THE CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA, LIMITED

PERSONNEL DIVISION
P. F. McINTYRE,
MANAGER

CABLE ADDRESS
"COMINCO"

TRAIL, B.C.

August 27, 1952.

Dr. Robert A. Kehoe,
The Kettering Laboratory,
College of Medicine,
Eden Avenue,
CINCINNATI 19, OHIO.

Dear Doctor Kehoe:

Thank you for your letter of April 30, 1952, re our lead problem. May I give you more information as you suggested in your letter.

As you may have surmised, our operation is vast, and although much money is being spent in modernizing the plant, the lead still is produced by very old equipment in antiquated buildings. Currently, it is an operation that was not planned, but like Topsy, it grew as new orebodies were discovered. Most of the growth took place in the days when the health of the men was a very minor consideration.

In the control of lead absorption and lead poisoning we have had to rely to a large extent on good housekeeping. This has not been too much of a problem in the summer time when a hose could be used on ceiling, walls, and floors. In the winter, however, with temperatures hovering close to zero, the use of water in these old buildings has been quite impossible, and housekeeping as a consequence has suffered. Our atmospheric tests and the number of men showing high urinary values are reflections of this deterioration in housekeeping methods.

About 18 months ago, when we started using urinary leads to help us judge when a man should be moved from a lead hazard area, we soon realized that the utmost precaution had to be taken in collecting the samples. The men were first stripped and given a shower bath and the sample collected while the man was still standing in the shower. This innovation

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gave us a much greater consistency in our results. However, we still get the odd sample which runs 1,000 micrograms or more. In the case mentioned in my previous letter the man, after three months away from the Smelter area had a urine value below 100 micrograms.

Recently, we have had another man with mild symptoms who on his first test showed 1,000 micrograms of lead per litre. This was repeated and his urine showed 1,660 micrograms per litre. He since has been moved from the Smelter area.

To keep the laboratory on its toes we periodically take a sample from one of the office workers and send it down under a number. These always are returned with results showing within normal limits. Our laboratory work is done by a very able man and I am enclosing a copy of the method he uses for your comment. In this connection I might say that I have submitted a sample of my own blood under a number and the laboratory failed to get a determination of its lead content. Would you be good enough to outline your method of blood lead determination?

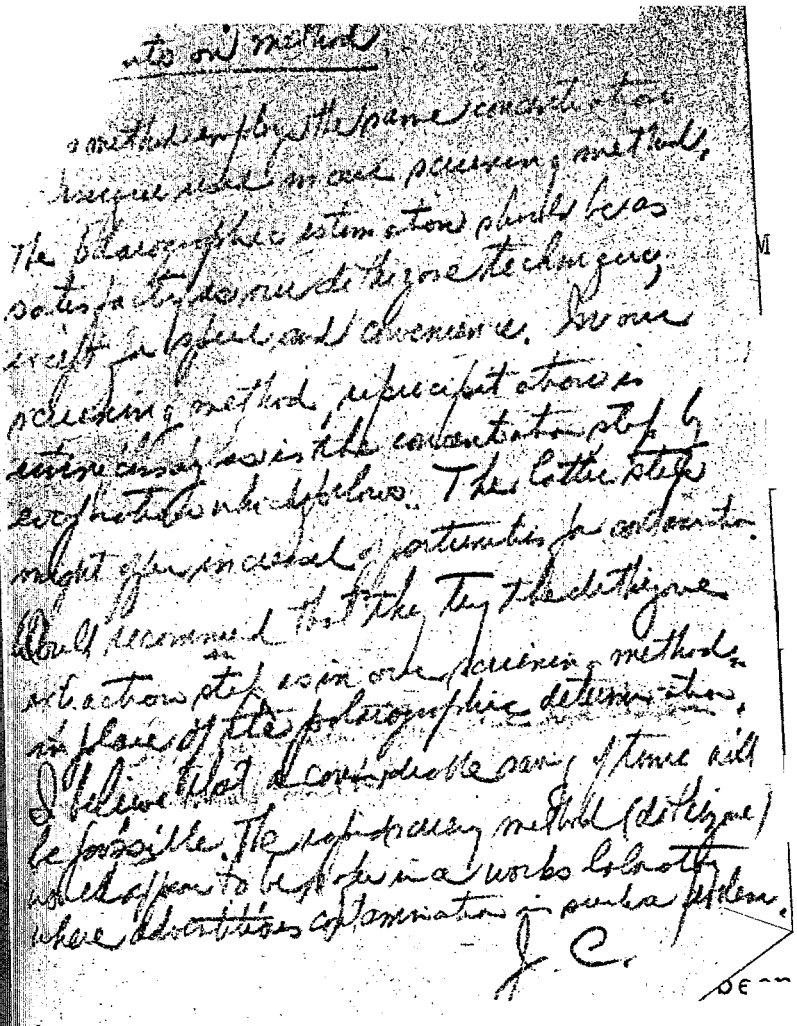
If I am not encroaching on your time to ask another question: in the literature, reports are appearing on coproporphyrins in relation to lead absorption and lead damage in the body. This, as you know, is a very simple determination and I would like your opinion as to its worth.

