

August 28, 1969

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Dear Doctor Hoschek:

I shall attempt to answer your questions. Before doing so, however, I wish to discuss certain points of definitive difference between your statements, and those which I would make on the evidence of forty years of experimental work and clinical observations made by myself and by trusted associates.

First let me say that I discarded, long ago, on the basis of experience, the concept of the virtually unlimited variation in susceptibility of workmen in the lead trades. Variation does occur, but it does not extend below certain critical levels of lead absorption as revealed by the concentration of lead in the blood. You speak of the occurrence of lead poisoning in workmen whose blood is low in lead. I would ask, how low, and also what are the precise limits of the known precision of the method of analysis employed in obtaining the "low" result? I ask this for the reason that the analytical methods which we employ in clinical work are the same as those used in research. They have high precision, low sensitivity and high reproducibility. Using such methods, and repeating the analysis when necessary (the experimental deviation is of the order of 10 percent), I have never seen a case of lead poisoning in adult or child at the time of the actual onset of characteristic illness, when the concentration of lead in the blood was below 0.08 mg. (80 micrograms) per 100 grams of whole blood.

This point is very important, for there is no other biological test indicating a critical level below which no poisoning occurs. This is not to say that the onset of illness occurs always or even usually, when the blood reaches this concentration, for men who appear clinically to be entirely well often have higher values. The fact is that no analytical value (that is, of lead in urine, blood or tissues) is indicative of intoxication. Something occurs in the body to "activate" lead which has been absorbed and bound in the tissues without inducing toxic reactions. It seems likely that this "something" results in the release of ionic lead, but no one knows whether this is true, or if it is, what brings it about. In any case, there is a threshold value approximating 80 micrograms of lead per 100 grams of whole blood, and if the exposure to lead within an industrial establishment is controlled to such an extent that no man reaches this critical level, no cases of poisoning will occur. I can say this flatly for the reason that a number of industries have achieved this degree of control and have had no cases of lead poisoning for many years.

One other thing I must insist upon, and I am shocked by your statement that you are surprised to learn that this is the common view of physicians who have studied this matter carefully. I know of no competent industrial physician who believes that the determination of the severity of basophilic stippling of the erythrocytes is a sound clinical control measure in the lead-using industries. I would simply not

accept the responsibility for the safety of a group of workmen in a potentially dangerous lead-using occupation if that were the procedure I had to rely upon. It is simply impossible to depend upon this procedure to determine the extent of the absorption of lead of a man, or the degree, if any, of his danger.

As to the "screening" of employees by determinations of Coproporphyrin III or delta-aminolevulinic acid in their urine, there is little doubt of the usefulness of either or both of these procedures. They do not have either the sharp significance or the specificity of lead determinations for the avoidance of occasional cases of lead poisoning. The sole question here, for the physician to settle for himself is "How often am I willing to make the wrong decision?" If you will remove men from exposure when their blood lead approaches 0.08 mg. per 100 grams (let us say that you do not allow them to go beyond 0.07 mg., so as to maintain a margin of safety, as the Swedes do), you will not have cases of poisoning to treat. If you insist on this degree of safety, you will soon find that in the well-managed industries, means will be found for controlling the occupational (environmental) conditions within the limits of safety. This is what the physician should undertake to achieve.

I can tell you that in your country and mine, as well as others, there are industries that will not take the steps necessary to protect their employees until they are compelled to do so by facing the facts of life. There are reasons of engineering incompetence, financial jeopardy, and, most of all, social irresponsibility, for neglecting the potentially dangerous working environment. I have tried, as a medical investigator, to find out what must be done in the lead trades to make them safe. I have found out, to my own satisfaction and that of many of my colleagues (through the facilities of an excellent research organization) what is necessary, and I have proved, also to my own satisfaction and that of many colleagues that it can be done. I am aware of the fact that there are many plants in this country and elsewhere, which, for one reason or another, do not meet the requirements. This is something which I cannot do anything about at once or soon, but I am sure that in a truly civilized industrial society, it will come about. The principal difficulty in this country is that we do not have a sufficient number of competent physicians in industry (we have many in private practice) to convey the gospel and the technique of preventive medicine and hygiene.

