. We have also studied the effect of thyroid and para-thyroid on inorganic salts other than calcium or lead and have also studied the calcium and phosphate metabolism ~~in various diseases~~ in various diseases.

The results of these observations are not thoroughly recorded here as they are very complicated and will soon be published in detail. They are of value in regard to lead poisoning in increasing our understanding of what regulates calcium metabolism, and what influences the body to deplete the storage house of calcium.

The work of this next year will be a continuation along similar lines. The work of the past year will be recorded in a series of about fourteen papers, now being prepared for publication.