

April 30, 1952

Dr. W. S. Huckvale
Medical Consultant
The Consolidated Mining and Smelting Co.
of Canada, Limited
Trail, B. C., Canada

Dear Doctor Huckvale:

Your letter of April 16 presents a situation which, to say the least, makes me somewhat cautious in my reply. I could wish that it were possible to see your problem, and also to sit down and talk with you about the details of your day's work. The extent of the hazard, under present conditions of control, would be a very important consideration to me in undertaking to express an opinion on your problem.

First let me say that I do not see any reason to suppose that you should find any very remarkable degree of correlation between the frequency of occurrence of stippled erythrocytes in the blood and the rate of lead excretion in the urine. I realize that in saying this I am going counter to a fairly generally accepted relationship. However, a good many years of study of this problem have demonstrated to me quite completely that while there is some very general relationship between the general level of stippling in the blood of groups of men and the severity of their lead exposure, this holds only very poorly. I look with a very jaundiced eye on the methodology of following men exposed to lead by means of hematologic determinations. Generally speaking, the changes in the blood are too variable to be a satisfactory indication of the extent of lead absorption. They err on both sides. In certain individuals the hematologic response to lead absorption is great, while in others it is quite small. In my experience at least fifty per cent of any group that is followed, regardless of the severity of the exposure, will yield substantially normal results. Therefore, one has to rely upon the statistics on groups of individuals, rather than on the findings of any one person. Actually the only rule, in my experience, which can be followed at all is that individuals who develop lead intoxication will generally have quite large numbers of stippled erythrocytes in the blood in immediate association with their symptomatology.

The only means that I have ever found that will guarantee that the severity of exposure of an individual can be determined is that of following carefully and precisely, the level of

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Dr. W. S. Huckvale - (2) - April 30, 1952

lead absorption in his body, as represented by the blood levels and by the general level of the urinary excretion.

I judge, from your statement that a group of men have shown urinary lead concentrations of the order of magnitude of a thousand micrograms per liter that the exposure to lead among these men is quite severe. Such values in the urine of men in the lead trades are rather rare in my experience, and I should regard such figures with utter alarm. When you point out that there has been no correspondence between these findings and the stippling, you give me no surprise. We have observed repeatedly, and have commented upon the lack of correlation between the severity of lead exposure and the level of stippling in the blood. Quantitative relationships here are almost utterly lacking, and therefore it is apparent that dependence upon this hematologic finding is not possible. The fact of the matter is that the response on the part of the bone marrow to lead absorption is non-specific and non-quantitative. The relationship between lead absorption and urinary lead excretion, on the contrary, with the rare exception, is a definite one, and therefore the severity of lead exposure can be determined by this means. In most situations I prefer to rely upon the lead concentration in the blood rather than that in the urine, since it is less variable under the ordinary conditions, and since, therefore, it can be regarded as the measure of the level of lead absorption. I do not like to be unduly skeptical, but what you have told me about the level of the urinary lead concentration of your men causes me to wonder as to the accuracy of the methods of analysis on the one hand, and the precision of the avoidance of contamination of samples of urine on the other. I should not speak of these problems so dubiously, except for the fact that our experience with the difficulties has been very great, and generally speaking many people have not been sufficient aware of them. Frankly I regard concentrations of the order of magnitude that you have described as being so unusual as to be unlikely expressions of physiologic states. I know that in some situations such levels of excretions do occur, but these are very heavy exposures, generally associated with complete lack of any measures of hygienic control. I cannot conceive of such values being found very frequently in any group of men without a high incidence of quite serious episodes of lead intoxication. It would seem likely that your company has concerned itself with a variety of measures of control, and therefore I cannot but wonder how such results have come about.

With reference to the problem of particle size, I must confess that I do not see its relevance in your problem. Size of particle in the atmosphere is an important feature in determining the extent of the hazard and the actual quantity of the absorption of lead. It is obvious that when lead occurs in high concentration in the urine, it is the result of extensive absorption. Therefore,

16

Dr. W. S. Huckvale - (3) - April 30, 1952

regardless of the size of particle, the nature of the compound, or any other factor which may have influence on the outcome, the absorption is great and, therefore, the hazard is great. Actually, from my viewpoint, the only thing that we are concerned in, in following the urinary excretion, or the lead concentration in the blood, of workers in the lead trades is to determine quantitatively the degree of severity of their exposure to lead, and their absorption thereof. This does not tell us anything about whether or not a man is ill. It merely tells us the degree of hazard to which he is exposed. It is my practice to use these data for the purpose of measuring the exposure of various jobs in a precise manner, and for the purpose of determining whether or not individuals and occupational groups are subjected to significant hazard. When the hazard is serious we regard it as providing the necessity for engineering measures of control. From the medical point of view, all that can be done by the doctor is to remove men from their work whose exposure is of a highly hazardous type. We have set certain criteria, which are followed faithfully, for the removal of men from their work when the extent of their absorption is such as to impose serious risks upon them.

I am very much interested in the problem that you have presented in your letter and I should be very glad to be of any help to you that I can in straightening out the facts in a clear manner. If you would care to give me more information on what you are doing and how you are doing it, and on the questions which are presented to you for consideration, I should be happy to give you as good advice as I can. I might also make a suggestion. The problems with which you are presented are like those which are found in a good many of the lead trades. We have had a rather extensive experience in dealing with some of these problems, and if you and your people should consider it worth while for you to come to visit us, I would be delighted to discuss your problem with you, to show you evidence which we have accumulated over a period of many years in many of the lead trades, and to aid you in any way I can in the development of a program for the control of the hygienic aspects of your exposure.

Cordially yours,

Robert A. Kehoe, M. D.

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THE CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA, LIMITED

PERSONNEL DIVISION

P. F. MCINTYRE,
MANAGER

CABLE ADDRESS
"COMINCO"

TRAIL, B.C.

April 16, 1952.

Dr. Robert A. Kehoe,
Department of Preventive Medicine,
University of Cincinnati,
CINCINNATI, OHIO.

Dear Sir:

I am in charge of preventive medicine among lead workers for the Consolidated Mining and Smelting Company of Canada Limited. They produce some 400 to 600 tons of refined lead a day, and currently employ between 800 and 900 men in connection with smelting and refining processes.

Our program consists of doing a basophilic stipple test on all starts prior to their being sent to a lead hazard area. Subsequently, they are called in at intervals of a month to six weeks for further stipple counts. While the blood is being taken, the laboratory technician enquires as to the employee's health. Should there be complaints or should the stipple count go above 10 cells in 20 fields, the employee is instructed to see me. I take a history of complaints and do a physical examination, and usually order a urinary lead determination. The urine is collected following a shower bath and is run in duplicate on a polarograph.

Recently, we had a group of men who have shown urinary lead figures of nearly 1,000 gammas per litre on repeat specimens. There has been no accompanying rise in basophilic stippling. Some of these men have

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DATE April 16, 1952.

CONTINUATION OF LETTER TO Dr. Robert A. Kehoe

symptoms of fatigue, sleepiness, and aches and pains about the joints of their extremities. Some have no complaints or no physical findings.

We have considered that particle sizing might be of some value in explaining the discrepancies in our findings. However, the operation is vast and constantly changing; the men transfer from place to place with great rapidity, so that an endeavour of this type would be of considerable magnitude and in my opinion of doubtful practical value. Would you be good enough to give me your opinion of the discrepancies we are finding and indicate if particle sizing would be of any value in our control program?

Yours truly,

SAFETY AND HYGIENE DEPT.


W. S. Huckvale, M. D.,
Medical Consultant.

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