October 13, 1936

Mr. Frank E. Chapman
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Wellington Street
Perth, Western Australia

Dear Mr. Chapman:-

In reply to your letter of September 8th, requesting some of our results for lead in urine and biological material, Dr. Kehoe, our Director, is sending you under separate cover the collected papers "Lead Studies" issued by the Laboratory. Included are papers describing the spectrographic and chemical methods employed, and a number of papers dealing with the absorption and excretion of lead for normal individuals and for individuals in certain lead trades. The requested information will be found among the numerous tables in this book. A comparison of the spectrographic findings with the results obtained by an earlier chemical method is given in Part II of the series of papers entitled "An Appraisal of the Lead Hazards Associated with the Distribution and Use of Gasoline Containing Tetraethyl Lead".

You might be interested to know that in addition to the two methods described in the book, we are also employing a dithizone method, and that the findings by this method agree very closely with the spectrographic findings. The method is essentially that of Winters except that double extractions are made, after the method of E. S. Wilkins etc. "Anal. Ed. Ind. and Eng. Chem. Vol.7, page 33 (1935), and that the red complex is converted to the green for colorimetry.

The spectrographic method employed at present is essentially that published in the Anal. Ed. Ind. and Eng. Chem. Vol. 27, 1935. The only modifications deal with the method of excitation and the application of the working curves. While the use of the negative crater is ideal for the detection of the smallest traces of lead, its use requires a somewhat increased period of exposure resulting in spectra with deep backgrounds. On the other hand biological material contains sufficient lead to be easily detected when the sample is placed in a deep crater (10 mm) in the positive crater of the arc. The latter requires a much shorter period to volatilize all of the lead, 60 to 90 seconds being sufficient when employing an arc operated on a 110 volt D. C. line, and using 10 Amperes. For

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best results, especially to prevent wandering, it is best to use a pointed upper negative electrode. (Sharpening in an ordinary pencil sharpener with steel cutters is satisfactory.) The resulting arc burns quietly and steadily, even when samples containing large amounts of Ca are arced and can easily be maintained centered on the spectrograph slit. The spectrograms will be found to possess very little background increasing the accuracy of the ratio of the galvanometer readings for the lead and bismuth lines. In evaluating the densitometric values we have found it advisable to employ opacity ratios for the low lead concentrations and the actual densities of the lead line, corrected for variation in the density of the internal standard for concentrations above 0.20 mgs/100 cc. For low concentrations (0.01 to 0.20 mgs./100 cc) the opacity ratios (galv. reading Bi line/galv. reading Pb line) are plotted directly against the concentration, while in the latter case the densities are plotted against the log of the concentrations.

I am, naturally, very much interested in your spectrographic work and would be pleased to hear of any modifications or improvements in the technique that you might develop.

Very truly yours,

JC:is

Jacob Cholak