

Fifth Report of the Lead and Calcium
Studies.
1927 - 1928.

Massachusetts General Hospital.

The last report of the activity of our laboratory in studying lead and calcium metabolism was issued in October, 1927. Since then our laboratory has continued to study factors which might influence lead and calcium metabolism. Those associated with me in the work were Dr. William Salter, Dr. Ray Farquharson of Montreal, Miss Dorothy Tibbetts, and Miss Elsie Rossmeisl. The result of the work of the previous years was confirmed and, briefly, this may be summarized as follows:

Calcium salts may be pulled from the bones by various methods: First of all by a diet low in calcium; second, by means of the active principle of the parathyroid glands which act specifically in increasing the calcium excretion; and third by the thyroid gland, which has an enormous influence on calcium excretion, a fact not before appreciated. These facts are incorporated in our previous reports.

In the last year we studied these factors far more carefully in order to determine whether the other normal salts in the body were influenced in the same way that calcium was. This was a very difficult and complicated problem in metabolism but the results indicate that the effect of these various procedures upon other normal inorganic salts is negligible compared to the action upon calcium excretion. In other words, the chief effect is in pulling calcium from the bones and the other inorganic salts in the tissues are

relatively spared from strain.

Another important problem lay in the effect of diet alone and we, therefore, studied with great care the effect upon inorganic salt excretion of varying the acidity and alkalinity of the diets. Work of this type is laborious but important, and little of it has previously been done. Our studies indicate that the salts in the diet have a definite influence on the calcium excretion. Thus, a man could be on a potentially acid diet, taking large quantities of meat and the acid vegetable rice, and he would excrete more calcium than if he were taking an alkaline diet with large quantities of vegetables and fruits. Our studies also prove that this effect of varying diets was dependant upon their potential acidity alone and, therefore, the action of these diets is similar to the added acid which we had previously used to increase calcium excretion.

This work on calcium is also referable to the excretion of lead because we have conclusively shown, previously, that lead excretion and calcium excretion run parallel. This work explains why our early studies on diet alone caused so definite an increase of lead excretion, for the diets we had previously used were potentially very acid ones, as well as being low in calcium. It is also important to remember that the average American eats a potentially acid diet and one which is relatively low in calcium, which fact should be taken into account in the prevention of lead intoxication.

It may be of interest to show the practical results of our investigations, and to summarize here our present treatment of lead intoxication. We find this very satisfactory and we are told by men of great experience that our present method allows people to go back to work in weeks rather than the months which were pre-

viously required for their rehabilitation after evidence of severe intoxication.

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.

The lead treatment of cancer. Another intensive activity of our laboratory was the study of the effect of lead on cancer, a treatment which was originally suggested by Professor Blair Bell of Liverpool. We treated a group of patients suffering from inoperable cancer by the intravenous injection of colloidal lead phosphate. We used our usual method of carefully controlling the diet, etc., so that we were able to study the excretion of lead in these patients and to determine the effect of diet and treatment upon the distribution and excretion of lead. One might, naturally, exert a very distinct influence upon the efficacy of this method of treatment for if one could keep the lead in circulation it, naturally, would have a greater effect on the patient. The results of the treatment, however, clinically have been very unsatisfactory and we have given up using lead as a treatment of cancer. However, we did learn from these patients the method of excretion of lead when it is given intravenously and this work will undoubtedly be of value to other investigators who are continuing the search for a satisfactory lead compound for the treatment of cancer. This study was largely supported by a grant from the Cancer Commission of Harvard but in small part the expenditures also came from the Lead Fund.

The third activity of our laboratory was to study the value of our methods of treatment upon other types of disease. It, naturally, occurred to us that where abnormal bone deposits occur we might be able to eliminate them by our method of treatment. Such conditions occur in arthritis and in otosclerosis, the common type of inherited

deafness. We have, therefore, attempted to use this treatment in twenty patients suffering with otosclerosis. It is too early to be sure whether these patients are definitely benefitted but there is some evidence that it has been of help in a few of the early cases. We now know that the lack of better results is undoubtedly due to the store of readily available calcium which we previously discovered and which is first mobilized before further stores of calcium are affected. The work on these cases of otosclerosis was not supported at all by the Lead Fund for we derived our funds from other sources but the idea developed from our studies on lead poisoning.

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