May 27, 1947

Dr. L. M. Petri, Director,
Division of Industrial Hygiene,
State of Georgia,
Department of Public Health,
Atlanta, Ga.

Dear Dr. Petri:

The question raised in your letter of May 16 is one which we have been investigating somewhat casually but systematically for some time. The correction factor advised by Fahy and his associates is probably the best rule of thumb correction that can be made at this time. We are not in strict agreement with theprinciple, and we do not believe that evidence has been obtained that will fully justify this factor on a strict scientific basis. Moreover, we believe that in the final analysis it is much better to eliminate the need for this factor by obtaining large samples of urine. On the other hand, we recognize that this can not always be done, and therefore the use of spot samples, in sufficient number, is an acceptable, and sometimes a necessary procedure. The difficulty is that one may not, under any circumstances, draw a hard and fast conclusion, in an individual case, on the results of the analysis of one or more spot samples of urine. Our own practice is that of obtaining a sample of blood with every spot sample of urine when a diagnosis is to be made. This has several advantages. A blood sample collected by proper means, is very unlikely to be contaminated, and therefore it serves as a check on the urinary sample. Moreover, from the physiologic viewpoint the blood is relatively constant throughout the 24-hour period, with respect to its lead concentration, unless the individual experiences a severe exposure to lead within the 24-hour period. Therefore, with this result at hand one can check it against the urinary values, which may be either excessively high or excessively low, and which, on the other hand, may be in complete physiologic agreement with the result obtained on the blood. When the latter is the case, one can be quite sure of the validity of both results. When the variation between them is extreme, as it sometimes is, it is necessary to check both results by obtaining additional samples for analysis. This sort of thing is not done adequately by most people, and failure to do so has been responsible for most of the confusion that has entered into this picture. Most of the people who have worked in this field have been unfamiliar with the problem of biological variation, and in their interest in "practical" methods, have simply refused to consider the range of physiological variability. In dealing with any individual case these matters have to be considered with minute care.

If we are considering only the general status of an occupational group, with respect to lead exposure, then the problem is wholly different, for if you will collect a representative series of samples of urine of any volume whatever, from sizable groups of exposed personnel, and if then you analyze such samples by reliable methods, you will obtain a satisfactory picture of the conditions of lead exposure. Your procedure, therefore, will depend on what you are undertaking to do.

Finally, by all means use the correction factor in the individual case, if you so desire, but use it only as a rule of thumb that is practically useful and not entirely accurate, and be sure to recognize its limitations in dealing with the individual case.

The trouble with Fahy's article (Levine, Leo and Fahy, John P., J. Ind. Hyg. and Tox. 27, 217, 1945) which I am sure you will wish to examine in detail, is that it does not deal with controlled experiments. One does not have the information which enables him to classify the persons observed according to the magnitude of their lead exposure. I am sorry that we do not have the data on the specific gravity of the urine of our subjects studied under laboratory conditions, for here we have complete information on both sides of the equation. In the absence of such information any conclusions drawn are based on some degree of assumption. All I can say about this for certain is that by and large the lead concentration in the urine of a given normal healthy individual varies with the rate of excretion of water. In general, in our observations the lead concentration in a specific individual can be correlated against the specific gravity. We have not established the physiological principle on a quantitative basis, and therefore at present, despite Fahy's argument, we do not accept any strictly quantitative correction factor.

Sincerely yours,

Robert A. Kehoe, M. D.

RAK ef

State of Georgia
Department of Public Health

T. F. ABERCROMBIE, M. D., DIRECTOR
ATLANTA

May 16, 1947

Dr. Robert A. Kehoe
Kettering Laboratory of Applied Physiology
University of Cincinnati
Cincinnati 19, Ohio

Dear Dr. Kehoe:

We have been discussing the correction factor for spot urinary lead analysis based on the specific gravity. I am wondering if you have had any experience with this. If so would you please let me know what you think of it? Give me data as to method, interpretation and the like.

I enjoyed seeing you in Buffalo. I am sorry that I did not think to discuss this with you in more detail at that time.

With kindest personal regards.

Sincerely yours,

L M Petrie

L. M. Petrie, M. D., Director
Division of Industrial Hygiene

LMP/mjp