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SUBJECT: AIR POLLUTION AND LEAD

To: The Industry Development Committee

Since lead has been found in the atmosphere of all of our large cities whenever air analyses have been made, public health people are expressing concern over the potential hazard to health. The State Health Department of California has expressed the most concern and we know that it is actively studying the lead content of the air at several locations. At its last session the California House of Representatives passed bill no. ER 411 which sets up a committee to study the composition of motor fuels, the use of additives and their relation to the creation of smog, which is to submit its report to the 1963 Regular Session.

A typical and concise statement of the problem is contained in the attached outline "Are Motor-Fuel Additives Hazardous to Public Health?" which expresses in general the way public health people feel about the hazard potential of lead. This outline is one of "100 Problems in Environmental Health" compiled by a committee of experts at the request of the U. S. Public Health Service and published with Public Health Service funds.

We are submitting this as background information to indicate the importance of the general situation to our industry, and to indicate further the direction of future cooperative action we may find necessary. We expect to have specific proposals to offer in the near future.

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Look Ahead with Lead

ARE MOTOR-FUEL ADDITIVES HAZARDOUS TO PUBLIC HEALTH?

The Problem: In 1923, when the addition of tetraethyl lead to motor fuel was first considered, it was felt that there was insufficient information concerning the possible effects of this addition on the public's health. In 1959, a second review of this problem was undertaken, with no essential change in the conclusion. At the present time the amount of tetraethyl lead added to motor fuel is being increased slowly. Other substances are also being added, including tetramethyl lead, various manganese compounds, and organic phosphates. Concentrated amounts of each of these substances present problems of toxicity, which have generally been handled skillfully by the industries that manufacture and distribute the additives or the fuel containing them. Although the information developed for the control of industrial hazards from additives is very useful, it is not directly applicable for evaluation of community hazards. On the other hand, no one has proved that the present levels of pollution from motor-fuel additives are damaging to the public's health.

There is a need to establish principles and limits to determine the toxicology of motor-fuel additives and their products, especially on the health of the public. Such guides should be promptly incorporated into practices concerning the addition of such substances to motor fuels.

Background: Several different approaches have been used in the past. For example, measurements of lead in urban atmospheres have been made over a number of years. The proportion of lead from motor-fuel additives and the proportion from other sources may vary from place to place. However, in areas with a good control program for industrial air pollution and a high population of motor vehicles, it is likely that most of the atmospheric lead does come from motor-fuel additives.

From what is known of the toxicology of lead, it is clear that the likelihood of acute toxicity in public exposures is very slight. The problem, then, is one of chronic toxicity. Industrial toxicologists have found that if lead is accumulated in the body from a given exposure at a rate exceeding that for non-exposed persons, there is some risk of toxicity. This general principle seems appropriate as a guide for the toxicology of community air pollution from exhausted lead. Past studies have also shown the particle size distribution of lead from motor vehicle exhausts and have indicated that in certain particle ranges a very high proportion, in excess of 50 per cent of inhaled lead, may be deposited in the lungs. It is also known that less than 10 per cent of orally ingested lead is retained in the body.

Potential Lines of Attack: It is important to evaluate systematically the relationship between atmospheric lead and motor fuel use, possibly by more detailed chemical analysis of particulate lead, as well as more detailed analysis of the particle size of lead in the atmosphere. The latter approach would also permit better estimation of the amount likely to be retained.

In addition, it would be very reasonable to determine average lead values in the blood and in urine of persons with various types of daily exposures. For example, drivers who spend much time on the freeways could be compared with service-station attendants, policemen, firemen, and clerical workers. The same methods should be applied to persons who have an occupational lead exposure in

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industries in which lead is widely used. An additional approach would be to study the amount of lead in various organs of persons who have no known occupational exposure. The analysis should be done in a laboratory fully familiar with the study of small amounts of lead. Generally speaking, spectrographic analysis has proved to be a most efficient technique.

Other Pertinent Considerations: These studies should not take more than four or five years. This is a very urgent problem and one that should be studied and resolved without delay. The work should be carried on in several localities, but it should be centralized by an agency, such as the U. S. Public Health Service, with laboratory and toxicologic facilities. The disciplines involved might include pathology, toxicology, clinical medicine, chemistry, and spectroscopy. Also important in this study would be engineers familiar with motor vehicle operations.

The principles outlined above would also apply to the study of other possible additives each of course being considered with respect to its own peculiar properties when added to the pollution in the atmosphere.

References:

1. Magnuson, H.J. (Chairman) Advisory Committee on Tetraethyl Lead to the Surgeon General of the Public Health Service, "Public Health Aspects of Increasing Tetraethyl Lead Content in Motor Fuel", Public Health Serv. Publ. No. 712 (1959)
 2. Kehoe, R. A., "Responses of Human Subjects to Lead Compounds", Ind. Med. and Surg. 28, 156 (1959)
 3. Aub, J.C., Fairhall, L. T., Minot, A. S., and Reznikoff, P., "Lead Poisoning", Medicine 4 (No. 1, No. 2) (1925)
- Problem No. 110 in "100 Problems in Environmental Health" compiled with Grant No. RG-7263 (later redesignated EF-243) from the Public Health Service, Department of Health, Education, and Welfare, Bethesda, Md. (1961)