

Cincinnati, Ohio
June 20, 1935

Dr. G. E. Willoughby
Chemical Department
Experimental Station
E. I. duPont de Nemours and Co.
Wilmington, Delaware

Dear Dr. Willoughby:

I feel that I owe you an apology for not having at least acknowledged the receipt of your letter of January 22nd long before this. I have your last letter written May 29th. During the past two weeks I have been so busy with calculations it was impossible for me to write a suitable answer to your letter. It was very considerate of you to forward the details of the bismuth separation prior to the publication of your paper.

In looking through my file I find that I have lost the only copy of my letter to you dated January 7th. If you still have this letter, would it be convenient for you to send me a copy? My thanks in advance.

You ask if we are still interested in the collaborative work. In spite of our apparent disinterest I must say that it is only the press of many other things which prevents us from working on this problem. We hope that you will continue to hold a place for the samples we hope to send you as soon as a favorable opportunity presents itself. We have recently received two reprints of articles appearing in Angew. Chem. during this year. It is my impression that these articles may interest you, so that I send the titles in case you have not encountered them in your search of the literature.

"Determination of Minute Quantities of Lead by Electrolysis"
Angew. Chem. Vol. 48 pg.259, 1935

Dr. Albert Necke, and Dr. Herbert Müller of the Institute
of Hygiene (Director:-Prof. Dr. P. Schmidt)
Martin Luther University
Halle - Wittenberg

This paper is an answer to a criticism of the method by E. Behrens who particularly attacked the electrolysis step as yielding incomplete separation.

Dr. Willoughby

"Testing by Means of a Radio-activity Method, the Quantitative Analysis of Minute Quantities of Lead as Carried out by P. Schmidt and Co. Workers."

Angew. Chem. Vol. 48 pg. 261, 1935

Dr. W. Messerschmidt and Dr. G. Partler of the Institute of Physics (Director: Prof. Dr. G. Hoffmann)
Martin Luther University
Halle - Wittenberg

This paper endeavors to show the completeness of the anodic deposition of lead during electrolysis by measuring the Gamma ray emanation of the daughter substance Thorium C" obtained from Thorium B the radio active isotope of lead. They stress the advantage of the measurement of the Gamma ray emanation over that of the Beta ray emanation. Their conclusion is that as little as 0.03 mgs. is completely deposited during electrolysis.

We have occupied a portion of our time in trying to establish the magnitude of the very small blanks encountered in the preparation of samples for spectrographic analysis. At this writing we do not care to make a statement as to the results obtained. Mr. Cholak has tested the graphite electrodes you so kindly sent and found them very similar to some special graphite electrodes we have obtained from National Carbon Company at exactly the same cost. The graphite electrodes used routinely fail to show either the sensitive lead or bismuth lines. Their cost in thousand lots 5/16" x 12" is 7 cents each.

The bismuth nitrate we have used in preparation of bismuth solutions does not contain sufficient lead to give a spectrographic test. At present the bismuth internal standard is a concentration of 1 mg. per 100 c.c. of solution as ready for the arc. The small amount of lead capable of giving the line used in quantitation is 0.000002 mgs. on the arc. During quantitation 0.002 mgs. of bismuth is present on the arc. This amount of bismuth is equivalent to approximately .0047 mgs. $\text{Bi}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$. We can calculate that the lead concentration of the bismuth salt must be over 0.004% before the lead line will appear.

Concerning the use of blood findings as a diagnostic measure, I must repeat that the experience we have had does not permit us to rely solely on a blood analysis. I do not think our data sufficient to answer your question concerning the lead concentrations in blood when the patient has an acute attack of plumbism. The picture in the case of chronic plumbism is certainly nothing so definite that one can rely on blood findings alone. Usually when the blood lead exceeds 0.15 mgs./100 c.c. the urinary lead is sufficiently above the normal range and clinical symptoms appear which make it possible to diagnose the case.

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Dr. Willoughby

There is no data available on the relation between lead in the blood and lead in the bones under various conditions. You are of course familiar with Dr. Aub's theory concerning the mobilization and deposition of lead but he has not presented any data which would reveal such relation.

Mr. Cholak and I were very much interested in your examination of the data and your resulting comment. We agree that distilled water adds very little lead, our spectrographic analyses show our double distilled water to contain less than 0.002 mgs./liter. We do not think that the positive findings in samples 2,3,5 and 7 are due to contamination.

We have never encountered a blood sample which did not contain lead. Qualitative analyses on samples deposited directly on electrodes and involving no treatment always show lead. We wish to do further work on this before we offer any positive explanation. At this time we have found one factor about the quantitation which could easily account for the variation from .004 to .006 but not for the 0.008 found in sample 5.

I do not know if we have complied with your request for a reprint of Mr. Cholak's paper. We are sending one under separate cover.

Thank you for your continued interest and hearty cooperation.

Sincerely,

FT:is

Frederick Thammann