

March 14, 1953

Dr. Morris Greenberg, Director
Bureau of Preventable Diseases
Department of Health
125 Worth Street
New York City

Dear Doctor Greenberg:

I am glad to reply to your letter of March 9 concerning the significance of analytical data on the liver of a deceased individual, in relation to the diagnosis of fatal lead poisoning.

We have expressed our views in some detail and have illustrated the subject by means of appropriate data in medical literature (cf. "Lead absorption and excretion in relation to the diagnosis of lead poisoning; Kehoe, Thamann and Cholak; Jour. Ind. Hyg.: 15, 320 et seq, 1933. Other articles subsequently have made mention of the same matter, but not so completely. The normal range of concentration in various human tissues has been given in two articles (1) Editorial Review. Manganese, lead, etc. in normal biological material; J. Nutrition 20:85, 1940; and (2) A spectrochemical study of the normal ranges of the concentration of certain trace metals in biological materials; J. Nutrition, 19:579, 1940.) Reprints of the foregoing articles are no longer available or I should send them to you. However, I have no doubt that you have access to them. Meanwhile I shall comment on the most important aspects of the subject.

1. The range of normal values in human tissues in the United States of America is known. There is an appreciable variability from individual to individual, but the range is reasonably well defined and is grossly different from that associated with hygienically significant exposure and absorption in the period immediately preceding death.

2. The value for any one organ cannot be regarded as adequate evidence of the status of the deceased with respect to lead absorption shortly prior to death, not only because of the technical difficulties associated with the selection of an uncontaminated and representative sample of the organ, but also because the pattern of the distribution of the metal in the body must be known beyond any reasonable doubt, if the time of occurrence and the extent of the absorption are to be established by analytical means.

(3) A significantly high value in the liver only is suggestive, but not acceptable evidence, of the order of magnitude of the exposure to, and absorption of, lead in the period preceding death. The liver is one of the important tissues to examine in



Dr. Morris Greenberg - (2) - March 14, 1953

this relationship, but it does not suffice. To render it of any significance at all for medico-legal purposes, the accompanying evidence (clinical, historical, etc.) of exposure must be beyond question.

4. The diagnosis of lead poisoning of any degree (mild, severe or lethal) cannot be made on the basis of any type of analytical information obtained from either the living or the dead. One can interpret the order of magnitude of the absorption of lead, can develop a very sound idea of when the absorption occurred, and can relate it to potential danger, if suitable analytical data are made available. Post mortem diagnosis, however, is an entirely different matter. There is no level of lead content in any tissue of combination of tissues that in itself, can demonstrate that lead poisoning existed ante mortem, since illness is not necessarily associated with any type of analytical findings. The nature of the precedent illness can be determined only on the basis of information that provides a satisfactory clinical diagnosis of the illness from which the deceased suffered. (You are aware, no doubt, that there are no gross or microscopic lesions which are characteristic of lead poisoning.)

(The only situation in which these statements must be made with some reservation is that associated with the absorption of tetraethyl lead. Here a sufficient concentration of lead in the brain, in association with a history of exposure to tetraethyl lead, comes very near indeed to proof of fatal tetraethyl lead poisoning, in the hands of a well informed person. Even here, however, I would not trust entirely to analytical evidence on the one tissue.

The answers to your two questions, therefore, are as follows:

1. Post mortem analyses of properly selected human tissues, but not the liver alone, have great confirmatory diagnostic significance in relation to lead poisoning, when appropriate clinical information can demonstrate the ante mortem existence of illness compatible with the diagnosis of fatal lead intoxication. Except in the child, fatal lead intoxication is rare, and therefore the clinical information must be pertinent and valid.

2. There is ^a/normal range of values for the liver (and other tissues) and these values are greatly exceeded in lead poisoning.

I trust that this covers what you wish to know.

Cordially yours,

Robert A. Kehoe, M. D.