



ESSO RESEARCH AND ENGINEERING COMPANY

MEDICAL RESEARCH DIVISION

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Dr. C. H. Baylor
Texaco, Inc.
135 E. 42nd Street
New York, N. Y. 10017

Dear Curt:

One of the things I promised to do at the last meeting of the Central Committee on Medicine and Health which has slipped my mind until the present was to write you concerning the potential studies that the Public Health Service would like to see done on lead workers in industry. You will remember that as API's representative on the Lead Liaison Committee with the Public Health Service I was provided with certain studies which they felt might be worthwhile undertaking in an attempt to answer the question of whether or not lead is having an effect on the health of the general population. They passed out to us the five sheets which I have attached to this letter. Of particular interest were the studies suggested by No. 1 under Occupational Group Studies on Lead. In this regard I agreed to contact the medical directors of the three major automotive manufacturers and see if they would be willing to do studies of this nature on their lead workers. In addition, I agreed to contact, through the Central Committee on Medicine and Health, the medical directors of the oil industry to see if they might be willing to undertake comparable studies in lead workers in the oil industry. Actually, the number one study under Occupational Group Studies on Lead parallels quite closely the epidemiology lead studies number one project.

The question which I posed to the Central Committee on Medicine and Health at its meeting was whether the medical directors of the petroleum companies would be willing to participate in such a study. In my view, the data are usually probably already available in the medical records maintained by the various petroleum companies, and it would be simply a matter of getting the data out and putting it down on paper. Thus, blood and/or urinary lead levels could be correlated with any critical findings that might be available, including hemoglobins, red counts, or other blood effects specifically. It is very likely that nobody has done red cell fragility studies, and that this information therefore probably would not be available, but it could be that one or another of the petroleum companies would be willing to undertake red cell fragility studies in their lead workers and attempt to correlate this with blood and/or urinary lead levels and environmental lead levels, if such are available.

It just seemed to me that a study of this nature could be done by the various petroleum companies involved in the Central Committee on Medicine and Health and perhaps collect valuable information which would add to the already available information indicating that lead exposures less than a certain figure do not constitute a hazard to anyone. I would sincerely hope that the petroleum companies through their medical directors would cooperate in such a collection of data for the Public Health Service, since it would be invaluable to the Environmental Health Committee in its discussions with the federal authorities on the hazards of lead in our environment.

As indicated, I have already met with Bud Irvin, Marion Jocz, and Dan Steiner to see if they would be willing to participate in a study of their workers. My letter of December 7, 1966, outlines more or less the thinking I have on what this study might consist of, and I am including it since I think it might be of value to you in attempting to assess whether the petroleum industries will cooperate in this study.

After you have had an opportunity to review the attached information and should you still have any further questions concerning the nature of the study to be undertaken, perhaps we could get together sometime in New York and discuss this more fully. I would hope that a decision on this might be reached at the May meeting of the Central Committee on Medicine and Health in order that this information might be conveyed to the Public Health Service. Might I also add parenthetically that lack of cooperation by the petroleum companies in such studies might well be seriously misinterpreted by the Public Health Service.

Sincerely yours,



R. E. ECKARDT, MD
Director

REE:bsn

Attachments

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EPIDEMIOLOGY LEAD STUDIES

1. A major source of knowledge concerning the health effects of chronic exposure to lead appears to be available in industry records. Inasmuch as working levels of lead are routinely monitored and blood and urine measurements are taken at periodic intervals, it should be possible to do both retrospective and prospective studies. For either type of study, it would be necessary to obtain a cohort of workers exposed to lead in the working environment, as supplemented by their other exposure, resulting in given blood lead levels after a given period of occupational exposure. This level, obviously, should be less than that required by company policy to require transfer to a lesser exposure. Thus, persons with blood lead levels of .03 or .07 milligrams per 100 grams of blood might constitute one cohort with other blood levels making up the remaining cohorts. These workers could be followed throughout their entire working lives with special provision made for ascertaining their morbidity and mortality experience as well as their reasons for job shifts. Large employers, of course, are most suitable as the place of study inasmuch as they would utilize sufficiently large numbers of workers so that meaningful comparisons might be made of the group means for the different cohorts. Special care would have to be given to insure that more detailed analysis was made of the red blood cells and other constituents of the hematologic system. In addition, particular care will have to be given to a thorough examination of the other body systems affected by lead exposure, which apparently is not the case now in routine industrial hygiene policy. A suitably designed study would add much to our knowledge of the health effects, if any, of chronic exposure to subtoxic levels of lead.

