

January 9, 1961

Mr. Jack D. Torrey
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Dear Mr. Torrey:

The data in the literature in relation to the distribution of lead in the tissues of the body are not numerous, but are not as few as the statement in your letter of January 3rd would indicate. I shall list a few reference at the bottom of this letter, and I am sure that a number of others can be found.

In answer to your questions, in sequence, the following statements may be made:-

(1) The lead in the marrow of human bones, under most circumstances may be analyzed with the bony substance or separately, without making much difference. If one wishes to know the lead content of the marrow, which is of some importance, he removes it of course as completely as possible. However, its lead content is relatively low, and its weight is small, and consequently little error is introduced into the results by including it. The bony tissue under ordinary circumstances is likely to contain 95 to 98 per cent of the lead of the body, so that a small error is of little consequence. Despite what I have said above, the data to which you refer, were obtained by separating out the bone marrow.

(2) Concerning the distribution of lead in the body, the references indicated below will indicate the "normal" distribution and that associated with excessive absorption. The time factor is, of course, an important matter in relation to recent excessive absorption.

The details of the mechanism of the carriage of lead in the blood are obscure. The broad facts are these:- The absorption of inorganic lead compounds (metallic lead, the oxide and the salts) into the blood stream results in the immediate extraction of virtually all of the lead by the erythrocytes, the plasma containing only minute concentration; the nature of the combination is unknown, but it is probable that an organic compound of lead exists within the erythrocyte, in some type of equilibrium with that in the plasma; the administration of EDTA affects the lead in the erythrocytes but little in contradistinction to the administration of BAL which decreases the lead in the erythrocytes promptly and drastically; following the administration of EDTA the lead in the soft tissues is released, after which, for a time (while excretion is catching up) the content of the lead in the blood is increased; later,

it decreases slowly; after the soft tissues have been reduced in their lead content, and sometime after the cessation of therapy with EDTA, the lead in the skeleton (which is essentially unaffected by EDTA) re-establishes its equilibrium with the soft tissues (including the blood), and with this redistribution the concentration of lead in the soft tissues and in the blood increases.

Do not worry about the lead in the bone marrow. The concentration of lead therein is generally about the same (a little less) than lead in the blood. If then, the concentration of lead in normal bone is about 1.0 mg. per 100 grams, and that in the bone marrow is about 0.03 mg. per 100 grams, you will see what I mean when I say that the error due to the presence of bone marrow is small indeed.

With respect to the lead compound in the blood, there is no precise information, and the reason for this is quite apparent. It would be a difficult job indeed to establish the facts, and no one has undertaken to do so. Bear in mind, please, the fact that until about 1936 or 37 we had no method for determining the lead in the blood; it is extremely difficult to determine the chemical composition of substances in such minute quantities. It is probable that this could be done by means of radioactive tracers, but no one has done it yet. Certainly it is of some importance, but not nearly so great as that of many other questions which yet remain to be answered.

We have a very complete story of the lead metabolism speaking descriptively, but in terms of the chemical reactions concerned, much is unknown and will so remain for some time.

Sincerely yours,

Robert A. Kehoe, M. D.

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References: KEHOE, Cholak, Story: A spectrochemical study of the normal ranges of concentration of certain trace metals in biol.mat. J. Nutrition 19:579.1940

Karl Bambach, Robert A. Kehoe, and Milan A. Logan
The Plasma-cell Partition of Blood Lead - copy enclosed

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