

June 14, 1939

Dr. Elston L. Belknap  
231 W. Wisconsin Avenue  
Milwaukee, Wisconsin

Dear Doctor Belknap:

I believe the figures which you have quoted, giving the limits of .08 to .1 mgs. per 24 hours of urinary excretion are our figures and were probably taken from our article in the Journal of Industrial Hygiene for September 1933. On the other hand you are quite right in saying that we refer to the urinary lead excretion in terms of concentration for the most part. In some of our work, where the opportunity has presented itself, we have determined the results both on a twenty-four hour basis and on the concentration basis. You will find such figures referred to in the green book which I sent you on "Normal Absorption and Excretion of Lead" reprinted from the Journal of the American Medical Association - Volume 104 - Pages 90-92, (actually page 3 of the reprint in the book). Generally speaking, however, it is not possible in industry to obtain twenty-four hour samples of urine in the case of men who are working. It is our practice not to collect such samples in the plant but to obtain them at the men's homes where the opportunities for contamination are presumably considerably less. In this type of work we obtain from two and a half to four liters of urine, collected without respect to time, and we express the results in terms of milligrams per liter. It has been well established by our work that the urinary lead concentration varies with the magnitude of the exposure, but that it also varies with the water output per unit time. Our purpose in obtaining large samples is to iron out the latter variations and to obtain a result in terms of concentration which will express the general lead content of the body of the individual in a comparative way. The lead output per day depends also upon the water excreted per day and we have shown that where the intake is high, the lead excretion is increased; and where it is low, there is a correspondingly low lead output. For this reason, it is quite apparent that some care must be used in expressing the results either on a concentration or on a time basis. What we have attempted to do is to show the range of values which occur in normal individuals by either method of expression. It is, therefore, a very good

as to whether the results in a given case are expressed on a concentration basis or on a time basis. However, since, as I stated above, it is frequently impossible to obtain the results on a time basis, it is more practicable and more useful to express them on a concentration basis. In making use of this latter form of expression, however, it must be remembered that the smaller the sample obtained, the larger is the range of variability of results.

I trust the above answers your question but if it does not, please do not hesitate to write me further.

The paper which I presented in Cleveland will not be published in the form in which I gave it. However it will be published in the not too distant future in another form, and I shall be pleased to send you reprints when they are available. What I attempted to do was to show the range of normal values for the blood, the urine and the tissues, and also to show in terms of blood levels and urinary excretory levels the point of distinction between hazardous and non-hazardous lead exposure. We have now studied a sufficient number of industries by both clinical and analytical methods so that we are able to express the threshold of hazard in terms of these data.

Cordially yours,

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Robert A. Kehoe, M.D.

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