UNIVERSITY OF CINCINNATI
COLLEGE OF MEDICINE
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LABORATORY OF APPLIED PHYSIOLOGY

July 15, 1940

Mr. O. B. Lewis
Ethyl Gasoline Corporation
Chrysler Building
New York, New York

Dear Oscar:

Thank you for your letter of July 3, with abstracts of the tank cleaning report by Mr. Harrison. These appear to be very well done and after we have had opportunity to go over them in light of the uses to which they are to be put, we will discuss them with you.

Concerning your comments on the organic lead in tanks, the figure of 0.042% does represent the mean value and it is true that as this figure is expressed in terms of per cent. organic lead in sludge, it will be influenced in amount or the proportion of iron, sand and other physiologically inert material present in the sludge. Accordingly, as we encounter more and more inert material, the percentage of lead is decreased, but the total amount remains the same, and one might assume from that that the hazard is the same. It is conceivable that in certain situations conditions might occur where the only deposit in the form of sludge would be lead salts and perhaps a small amount of iron rust and conversely, situations in which the same amount of lead salts are deposited, but due to the contamination of river mud, sand and the like, they would come to constitute but a very small proportion of the sludge. These would represent the extremes, but it is probable that our results are influenced to a degree by this very factor which we seek to eliminate by the study of a large number of samples. But from a practical point of view especially in consideration of the over-all general uniformity in refining and storage practices, that variability within the wide limits encountered in the organic lead content of sludges, does come about as a consequence of differences in the amounts of lead contributed to the sludge rather than the extremely wide fluctuations in the amount of inert material.

One might assume that regardless of the percentage of organic lead the same order of hazard would exist provided of course a sufficient total amount of organic lead were present to saturate the air in the tank with vapor and it is true that regardless of the amount of organic lead in sludge, amounts of lead are found in the air above it. Our recent

experiments however, indicate that the amounts of lead in the air above sludges that contain organic lead are in general directly proportionate to the percentage of organic lead in the sludge. We have not included these experiments in our report but will discuss them later. It follows therefore, that the concentration of organic lead is an important factor, whether we express it in terms of per cent. of sludge or in amounts per square foot of sludge in tank bottoms.

I can not agree with your comments on the validity of the figure 0.042% being influenced by any factors. The figure 0.042% is a statistical constant, the validity of which can be estimated by its relation to its probable error which is given. Inspection indicates this constant to be 20 times its probable error, establishing its validity. Any inferences from this constant would of course be subject to examination. Consequently, if we wish to use this constant to estimate the probable average organic lead content of the sludge of tanks it would have to be used in conjunction with our data on thickness of sludge. This data is given in Table 12 of the report. These figures are not in agreement with your surmise that many tanks show little sludge, as over 75% have more than 1/2 inch, which would make 72 cubic inches of sludge for every square foot of tank bottom. Moreover, we have no data to support the statement that some tanks show no sludge. Fifty-five of 656 had less than 1/4 inch, but in going over our records, we could find no statement of any tank that contained no sludge.

Making allowance for the fact that the figures for the thickness of sludge represent only a rough estimate on the part of the safety engineers, one can easily see that in most tanks there is an adequate amount of lead to contaminate the atmosphere to a dangerous concentration. The extent to which this occurs will be influenced by a number of factors, such as the ventilation of the tank, the ratio between bottom surface and volume and other factors. This is one phase of the problem that we will investigate in our proposed experimental program.

In your hypothetical case of a 5000-barrel tank were the worst possible conditions to obtain, that is, all of the lead volatilized, and there be no ventilation, it would be possible for a man to become intoxicated in one day's work.

In so far as the inorganic lead content of refinery tanks is concerned, this would be dangerous only if inhaled as dust or if swallowed. There is little danger therefore, if tanks

are cleaned while wet and in any event the practical danger of poisoning from this source would be very much less than that from organic lead in the sludge. Legislation and plant practice have demonstrated that amounts of inorganic lead in excess of 1-1/2 to 2 mg. per 10 cu. m. of air will produce intoxication in workmen who are exposed daily. As tank deposits are not 100% lead, fairly large amounts of dust would have to be present in air to create exposure conditions of significance in so far as the inorganic lead is concerned, particularly since few men work at tank cleaning daily, the operation usually being of an intermittent character.

We are happy that you asked these questions. These are the type of specific inquiries that I hoped would arise out of study of the report. Little attempt was made to draw any except general inferences in the preparation of the report, which was a picture of the situation as we found it and it is only when the report has been disseminated and many more questions are raised about it, that it will have its full application to the practical problem.

Cordially,

WM:vr

Willard Machle, M. D.