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COLLEGE OF MEDICINE
DEPARTMENT OF ENVIRONMENTAL HEALTH

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CINCINNATI, OHIO 45219

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Mr. Victor Sussman
Air Pollution Control Committee
P.O. Box #90
Harrisburg, Pennsylvania 17120

Dear Mr. Sussman:

Thanks very much for sending me copies of your correspondence with Katharine Boucot, M.D. and John Goldsmith, M.D. and for giving me the opportunity to comment on them.

I am quite sure that you are prepared to put these two views of the matter at issue side by side with the evidence which I provided for you in my statement, and to come to your own conclusion. Nevertheless, there are certain comments that may, and, I believe, should be made about their statements, and also one or two points in addition may well be made.

First, let me emphasize the fact that, whatever may be the immediate reason for establishing a hygienic standard for the quality of the ambient air, with respect to lead, the position of the Commonwealth of Pennsylvania in this matter is that of establishing a precedent in the United States. This standard should not be seriously at fault from the aspect of the information available at this time, and above all it should not be much too low, because of the serious difficulties - I'm not thinking here primarily of the effects on the anti-knock industry but rather those involving professional credibility - that are associated with changing it upward, in both national and international jurisdictions. I have considered this matter to be serious enough to justify years of careful research, and large expenditures of money. They are nearing completion. It may be very easy to disregard these facts, and to say as Dr. Boucot has said that she would be proud to have Pennsylvania be the first to adopt an atmospheric standard for lead. She did not say "right or wrong," but that is clearly implied. I simply cannot go along with this attitude toward "hygienic standards." They are serious matters with serious consequences, both economic and professional. Incidentally, I am fond of Dr. Boucot, and I respect her capabilities and her judgment within her field of competence. This matter is not in that category. I am sending a copy of this letter to her, so that I am not speaking of her without her knowledge.

Further to comment on the substance of Dr. Boucot's statement, rather than her attitude, let me point out that when we talked briefly at the meeting of the Academy of Occupational Medicine, I made little attempt to explain my position, but merely said that I had been misquoted (or perhaps misinterpreted) as to my testimony at the hearing before you, and that I would send her a copy of my statement so that she could know what I said. She was disturbed by the issue and what was being said about my testimony in a letter which she had received, and I am sure, from her letter to you, that she did not understand what I had testified to, or why. You will note, I am sure, that her description of our experimental work (as I had spoken of it briefly to her before she had

received my statement) cannot be dismissed as lightly as she has indicated, as being "the data on only two human volunteers." Five years of meticulous experimental work have gone into this particular matter, and these are backed by many years of physiological investigation in the general field of the behavior of lead. Her further statement that "it would be unwise to (1) use data based on only two human volunteers and (2) extrapolate on the basis of theoretical models and considerations" reveals the utter weakness of her position. Quite clearly that, in principle, is what you have done (properly, for the lack of something better), in arriving at 5 micrograms, while I have merely inserted a factor of correction, admittedly in much the same manner, while pointing out that a sound position could be established only by direct experimentation.

I don't wish to labor the point unduly, but this is precisely the manner in which a number of decisions about uncertainties are being urged at present - that is, on emotional grounds, in the face of real or imagined danger. So far as lead in the ambient air is concerned, there is not a scintilla of evidence to indicate or even suggest that there is any public danger. I hardly think I need say that your problems and your approach to them are in a different category, but it is quite certain that your official action here will be regarded elsewhere as a preventive measure against a hazardous degree of contamination of the general ambient atmosphere with lead.

With respect to Dr. Goldsmith's comments, we are dealing with a different set of ideas and a different approach to the problem of lead in the atmosphere. I have talked with him, to some extent, about this, and there is one thing about his approach which disturbs me greatly. That is his excessive confidence in the significance of slight variations in the concentration of lead in the blood and their degree of correlation with correspondingly slight variations in the concentration of lead in the atmosphere in various areas of the cities involved in the Three Cities Survey. Having carried out other surveys of this type over the years, and having become familiar with variations of this type, I am skeptical of the validity of conclusions arrived at by applying precise mathematical treatment to data which are lacking in precision, not because of analytical inaccuracies but because of multiple environmental factors that have not been, and cannot be, given proper weight. One becomes deluded by the precision of mathematics into the belief that the associated hypotheses and the conclusions have achieved precision.

