

November 1, 1948

Dr. B. W. Lewis,
Industrial Hygiene Section,
City of St. Louis,
62 Municipal Courts Building,
St. Louis, Missouri.

Dear Doctor Lewis:

I am very glad to answer the questions in your letter of October 25 as well as I can.

There are a number of considerations that always come up in connection with the sampling and analysis of body fluids or excreta in relation to occupational lead absorption. The problems which you have come across are precisely those that have confronted everyone else who has undertaken to carry out these procedures.

Let me first differentiate between the problem of diagnosis as differentiated from that of measuring the lead exposure in connection with various occupations. When one undertakes to make a diagnosis in a specific instance, it is necessary to establish the facts as to the individual. For a number of practical and physiological reasons, this is best done by the examination of both blood and urine, making a sufficient number of observations so that one can be sure, despite the variability of the results, that he knows the facts concerning the individual's exposure. The lead concentration in the blood is subject to little variation during the day, while that in the urine varies from hour to hour, and can only be determined by repeated samples, or by the analysis of a sample or samples of large volume. In my opinion, it is unwise, for diagnostic purposes, to rely only upon the results of the examination of the urine. It is also inadvisable to rely only upon the analysis of a sample of blood. Analysis of both provide data which are much more valuable than either.

In making surveys, for the purpose of determining the order of magnitude and hygienic significance of the lead exposure, the results of the analysis of the urine are more useful than those obtained on the blood, for the reason that we have much more information on the safe levels of lead concentration in the urine than we have on the blood. It is true that it is necessary to avoid the contamination of the samples. This can be done in several ways, as we have pointed out previously. "Spot samples" of urine can be taken from individuals under conditions that will provide uncontaminated samples in the very

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large proportion of all instances. For example, in most of the lead trades, men remove their clothing and bathe at the end of the day's work. Urine samples can be taken in a nearby clean place after the men have bathed and changed their clothes. Samples can also be obtained in the morning before the men have changed into their work clothing. It is equally convenient to obtain samples in the medical offices, but here it is necessary that the men remove their clothing and shower before doing so. Since this is usually necessary or at least advantageous, in connection with periodic medical examinations, there is no great problem of inconvenience introduced by this procedure. At some of the plants in which we have carried out studies of this kind this has been the regular procedure. In our experience it is not at all difficult.

The problem of obtaining reliable samples of urine from female employees is solved in exactly the same manner, except that here the individual, after bathing, is provided with a sampling container with a wide mouth, thereby avoiding the use of any intermediate container.

We have also carried out a very successful procedure whereby samples of large volume can be obtained. A clean container sealed in a paper bag is provided to each employee either at his home or for him to take to his home. Simple instructions are issued for the avoidance of contamination, and these have been very nearly uniformly satisfactory in our experience. The urine is collected in the container until two or more liters are available. Containers are then returned to the laboratory within the bag. This does not involve any interference with the days work, and the samples are perfectly satisfactory, if one takes reasonable care to instruct reasonably sensible and reliable employees. It is, of course, quite impossible to do this unless there is a proper understanding between the medical people and the employees.

In my experience it is not only useless but misleading to carry out analytical work on samples that have not been obtained under the responsibility of the laboratory that is asked to perform the analyses. We never waste our time analyzing samples of any material that are not obtained in our containers and in accordance with our instructions. If a physician in an industrial plant will not bother to take the responsibility of seeing that we obtain samples according to our instructions, we will simply not work with him. Our reason for that is not an arbitrary one, but is rather an expression of our experience. If through our willingness to work on improperly gathered samples we obtain the wrong information, we are performing no useful service for anyone but are rather contributing to misinformation. In this field of work it is the analyst's duty to know that what he is examining will give useful results.

We do sometimes have difficulty in obtaining blood samples in plant surveys. Some of the men object, and therefore either do not

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cooperate or do so under duress. We are always able to eliminate this difficulty in time, but sometimes disappointing results are obtained on the first round. This again is a reason for relying principally upon the results of multiple samples of urine. If we survey an area in which 8 or 10 people are employed, the examination of spot urine samples will almost always reveal the order of severity of the lead exposure. If there are 30 or 40 employees in each occupation, the information is always satisfactory. However, if there are only one or two individuals in a given category, it is usually necessary to obtain a number of samples from each one. Nevertheless the urinary lead concentration will portray the picture as nothing else will do. Moreover, as I have indicated above, we know full well where safety lies in relation to urinary lead concentration. We are not nearly so sure in the case of blood values in the intermediate range.

This is the best I can do in a letter, but I should be glad to discuss this with you further if the opportunity presents itself.

Sincerely yours,

Robert A. Kehoe, M. D.

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