April 7, 1971

J. Julian Chisolm, Jr., M.D.
Baltimore City Hospitals
Department of Pediatrics
4940 Eastern Avenue
Baltimore, Maryland 21224

Dear Doctor Chisolm:

Thanks for your letter of March 31st. One of its comments, however, has compelled me to reply to you at once, since it strikes me on a tender point which I spent a goodly number of years investigating - namely, the point at which the lead content of the blood becomes really dangerous.

The question, as you know, revolves around the fact that lead poisoning does not result, with any degree of certainty, when the blood reaches a certain level of concentration, unless - it seems - this occurs very abruptly. Most of the cases occur - or are found, in hospital to have occurred - in association with concentrations well above 80 micrograms per 100 grams of whole blood (of essentially normal erythrocyte and hemoglobin content).

Thus, in industry and in dealing with adults, most of the cases have their onset when the concentration of lead is around 90 micrograms or more per 100 grams. However, the lowest point at which (in thousands of exposed persons) we have found the onset occurring is 80 micrograms. Taking in all of the most susceptible people in our industrial populations as seen thus far in over 30 years, the threshold of danger is just about 80 micrograms. It is common practice with us and our associates to begin at 70 micrograms to look carefully at the trend. If it rises at all (on repeated analyses which neutralize the 10 per cent. error of analysis, or thereabouts), we consider what to do with the employee in removing him from exposure until such time as his blood lead decreases down to the 50 microgram range. He is transferred to similar work (and compensation) in an area free from exposure to lead.

Now it so happens, in our experience, that the same threshold relates to children at the time of the onset, i.e., within a very few days of the actual beginning of the illness, or at a time when the alimentary tract of the child is still high in lead, as shown by the analyses of the feces or on the evidence of the abdominal X-ray. We have never seen a single child at, or this near to, the onset of his illness, who has been at a significantly lower level with due regard for the analytical error. I believe therefore, that the lower levels referred to in the literature are the result of delays in bringing the child to the doctor, that is, to the point at which analyses can be made. There is no doubt that the level above 40 or 50 micrograms per 100 grams is an indication of an unusual degree of absorption of lead, but if the source of exposure is of such a type as to raise the lead in the blood only to 55, 60 or 65 micrograms, no evidence of poisoning will be found unless the child in question became ill at a higher level and is still ill despite the subsiding concentration in the blood. It is barely possible that I am

wrong about this in the case of children, for I have never been in position to know all of the facts about the child (under the care of a pediatrician), and I cannot have come to the same degree of certainty about them that I have about people who work in industry. However, in the latter situation, this procedure which I have described has become the method of operation (along with good clinical work), and it now applies in quite a number of industries which I and my associates have been able to influence, and, at present, thousands of workmen in the United States are being handled successfull in that manner. I think, therefore, that there is no doubt, that there are three levels of exposure to lead, characterized by three levels of concentration in the blood - normal blood, not the site of more than a very mild anemia, not sickle cell anemia and not thassalemia - the so-called normal range (up sometimes but not too often to 40 micrograms), the abnormal, i.e., unusual, but safe range, 50 to 70 micrograms, and the dangerous range - 80 micrograms and above - at which level persons under observation can become ill of lead poisoning, without further warning. What happens to these men, I believe, from numerous reports and the observations of reliable people, is that they run into a bit of excessive exposure - accident or what not - and get picked off thereby as though they had exceeded the resources of the body to neutralize in some manner the toxic effects. I think this because I have seen (incidentally) the level go up very gradually in some persons to very high levels without causing any illness. I have seen a man, for example, with a blood lead of 0.90+ mg. per 100 grams of whole blood, who had not a symptom of illness.

The reason I am insistent upon this thesis is that the freedom of workmen from the threat of illness (lead poisoning) in the lead industries depends upon our having a threshold value which is substantially never failing, and yet feasible to achieve, one below which no one ever becomes ill of lead poisoning. If 80 is too high, I am ready to move it downward, but thus far, I have not found it necessary to do so. This state of affairs in industry is dependent upon good industrial hygiene, which can - if it will - maintain a uniformly satisfactory industrial environment, plus a very good brand of clinical medicine, which provides a competent medical supervision of men at work, and an analytical service (available nearby) through which dependable analytical results can be obtained. I am willing for the industrial health team to rely upon determinations (accurate determinations on properly collected samples of urine) of delta-aminolevulinic acid, until they reach suspiciously high levels, if they will then have the blood of individuals analysed for lead with sufficient frequency to keep the doctor aware of the status of the men under his supervision. This regimen, of course, can be so sloppy as to be almost worthless, but it can be done so well that everybody concerned can do his day's work with confidence and comfort. This is expensiv in competent personnel and in satisfactory facilities, but it is economical in terms of human contentment, comfort and satisfaction, freedom from anxiety on the part of well-protected workmen, and the elimination of the cost of Workmen's Compensation and medical care for persons afflicted with lead poisoning. The latter benefits are not figments of a hopeful imagination, but are actually reaped, by a number of wise managers in industry. This, in fact, is what could be done universally, if we just had enough knowledgeable, well-balanced, and thoroughly decent people running the lead industries of the country. It is this feature of this situation which enables me to be willing to seem somewhat arbitrary about some of the facts of life.

Sincerely yours,

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

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