In practical terms, the differences in the mean concentration of lead in the blood, ~~and~~^{and} between two groups of persons in the general population, must be sufficiently large, in the complex environmental situation involving numerous sources of exposure to lead, to separate out and identify a specific source that applies to one group and not the other. It is simply impossible to do this in the case of most of the groups of subjects that have been investigated in this manner. For example, it is certain that the lead ingested with food and beverages is responsible for the larger proportion of the lead found in the blood of persons and groups in the general population. Respiratory exposure of certain occupational types can be detected and measured with fair precision, when it is really significant, by the sharp differentiation of the individual or group of exposed persons from ordinary persons through their significantly elevated concentration (rate of excretion) of lead in the urine and in the

blood. Variations of the order of 0.02 to 0.04 mg. per liter of urine or per 100 grams of whole blood, as the mean value of numerous observations on individuals or on individual observations on many persons, are of common occurrence, as the result of variations in the lead content of the food and beverages of the individuals, as well as variations in other environmental factors (air). It is futile to relate these variations to any one factor in the environment unless the other factors are known or kept constant. That is precisely why we resorted to balance experiments on individuals - that is, to fill in the other side of the picture and to learn to appreciate the individual variables. These are simply ignored or given only slight consideration by Dr. Goldsmith, on the supposition that they must be reasonably ironed out within the group.

What we have been doing, therefore, in the surveys which we have carried out repeatedly during the years, and in the last survey in which we participated - i.e., the Three-Cities Survey, is to investigate the atmospheric environment, and the status of presumably representative groups in the population, in search of statistically and clinically significant increases in the exposure of the individuals and groups, in correlation with significant increases in the concentration of lead in the atmosphere. We have not found either of these phenomena during the past twenty or thirty years. Therefore, regardless of skill and precision in the application of statistical techniques to the slight differences observed among the groups under investigation, one cannot arrive at significant interpretations through the study of undifferentiated data. Inferences can be made, but reasonable certainty cannot be achieved.

Mind you, I am not criticising John Goldsmith for examining the data which are available by every means that can squeeze out every drop of information or every bit of suggestive information that may lead to further investigation. What I am saying both to you and to him is that the conclusion which he has reached - namely, that human exposure to 5 micrograms of lead per cubic meter of air results in an average blood level of about 27 micrograms (i.e., 0.027 mg.) per 100 grams of blood, is not necessarily true, and that even if it were it would not be a matter of consequence in our present situation. Whether or not it is true, depends on the level of lead absorption from the alimentary tract, and the latter is inconstant from day to day and from person to person, within the range of differences under examination. Moreover, a significant proportion of the males in the population of the United States at this time has this much lead in the blood.

I believe I have said enough, previously, to clarify my position in this matter. I recognize, however, that conflicts of opinion for various reasons between honest and sincere people are difficult to deal with in matters of public policy. Perhaps, therefore, I should conclude these remarks by a statement of the facts, and of appropriate public policies as I visualize them.

1. The present levels of the concentration of lead in the ambient atmosphere of American urban areas, do not constitute any threat to the health and well-being of American citizens, in so far as any even suggestive evidence has been found.

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2. There is no evidence which points to the likelihood that any such threat may come into existence at an early date in the United States. (There have been sharply localized areas, from time to time, in relation to localized sources, which have been open to serious question.)
3. There is, therefore, no great urgency for the establishment of a standard of quality, with respect to the tolerable concentration of lead in the general or ambient atmosphere of American cities generally.
4. It is desirable, nevertheless, to have sound information, as soon as it is feasible, by which a satisfactory quality of the general atmosphere with respect to its content of lead, may be specified. The time appears to be near at hand when this can be done.
5. The establishment of a local standard of air quality in relation to lead content, for any reason of public policy concerned with the health of domestic animals or men, might well be accompanied by a definition of the area and purpose of the application of the standard, as well as a clear indication of the tentative nature of the standard, if such is the case.

With regards, and again my thanks for your courtesy.

Sincerely,

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

RAK:wp

cc: Dr. Boucot
Dr. Goldsmith

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