2. The resurvey of the Westabee orchardists who were exposed to lead arsenate appears to offer a suitable vehicle for epidemiologic research into occupational exposure primarily together with some non-occupational exposure of women and children. The range of blood lead levels found varied from those present in our community surveys to just below the .03 milligrams per 100 grams of blood, the threshold established by Dr. Kehoe. One might then follow cohorts of given blood lead levels as of the state of the original study. Further differentiation might also be made of the age and sex distribution of the population at risk. Since there were some 1,000 persons in the original study, it may be possible if suitable follow-up techniques are used, to obtain statistically significant differences in selected group means. However, before undertaking such a study, it would be necessary to look into the obligations of bias surrounding the conduct of the study. It is quite conceivable that even a "biased" study might well be suitable for follow-up and might lead to scientifically acceptable results. This, of course, would depend on the nature of the bias.

Special Group Studies on Lead:

1. Pregnant women should be studied specifically for a possible effect of lead at various low levels. Attention should be given to both fetus and mother. Blood lead levels would probably be the best to employ as an index of exposure. Two general types of studies can be undertaken. In one pregnant women could be grouped by blood lead level and followed to determine any differences in health status which might develop between the groups having differing levels. It is also possible to select groups of women and/or offspring with and without various circumstances and compare lead levels in these groups to determine whether or not above average lead levels are commonly associated with any undesirable condition.

Another type of study would be to select a group of pregnant women and follow them through pregnancy and delivery. Blood lead levels would be determined at various intervals during pregnancy and at delivery. The health status of the mother and the health status of the child would be followed up to determine if there is any correlation between lead levels and health status.

2. Another type of study would be to select a group of children and follow them through childhood. Blood lead levels would be determined at various intervals during childhood. The health status of the child would be followed up to determine if there is any correlation between lead levels and health status.

Laboratory Studies of Normal Animals

1. One of the major advantages of conducting animal studies is the likelihood of being able to use constant and controlled lead exposures in the air, in food, and in beverages over a relatively long period of time. Accordingly, it is very simple to have a group of normal rats, for example, who are exposed during their entire lifetime to levels of lead found in the community atmosphere, as well as another group exposed to a level of lead 10 micrograms greater, 20 micrograms greater, etc. The effects of lead can be determined sequentially on blood porphyrin and urinary coproporphyrin. Histo-pathological studies and neurophysiological studies can be made during the course of the work. Bone marrow can also be looked at in this animal experimentation from the biochemical and physiological point of view as an indicator of changes in the hemoglobin. Chronic effects, if any, can be measured more easily on the other organ systems affected by lead, i.e., the central nervous system, the reproductive and renal systems.
2. Another study would vary the animals used to attempt to ascertain the nature and extent of species differentiation. This type of study would identically parallel the previous study but would use hamsters or rabbits on up to primates.

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Occupational Group Studies on Lead

1. Several fragments of current information, mainly related to the blood-forming system, indicate that blood and urine lead levels presently believed safe, may not in fact be so. None of the information pointing to this possibility is satisfactory for use in altering control programs. It does raise enough doubts so that careful reevaluation of current concepts is in order. This can probably be done by the use of existing industrial data from the supervision of lead-exposed employees to a large extent. If employees who have been examined periodically have had urine lead level, blood lead level, hemoglobin level, red blood cell count, red blood cell fragility, and urinary coproporphyrin done a preliminary survey could easily be done by grouping subjects according to blood lead levels and again according to urine lead levels. For each such group frequency distributions for hemoglobin, blood count, fragility and coproporphyrins can be determined. If these differ in relation to lead level it should be apparent in such a design. Evidence for or against other types of injury from lead could also be sought in the same pattern.
2. There are also unsatisfactory fragments of information indicating that lead exposures above and/or below those producing lead poisoning may also produce chronic illness, particularly kidney disease. This problem also merits more careful study to decide whether or not such damage is in fact occurring. Two industrial groups lend themselves to such a purpose. Groups mentioned in the first section can be classified into cohorts by length of exposure or by blood levels (or by both), and followed for differences in life expectancy and health status as compared to non-exposed groups. Cases of industrial lead poisoning could be subject to follow-up study in the manner used previously for children by Henderson and by Tepper? (sic). Comparison groups should probably be employed.