Now as to your questions. In the matter of medical examinations in lead-using industries in the U.S.A., we have everything from the emptiest medical gesture, to thoroughgoing clinical study of the entire exposed population. The schedules for the different types of physical examinations and the laboratory procedures (which vary from tests of negligible worth to the best and most varied techniques employed in clinical investigation) depend upon the physician in charge. If he is a man of experience and good judgment, he employs reliable clinical and laboratory procedures with such frequency as may be necessary to keep himself well informed as to the condition of the men (and women) for whom he is responsible. I have not found that well informed persons in responsible management balk at the expense required to perform an adequate job. I will not, myself, submit to an imposed schedule of examinations of any type, for the nature of the schedule depends vitally upon the conditions under which men work. One should do what is necessary to be adequately informed. Let me repeat, however, that almost any variety of professional performance can be found in this country, since the laws vary with the individual State, (in some of which there may be little knowledge and experience, as in States which only recently have become really industrialized), and since we do not have adequate numbers of well-informed and specially trained physicians in industry. (I know of no country in which this same situation does not exist in some degree, but the specialty of Occupational Medicine is making some headway in several countries.)

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As for methods of analysis for lead, members of our analytical staff in this Laboratory have investigated and employed all but the most recent exotic methods of research for lead and other trace metals. We have found the methods of atomic absorption to be useful and reliable within appropriate limits. The problem here is not the choice of method, so much as the development of competence in employing the method selected. The selection must however be made on the basis of utter reliability since erroneous results are worse than none at all. For example, you have said that you have seen lead poisoning occur - i.e., at the time of its onset, in the case of a person whose exposure is occurring regularly - when the concentration of lead in the blood was low (implying that it was below 80 micrograms per 100 grams). I am sure, from many years of experience with hundreds of industrial establishments, that this is not true. Rather, what you saw was an incorrect analytical result, or a result obtained sometime after the patient had been free of exposure to lead, i.e., some time after he had quit work. There is, I think, no real likelihood of my being wrong in saying this for I have been looking carefully for many years for even one exception to this rule, without finding any.

There is no other common clinical analytical procedure which offers opportunities for error, in its total performance, which are equal to those afforded by the sampling and analysis of the urine and blood for their lead content. I can say from sad experience that such analyses in the usual type of analytical laboratory can be counted on to yield erroneous results. Therefore, I do not accept the validity of your statement on this matter.

Under separate cover, I am sending, in addition to those forwarded previously, a booklet prepared by Mr. Cholak of this Laboratory, for use by the American Public Health Association, to which I have added some paragraphs on sampling. This booklet does not contain a description of the method based on "atomic absorption" which we now use in parallel with the "dithizone" and spectrographic methods described therein. However, for clinical purposes, generally, we regard the "dithizone" method as the most suitable in terms of the cost of the equipment required for its use, as well as the ease of its expert performance. All kinds of people are using the "atomic absorption" equipment, which is indeed good, with the idea that the equipment performs the job. This, of course, is the choice way of obtaining unreliable results. Expert knowledge and meticulous care is necessary regardless of the method. It is my opinion that a method of high and known precision should be used for all analyses, for only by such means can quantitative values be obtained reliably. It is for this reason that I do not approve heartily of "screening" methods, all of which tend to yield somewhat non-specific or dubious results. Economy in the use of analytical methods for hygienic control in industry is best achieved by reducing the numbers (frequency) of analyses, by pinpointing the personnel who are in danger and by applying effective methods of environmental control. From the medical viewpoint, it is a poor and unjustifiable practice to economize in methods of locating and measuring danger when the health of workmen is at stake. Work-places should be made safe (as safety is defined in relation to medical knowledge and skill), and then the measures taken to locate unduly dangerous conditions so as to correct them need not be extravagant. I do not believe it is a function of good medical practice to compromise with these matters. We can, of course, afford to be patient when the management of industry is trying to do a good job for the employees against serious difficulties. However, poor performance in an industry as a deliberate policy of economy is and must be intolerable to the physician, since his acceptance of this is equivalent to connivance.

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I realize in what I have just said above, that it is impossible, at present, to affect the kind of industrial hygiene that is required in the small and poorly managed, lead-using factories. This, however, is not our fault as doctors, nor will a more civilized social attitude in industry be achieved by our tacit acceptance of the situation. We must hold out for good and humane practices in industry if we are to maintain our concept of the responsibilities of the physician in our society.

Sincerely yours,

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Occupational Medicine

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