

February 16, 1967

Ken Nelson, Director
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Dear Ken:

I am pleased to have your letter of January 30, and also to answer your questions about the significance of the critical concentration of lead in the blood in relation to the danger of intoxication.

First, let me say that the transcript of my testimony in Harrisburg was indeed "rough". I have sent in an edited copy which may or may not replace the stenotypist's version, dependent upon the official policies in such matters. I am not sure how far my testimony achieved its purpose, but I sent in a fuller statement, as requested, for such use as the Commission may choose to make of it. I hope it will be added to the public record. I am reasonably sure that the Commission will not adopt a level below 12 micrograms of lead per cubic meter, as a "tentative standard" for the ambient air.

With respect to your query, the answer is in the affirmative. We have seen cases of lead poisoning of mild but definite character when the concentration of lead in the blood, by our methods of analysis, was at the level of 80 micrograms per 100 grams of whole blood. No method of analysis with which I am familiar is capable of yielding this figure with an accuracy that is greater than plus or minus 10 micrograms

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(when the samples analyzed are of the usual weight of 10 grams). We do duplicate analyses, as a rule, however, in the investigation of the blood, so that we improve the precision somewhat thereby. We have not published case reports in this relationship. In fact, I rarely publish reports of individual cases unless there is some very unusual situation that justifies it. The many cases of lead poisoning in which we have been involved, in one way or another, during the past twenty-five years, in which we have employed essentially the same methods of analyses, would hardly justify individual publication for any reason.

Let me point out that I do not now, and never have, talked about poisoning and the alkyl lead compounds, in this connection, except to point out that the analysis of the blood is valueless in these cases. These cases show very little change in the concentration of lead in their blood, even in association with fatal intoxication. That, of course is a different story. The compounds that result from the intermediate metabolism of these compounds behave differently than the inorganic compounds. However, we have investigated the status of thousands of workmen in a very large number of lead trades, over the years, in acting as the consultants and monitors of such industries, and it is of these that I have spoken in a series of publications, from the point of view of the application of analytical services in industrial hygiene. You will realize of course, that I am no analyst, and that I usually talk about "our" work, meaning the analytical work of Cholak and his group, in coordination with the clinical and medical work of myself and a series of associates in our clinical group. In many instances, we have followed large and small groups of

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employees at intervals, year after year, in conjunction with environmental investigations (sometimes of our own doing) and also medical and employment information on the personnel. Therefore, we have, I believe, the largest bulk of coordinated information that is available anywhere. (In addition, we have consulted with local and some distant colleagues, in their handling of childhood problems of lead exposure and lead poisoning for the past thirty years, and have followed, in this way, a large number of cases (several hundred) during that period many of them at the onset of their acute episodes of illness. The record, therefore is fairly complete. I hope, some day, to have an opportunity to assemble and classify these data for publication, in relation to a number of important hygienic and clinical considerations.) There is, then, no doubt, about the fact as stated above. We have seen such cases occasionally, as well as many at slightly higher levels i.e. 10 to 15 micrograms per 100 grams.

This brings me to your other point - namely, that many persons have reached levels well above 80 micrograms per 100 grams of whole blood without illness. This is certainly true. Indeed it is true that no level of the concentration of lead in the body of an individual, or in any tissue, with the possible exception of that in the brain (of this I cannot be sure, from our data), or in any body fluid, including the urine, is indicative, in and of itself, of lead intoxication. We have seen persons with levels beyond 500 micrograms of lead per 100 grams of blood, who had none of the symptoms or signs of lead poisoning. I have stated this fact again and again for years, but it seems not to have made any impression on most people, including physicians. Many

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insist on arriving at a diagnosis of lead poisoning by means of single analytical finding. I have said, until it has become trite, that "the diagnosis of lead poisoning must always be made on the clinical grounds of finding symptoms, or signs, or both, that are compatible with our knowledge of the toxic effects of lead. The analytical findings merely demonstrate that the extent of the absorption of lead, as shown by appropriate analyses, is compatible or incompatible with the diagnosis of lead poisoning, that is, they can exclude but not prove.

From the aspect of industrial hygiene, the determination of the extent of the absorption of lead by individuals and occupational groups, differentiates between safe and dangerous environmental conditions (not all of which relate to occupational exposure but can be identified by appropriate investigation, as a rule.)

