July 10, 1958

Mr. Henry Doyle
Occupational Health Program
Division of Special Health Services
Department of Health, Education and Welfare
Washington 25, D. C.

Dear Henry:

I am sending to you, separately, a bundle of reports, reprints, precautionary instructions and certain other items of information relative to the problems which relate to the manufacture, distribution and use of tetraethyl lead and leaded gasoline. I am plagued by the unavailability of publications that would fill in the blank spaces in the account of what has been done, as well as the step-wise development of the facts. Some of the unpublished reports, copies of which were furnished years ago to the Public Health Service, have been depleted long since, except for my bound office copies. I am sending a copy of the report, minus a series of tables, of the investigation carried out by us in 1928. There are no available copies of the others, the first of which was issued in 1925 and the last in 1932. These, especially the last, are of importance in recording the development of the methodology of approach, and in demonstrating certain weaknesses, since eradicated in large part, in both the physiological and the analytical concepts and procedures. For example, the investigation of the excretion of lead by Leake and his associates, as reported in Bulletin 163, was limited to the analysis of the feces, and it is now quite clear that nothing of relevance could possibly have been learned by this approach to this problem, and that the statistical comparisons of the results yielded by different groups of persons could not now be expected to have any important relationship to the issue under investigation. The procedure employed derived from the belief, then the prevailing viewpoint, that the lead output of the alimentary tract was essentially an excretion, whereas it is now evident, from our long study of the lead metabolism, that except under conditions of respiratory exposure to dust (particles appreciably in excess of 1 micron in diameter), or in situations in which the absorption of lead is quite high, the alimentary lead cannot be differentiated from that ingested with food and beverages, except in balance experiments.

It can be noted in our early publications (the series in JIHandT, 1933 and on through 1936, including the first of two articles in JIHandT in 1934 and 1936, on "An Appraisal of the Lead Hazards Associated with the Distribution and Use of Gasoline Containing Tetraethyl Lead"), and the facts are discussed and explained on page 66 of the 1936 article, that somewhat high mean values for

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the urinary lead excretion of groups of persons were obtained by us prior to the period 1934 through 1938, when the present facilities and methods of collecting and analysing samples (whereby the losses of the analytical procedures were prevented, on the one hand, and the introduction of minute quantities of lead from a variety of sources was avoided, on the other), were developed to their present efficacy. Incidentally the two later articles in JIHandT summarize the most important features and facts of our several field investigations (detailed reports of which are no longer available) and in addition, the latter of the two describes some further observations on garage mechanics which led up to the later and more detailed investigations of such mechanics, the results of which have not been published. Our failure (or rather my failure, for I haven't found the time) to publish many of our later investigations, is another source of frustration to me at this time in providing you with full information on the present situation. The information gained, for example, in the systematic clinical and analytical regimen of hygienic control in the manufacturing plants, is of the utmost importance in viewing the entire problem, and especially in considering the margins of safety represented in different levels of the lead metabolism. I have been gathering together this information in a systematic manner for years, with the purpose in mind of writing a monograph on the subject, since the data are much too voluminous for study and presentation otherwise. I have agreed to get at this within the coming year, on the presumption that my retirement from the Medical Directorship of Ethyl Corporation will give me time to do it. Meanwhile, what I have on hand could be made available to you or your representative for further study, if you wish to look into it here. The same applies, of course, to our current investigation of the metabolism of inhaled lead, as far as it has gone, and to our last field investigation, the voluminous data of which are now under study. A detailed report of the latter will be prepared.

With respect to the items which I am sending to you, I must ask you to return to me, if you find it possible, any of the articles or reports of which you now have copies. Instead of sending you a copy of the bound volume "Lead Studies" which I mentioned to you, I am sending all but one of the more important individual papers that went into this volume. The article omitted is Machle's account of "Tetraethyl Lead Intoxication and Poisoning By Related Compounds of Lead," JAMA 105:578-585, 1935. There are things to be added to this article, especially on the laboratory side of the diagnosis, but it is much the best clinical description available of the more severe cases of poisoning. My prior article (which is included in the present sheaf) on the less severe and non-fatal types of poisoning is still the best description of this form of the disease (since I saw more of it than anyone has had an opportunity to see), but the other aspects of my article are obsolete. With respect to your return of anything you do not need, I call specific attention to two items, which you should have, but which I can ill afford to supply to you. The one is the series of articles which appeared in JIHandT in 1933, beginning "On the Normal Absorption and Excretion of Lead. I. Lead Absorption and Excretion in Primative Life." The other is the "Final Report of the Departmental Committee on Ethyl Petrol," issued by the British Ministry of Health in 1930. I doubt that the latter is obtainable from any other source, although I have made no attempt recently. You may be familiar with this report, but if you are not, it has some very interesting and pertinent

information in it.

