

July 6, 1971

Mr. H. L. Markel, Jr., P.E.
Public Health Engineer
Air Pollution Control Program
Public Health Department
1936 Amelia Court
Dallas, Texas 75235

Dear Mr. Markel:

The answers to the questions which you raise are not, unfortunately, well documented. I shall give you the best information which I can provide, in the form of incomplete experimental data. I can also give you my views on the matters at issue.

First, with reference to the 200 ug./M³ threshold limit. I am, to some slight extent, responsible for agreeing to this value when I was associated years ago on a committee with Manfred Bowditch to reexamine the at-that-time value of 150 ug./M³. I had completed certain experiments in which we had investigated the effect of subjecting human subjects to air containing particles of lead (as sesquioxide) in the mean diameter of 0.05 u., in an aerosol in which the maximum size of the particles was 0.18 u. (I'll send you a booklet in which the experiments are described as the documentation of my statement.) We had not investigated 200 ug./M³, but the results obtained at 150 ug./M³ were such as to indicate clearly that air containing 200 ug./M³ would be tolerable, and I told Manfred that I would not object if the standard value was set at 200 ug./M³. Frankly, I was not impressed with the desirability of raising the standard, but I was not prepared to object to it. My reason was that I felt quite sure, that if the general conditions in an industry were such as not to exceed this figure, the measures of control would prevent any considerable diversion of lead (as larger particles) into the nasopharynx where they would, in all likelihood, be swallowed. (I believe the reason for Manfred's wish to increase the standard came out of the fact that some industrial groups had found it difficult to achieve the lower value of 150 ug., but could comply with a value of 200 ug. You may or may not have known him, but he was a capable industrial hygienist, and I didn't believe he was advocating a more lenient standard just to please certain people but rather because he didn't like to see the values greatly more stringent than necessary for human safety.) At any rate, I have no real objection to the lower value, and I believe it is feasible to meet it, in the very large proportion of instances, without undue hardship.

The standard in industry, designed to meet the requirements of safety for men who breathe respirable lead particles for 8 hours per day on 5 days per week, have nothing to do with any situation in which men inhale lead constantly through breathing the ambient air. In the latter instance, one must assume that they inhale lead 24 hours per day on 7 days per week; and suit the value to the different situation. I have believed, from our experiments that the appropriate value is very near, perhaps a little lower, than 10 ug./M³. This has not yet been proved, and it must be proved before it can be accepted. However, I repeat that it is very near to the truth of the matter. The situation here, in contrast with that in industry, is precisely that one is continuous while the other is intermittent, and involves at most only one third of the time of the workmen in actual exposure through inhalation. Actually, the exposure

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in industry is somewhat greater than 1/3 of the time (even assuming that there is no alimentary component in the industrial worker's exposure), for absorption from the lung does not stop at once - that is, as soon as the day's work is finished, because the lung has not been freed of all of the lead inhaled during the preceding hours of the work day. This, however, may not be a very large factor, since there is reason to believe that the clearance of most of the deposited lead occurs fairly rapidly. The question, of course, is the quantitative one, of how much lead remains in the lung, or accumulates in the lung from one day's work to another, and this no one knows for sure at present.

To answer the question in the first paragraph of your letter, let me say that I believe that 5 ug./M³ will turn out to be quite satisfactory, and not quite as high as it might well be, as an ambient standard. The amount of absorption which will occur among individuals who inhale lead at this level, is not sufficient to elevate, measurably, the concentration of lead in the blood. It is so small, in relation to the lead intake in food and beverages, with the variability of the latter from day to day, to be found. In order to illustrate my point let me cite the findings in the population in Cincinnati with those in Los Angeles. The average concentration of lead in the Cincinnati atmosphere is about 1.5 ug./M³, while that in Los Angeles is about 2.5, yet the average concentration of lead in the blood of apparently comparable groups of people in Los Angeles is no higher than that of Cincinnatians. That is to say, that within the realm of the day-to-day variability of the groups, we have been unable to find any difference.

Now, if the air in the vicinity of an industrial plant, where people live, is kept within such limits as I have indicated - i.e., 5 ug./M³, as the result of the control of emissions of lead from stacks, or other orifices (windows, doors, etc.), it will be satisfactory for public safety. The criterion here is not what is coming out of a stack, but what is in the air to which people have access to breathe. That is, the question here is the extent of the dilution of the effluent (of whatever volume the effluent material from the stack or other opening may be in relation to that of the outside air in which it becomes mixed) by outside air before it reaches the ambient air of man. In other words, if you apply a single standard to the ambient air, however it becomes contaminated with lead, so that people (or animals) who breathe it are protected, you have achieved your purpose.

I enclose herewith two reprints, one in the form of a booklet, and the other in the form of a xerox copy of a single reprint which will contribute to the documentation of this matter.

Cordially yours,

Robert A. Kehoe, M.D.
Professor Emeritus of
Occupational Medicine

RAK:wb

enclosures

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CITY OF DALLAS
TEXAS

June 25, 1971

Robert A. Kehoe, M.D.
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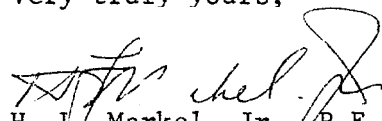
Dear Dr. Kehoe:

It was indeed a pleasure to again visit with you during the recent AIHA Conference in Toronto. As you may recall, and in accordance with our brief discussion, I would like to take this opportunity to request your comments on the "reasonableness" of a $5 \mu\text{g}/\text{m}^3$ lead emission standard presently incorporated in our local air pollution ordinance. (Note: The ambient standard has similarly been set at $5 \mu\text{g}/\text{m}^3$.)

You also mentioned that you might have printed material available which relates to a comparative evaluation of a $200 \mu\text{g}/\text{m}^3$ threshold limit value (in plant, 8 hours per day, 5 days per week) versus a $5\text{-}10 \mu\text{g}/\text{m}^3$ ambient/emission value (24 hours per day, 7 days per week). If such material is, in fact, available, we would appreciate receiving a copy.

Thanking you in advance for any comments and/or information you might furnish on the above described inquiry, I remain,

Very truly yours,


H. L. Markel, Jr., P.E.
Public Health Engineer
Air Pollution Control Program

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