I trust that my enquiries are not taking up too much of your time. I await your reply with interest.

Yours truly,

W. A. Huckvale

W. S. Huckvale, M. D.,
Medical Consultant,
Safety and Hygiene Dept.



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A. KEHOE

Chocolate:
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Read as much or as little
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[illegible] SMELTING COMPANY OF CANADA, LIMITED

[illegible]GRAPHIC ANALYSIS

[illegible]ermination of Lead in Urine

[illegible]ction 56, Report No. 4 ✓

LEAD

[illegible]ction 22, Report No. 28

Details of the polarographic method of determining lead in urine that is currently in use at the Central Research Laboratory is recorded.

SUMMARY AND CONCLUSIONS:

This method has been in use for four years (memo, G. H. Turner to J. R. Mills, September 24th, 1948) in this laboratory and has proven to be satisfactory. The method is fairly rapid (2-3 hours), and the precision appears to be better than 20 micrograms per liter.

Endorsed:

G. H. Turner
G. H. Turner

Signed:

D. W. Langille
D. W. Langille

DWL:jo
Central Research,
March 28th, 1952

cc: R. and D. Division: DDM
Central Research: (JRM, AHWB, RCB), GHT, DWL
Central Technical Library (2)
Research Records Office (2)

Sullivan Concentrator: KR, JCS

Industrial Hygiene and Safety Dept.: JBB

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THE CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA, LIMITED

POLAROGRAPHIC ANALYSIS

Polarographic Determination of Lead in Urine

Laboratory Section 56, Report No. 4

LEAD

Laboratory Section 22, Report No. 28

ABSTRACT:

Details of the polarographic method of determining lead in urine that is currently in use at the Central Research Laboratory is recorded.

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Industrial Hygiene and Safety Dept.: JBB

Metallurgical Division: (RRNcN, AGR, ADCB),RE

Analytical Labs=: JM (5)

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DETAILS:

1. Principle:

In this method lead is precipitated as the phosphate, using calcium phosphate, which is precipitated simultaneously, as a carrier. This process enables the lead to be separated from the rest of the urine constituents and concentrated in a small volume, suitable for polarographic determination. Lead phosphate has an extremely low solubility product, and for this reason the calcium phosphate entrainment was chosen in preference to other competitive methods, such as oxalate entrainment.

2. Procedure:

The sample as received from the Industrial Hygiene Department is cleared, if cloudy, with a drop or two of HCl. Forty ml are placed in a 50 ml graduated centrifuge tube and 2 ml of a solution, 0.3M with respect to PO_4^{-3} and 5% in $Ca(NO_3)_2$, are added. The solution is stirred and precipitated with 5 ml NH_4OH and again stirred. The tubes are then centrifuged for 10 minutes at 2500-3000 RPM and the liquid decanted. Distilled water is added to the 50 ml mark, stirred, centrifuged as before, and decanted.

The precipitate is then taken up with 10 drops of HCl, bulked to 40 ml and re-precipitated with 5 ml of NH_4OH. The whole sequence of centrifuging, decanting, and washing as outlined above is repeated, and the remaining precipitate taken up as before with 10 drops of HCl.

The solution is then evaporated in an oven at 100-110°C to approximately 0.25 ml, and then diluted to exactly 1.0 ml with distilled water. This solution is transferred to a small polarographic cell, and a polarogram obtained using 1.5 volts span potential and 3/00 sensitivity (1.4×10^{-3} ma/cm).

Samples are run in duplicate where possible, and with each group of samples two blanks are carried (.40 ml of distilled water replacing the urine sample). Standards are run frequently by adding sufficient standard lead solution to a blank to give an apparent lead concentration of say 1035 γ/l, which can be obtained from a stock 0.005 M solution by the appropriate dilutions. This will give a wave height in the neighborhood of 6 - 7 cm.

A single sample can be completed in a period of two to three hours. Larger groups of samples, of course, can be completed in a much smaller unit of time per determination.

Signed: KE

D W Langille