With respect to the high values, there are, so far as I can see, two methods of their prevention and control. The best, of course, is the elimination of dangerous environmental conditions, whether in industry or elsewhere. There are some industrial operations that are extremely difficult and costly to control. I cannot see that cost should be permitted to be a factor in these, unless there is an operation that is unusual, temporary, occasional, or is of such a sort as to affect only a very few people. In the latter situation, extraordinary means of individual protection are justified, including shortening their periods of exposure, as well as alternating periods of employment involving no exposure, with those of exposure. I have had good reason to believe, however, that the cost of certain types of control, in,

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irresponsible as well as highly competitive industries, has often prevented their use, and that workmen have been victimized by this uncivilized situation. An attitude of mind has developed in those who direct certain industries, to my certain knowledge, that it costs too much to provide complete safety from exposure to lead; that the disease is not very serious, in the main, and that one can justify the occurrence of a case or two now and then. I have never been able to accept this view. I do not believe that a process or a product that takes its toll of human breath or life should be permitted to continue. If it cannot be controlled, and if it continues, it is a social liability, and should be abolished. This is hard doctrine, but it is the only acceptable doctrine, I believe, for the guidance of the professional technical or medical industrial hygienist.

One last point, that is, on the establishment of criteria by a medical or scientific organization - for medical-legal purposes - some effort is made to achieve this result, by the democratic and educational process, but there is no such authority that can lay down and edit of this sort and make it stick. Actually, only a relatively small group of persons in the American Medical Association has had the experience and acquired the knowledge, that would justify any such action. In our jurisprudence, the knowledgeable persons are often called upon to appear in courts or legal and official hearings of one kind or another, and give expert testimony. Such persons also publish their findings, for the benefit of their colleagues and the community. My chapter in the last edition of Patty et al., is an example of this sort. This chapter has in it the methods (and their scientific and

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social justification) that we have found to be wholly satisfactory for the purpose. These combined activities are about all, I believe, that we are prepared to accept in our society as means of declining these issues. In the long run - and I realize that it is often a very long run - this is probably the best way of handling these matters. In the medical and hygienic literature of our time, an intelligent technical industrial hygienist, as well as a reasonably sensible physician, can find all of the information he needs to steer a judicious course in this field. It is true, of course, that one must set about to learn where reliable sources of information can be found, but this is not too difficult. The trouble is that the physicians, generally, know so little, from experience and study, about lead poisoning, and the disease has been known to be among us for so long, that they do not understand how little they know. They actually believe that they know something about it, although they have had little or no experience, and have not kept up with the knowledge that is available. The old saws that came to their attention in their student days, are just about all that many of them know about it. And yet, a physician with a license to practice medicine is regarded as an expert, in courts of law and in industrial compensation circles, quite as much of an expert, in fact, as is a man who has spent much of his life in observation, study and research. (I think, from what I have heard, that this is somewhat less the case in your State of Utah, than it is in many others). Here is where we need some integrity and intelligence among attorneys, and judges, and until we have satisfied that need to a greater extent than is now apparent, we shall be in trouble.

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But enough, I had no intention of writing at this length when I started, but having been t̄aumatized considerably, lately, by certain of these matters, I tend to react at times with vigor.

Let me thank you again for your letter, and accept from me my kindest regards.

Sincerely yours,

Robert A. Kehoe, M.D.

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AMERICAN SMELTING AND REFINING COMPANY
DEPARTMENT OF HYGIENE
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January 30, 1967

K. W. NELSON
DIRECTOR

Dr. Robert A. Kehoe
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Cincinnati, Ohio 45219

Dear Dr. Kehoe:

I've just been reading the rough transcript of your testimony on lead before the Pennsylvania Air Pollution Commission. Please accept my sincere thanks for straightening out the Commission's thinking on lead.

Your point about individual susceptibility to inhaled lead interested me very much. We have learned that we too often ascribe to individual susceptibility marked differences in lead absorption among men ostensibly having the same exposure. But almost always, if we observe closely the working habits of each man, we find that true exposures are markedly different.

I believe I have read all your published work on lead. Yet I have not found, or at least I do not recall seeing, a report of a clear-cut case of clinical lead poisoning accompanied, at the onset of symptoms, by a blood-lead as low as 80 micrograms per 100 grams. Have there been such cases? Over the years we have found many blood-leads above 80 and some as high as 300 without definite illness. Our exposures of course are to inorganic lead only.

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Dr. Robert A. Kehoe

We are not happy when we find high blood-lead values and we do what we can to bring them down. But this is difficult in some instances because there is no illness, and men object to changing things when a laboratory result is the only reason for change.

Another difficulty is that compensation courts almost automatically declare any blood-lead level above 80 is lead poisoning. Wouldn't it be well if a set of diagnostic criteria were set by the AMA or someone, so that these compensation cases could be decided fairly?

With very best wishes,

Ken Nelson

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