

August 20, 1951

Dr. Ian MacLachlan
Maywood Area Physician
American Can Company
11th Avenue and St. Charles Road
Maywood, Illinois

Dear Doctor MacLachlan:

I shall undertake to answer your letter at some length, since, in my opinion, the questions raised are of considerable significance.

Your manner of sampling the urine is, in my opinion, unduly exacting, since it is based upon an hypothesis which is faulty. There is no present reason for regarding the excretion of lead on a time basis as any more exact than that on a concentration basis. Actually the excretion varies with, (1) the intercurrent (hour to hour) exposure to lead, including that involved in the alimentary tract through the ingestion of ordinary food or through the ingestion of excessively contaminated food, and (2) the volume of water available for renal and cutaneous excretion (a factor only when there is appreciable sweating). There may be other factors but we know nothing about them.

Concerning the significance of the water; the lead output per day, (time), can be multiplied by increasing the water intake, or reduced significantly by water deprivation. Since both of these occur in industry to a significant degree, the matter of trying to adjust the time gives a false sense of precision.

The business of emptying the bladder etc. is unimportant in practice, but is not a source of error if a sample of 80 c.c. is obtained without artificial emphasis to the man. The latter results in his drinking excessive quantities of water just to obtain an adequate sample, and this results in a dilute and misleading sample. It is better, I think, to obtain the first morning sample, if it is obtainable. Otherwise it suffices to obtain a sample at that time of day when the urine is least likely to be either highly dilute or highly concentrated. Observation of the habits of the men will establish the facts in these matters.

The urinary concentration in spot samples is highly variable at best, and the results cannot be corrected for specific gravity or by any other means, except in a rather gross manner. The only recourse for their interpretation in the individual case is that of (1) obtaining a sample of large volume over the period of hours, (the more hours the better up to 48), or (2) obtaining a series of spot samples that will show the extent of the variability, and hence give a representation of the physiologic situation. Otherwise one must obtain

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a blood sample, with which to check the meaning of the urine.
(Variation in urine may be physiological or pathological, hence for medico-legal diagnosis, one must check urine against blood.)

A few statements of fact may help.

Normal lead excretion occurs within the limits of 0.01 to 0.12 mg./liter, with very few results over 0.08 when samples of large volume are examined.

Normal lead excretion ranges from 0.005 to 0.16 mg./liter with few results over 0.14, when spot samples are examined.

Safe limits of representative lead excretion for the individual do not range above 0.15 mg./liter, and therefore the variability of samples may obscure the fact that the individual is above this level, physiologically.

The maximum limit of urinary lead excretion in certain renal disorders may be as low as 0.06 mg./liter. This is rare, but it must not be forgotten. Cases of dangerous exposure may be missed.

For the group, the conditions of lead exposure in an occupation are too high, if the average for the group remains consistently above 0.12 mg./liter in the urine. Safety should be interpreted on this basis.

For the individual, there is danger, as I indicated above, if he runs consistently above 0.15 mg./liter. The value of 0.20 (your figure 200 micrograms) is, therefore, too high, especially in the winter months, when the urinary volume is relatively high.

As I have indicated, diagnosis should be based on the certainty of abnormal lead absorption, and hence blood values may be absolutely necessary.

Finally, the removal of a man from his work is a serious matter which should not be allowed to result from a chance error. No one should be so dealt with on the basis of the result obtained on one spot sample of urine. It is necessary to visualize the facts of lead absorption without guessing. This requires multiple sampling of the urine, or sampling of both urine and blood. No man should be so removed except on the recommendation of the physician, who has considered all the facts. He should explain the situation to the man and make sure that the situation is fully understood.

His, I believe, conveys my opinions on this subject, but if I have not made myself clear, do not hesitate to ask again. Since this is

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a hurried letter, just ahead of the hour of departure of a plane,
I may have been obscure or incomplete in my comments.

Sincerely yours,

Robert A. Kehoe, M. D.

RAK ef

Dictated but not read.

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AMERICAN CAN COMPANY

11TH AVENUE & ST. CHARLES ROAD

MAYWOOD, ILL.

MEDICAL DEPARTMENT
IAN MACLACHLAN, M. D.

August 13, 1951

Dr. Robert A. Kehoe
Kettering Laboratory
College of Medicine
Eden Ave.
Cincinnati 19, Ohio

Dear Sir:

It is our practice in this company to screen employees exposed to metallic lead dust by determining the concentration of lead in their urine.

Samples of urine are taken as follows.

1. Employee empties bladder and notes time.
2. Employee passes next urine into lead free bottle and notes time.

Precautions are taken to avoid contamination. At least 80cc of urine must be passed into the bottle.

The results of analysis are reported as so many micrograms of lead per litre of urine and so many micrograms of lead per hour.

If the micrograms of lead per litre are more than 200 or the micrograms of lead per hour are more than 8, the employee is considered to have absorbed too much lead. He is then examined by the plant physician for evidence of lead intoxication. He is removed from the lead hazard at the discretion of the physician.

Analysis of samples of blood for lead are done at the physicians request but are not done routinely.

I have experienced some difficulty in interpreting the the micrograms of lead per hour and have doubts as to its value. I would be greatly obliged if you would give me your opinion concerning the use of this determination, either ~~above~~ or with micrograms per litre.

Kindest personal regards.

Sincerely,



Ian MacLachlan M. D.
Maywood Area Physician

cc: Mr. E. D. Sallee

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