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DEPARTMENT OF ENVIRONMENTAL HEALTH
Kettering Laboratory, College of Medicine, Eden & Bethesda Aves.

August 21, 1969

John P. Curran, M.D.
Director, Dept. of Pediatrics
Medical Center
Jersey City, New Jersey 07304

Dear Doctor Curran:

I have received a letter from F. X. Worden, Secretary of the Occupational Health Section of the American Public Health Association, (of which you, I believe, have received a copy), asking me to reply to a copy of your letter to him dated August 15, 1969. I am pleased to comply with Mr. Worden's request, and also to send you some of the documentary information on the subject, which indeed is much more extensive and convincing than mere answers to your questions. If I may interpret the evidence in a somewhat categoric manner, I should say that the standards which relate to lead in the "normal" population (including its children), and in relation to the potentially hazardous levels of the absorption of lead (as indicated by the rate of the urinary excretion and, more, particularly, by the concentration of lead in the blood), have been as thoroughly documented as any which apply in the field of toxicology and medical practice . The evidence for this is provided, in considerable part, by some reprints (of books and published articles), and by the references contained therein.

As to the issue of the upper limit of the so-called normal level of lead in the blood, one must consider two features of the sampling and analysis of human blood in relation to its content of lead. First of all, is the fact that it is quite impossible, in our society, to establish a "normal" on any other than a statistical basis. The general exposure of our people to lead is variable from day to day, as well as seasonally, dependent mainly upon the content of lead in the food and beverages consumed from day to day; it is also variable because of the variability of the human appetite and demand for food, in that the individual may consume large or small quantities habitually, or he may choose to eat articles that tend generally to be either high or low in lead.

Secondly, the analytical procedure - there are several - deals with such small quantities of lead as to yield an analytical error which, at best, is of the order of 10 percent, more or less dependent upon size of sample and the absolute precision of the analytical method. This means, of course, that a single analytical result of 0.05 mg. per 100 grams in round numbers may in fact (through multiple analyses) be found to be closer to 0.04 or 0.06 than it is to 0.05. It is necessary, therefore, in dealing with such a single result to include an 0.06 in the normal range, since it sometimes (not very frequently) turns out that way. As a matter of fact, from long experience, I regard the figure of 0.06 in a series of determinations on the blood of an individual whose mean lead concentration (in the blood) is 0.03, as being the result of a fortuitously high expression of the analytical error. But since such results do occur, one cannot say, from it alone, that it is abnormal in any way. In all instances, however, in research, rather than in clinical evaluation, it is essential to analyse a series of specimens of the blood of an individual, to arrive at a sound result as to his physiological status in this respect. Again, however, I repeat, that for

medico-legal purposes, when, as is so often the case, one has a single analytical result, it is not possible to conclude that a value of 0.06 mg. of lead per 100 grams of whole blood is an abnormal figure. If you will examine the statistics yielded by the experimental subjects investigated in this Laboratory, you will appreciate, I believ the need for repetitious analyses in crucial situations. Obviously, in setting down criteria for the differentiation of "normal" from "abnormal" results (when the values are fairly close together), the "rule book" always tends to err on the side of simplicit since it is not feasible to set down all of the factors which enter into variability.

I am sending, under separate cover, certain publications which I believe will be of service to you in your attempt to understand the somewhat complex information which is available in this matter. If certain additional questions are suggested to you by the data or statements in these publications, do not hesitate to write to me. I shall be out of the country from September 8 until after the middle of November, but after my return to my desk, I'll be glad to reply.

Cordially yours,

Robert A. Kehoe, M.D.
Professor Emeritus of
Occupational Medicine

RAK:wp

cc: Herbert E. Stokinger, Ph.D.
E. Lynn Schall
F. X. Worden