There are other bits of relevant information here and there, among which a series of articles from Switzerland is of significance in indication of the apprehension of certain vocal physicians there, concerning the lead in exhaust gas of automobiles. Moreover, a series of articles by Russian investigators present experiments and opinions on tetraethyl lead intoxication. I should say, off hand, that none of these articles cast much light on our practical problems of industrial or public health, but they demonstrate that the issue is not dead, and convey something - perhaps the fringe - of professional attitude elsewhere.

The mineographed statement issued by The Associated Ethyl Company Limited in January 1944, represents an abbreviated account of the main results and conclusions of my survey of the situation in the Near East and Middle East (mainly Egypt and Iran), during the war, with respect to tetraethyl lead poisoning among persons exposed to excessive quantities of spilled and vaporized gasoline in improvised, crude and unventilated facilities for canning, transporting and storing leaded gasoline for military purposes. This is highly pertinent information which clearly indicates the precise nature of the hazards of handling leaded gasoline and the type of situation which must always be avoided, if such hazard is to remain negligible as it is under the generally prevalent conditions of the handling, dispensing and utilization of leaded gasoline by normal commercial methods.

There are a few other pertinent matters to which no attention is called in the material which I am sending to you. There are several articles and numerous items of information from various sources, on the results of the incomplete and, in some instances, the utterly lacking, measures for control of the handling of tetraethyl lead during the war, in countries in which inadequate or no supervision was provided either by industry or by government - in Germany, for example, where the previously established precautionary regimen broke down, and in the area under Russian governmental and military control, and in Japan. These matters are of interest and importance in demonstrating the need for control, and in predicting what might well happen anywhere when control measures fail or are lacking in application.

We have, I believe, the most comprehensive bibliography available on various aspects of the lead problem, and it is unlikely that anything of real importance has escaped us. To the extent, therefore, that the information and facilities of this Laboratory can be of use to you or your associates, especially as a matter of saving time (for your access to the world's published information is unsurpassed elsewhere), you have only to call upon us.

I believe this is the best I can do for the present, but if questions occur to you or your associates, do not hesitate to raise them.

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Mr. Henry Doyle - (4) - July 10, 1958

It was a pleasure to see and talk with you and Dr. Gafafer last week, and I was encouraged by our general conference. My thanks are due you for arranging it.

With kindest regards,

Sincerely yours,

Robert A. Kehoe, M. D.

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Reprints under separate cover.

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Studies on the Absorption of Lead from Ethyl Gasoline - Kehoe, Thamann and Sanders
Addendum to Report Dated Nov. 18, 1926, Studies on the Absorption of Lead From Ethyl Gasoline - Kehoe, Thamann and Sanders
A Study of the Health Hazards associated with The Distribution and Use of Ethyl Gasoline - Kehoe, Thamann, Kitzmiller, Crudgington, Machle, Sanders and Cholak
Report on A Study of the Hazards of Cleaning Gasoline Storage Tanks (including Glossary)
Final Report of the Dept. Com. on Ethyl Petrol - London 1930
The Assoc. Ethyl Co. Ltd - London - Summary of Conditions Responsible for Toxic Hazards to Workmen Engaged in Filling Small Containers (up to 50 Gallons Capacity) With Leaded Gasoline, and in Handling Packaged Leaded Gasoline together with Recommendations for the avoidance of such Hazards. - Kehoe
On the Toxicity of TEL and Inorganic Lead Salts - Kehoe
The Excretion of Lead by Normal Persons - Kehoe, Thamann and Sanders
TEL Poisoning - Clinical Analysis of a Series of Nonfatal Cases - Kehoe
The Excretion of Lead - Kehoe and Thamann
The Behavior of Lead in the Animal Organism, II. TEL - Kehoe and Thamann
On the Normal Absorption and Excretion of Lead I. Lead Absorption and Excretion in Primitive Life - III. The Sources of Normal Lead Absorption - Lead Absorption and Excretion in Relation to the Diagnosis of Lead Poisoning - Kehoe, Thamann and Cholak
An Appraisal of the Lead Hazards Associated with the Distribution and Use of Gasoline Containing TEL Part I - Kehoe, Thamann and Cholak
Normal Absorption and Excretion of Lead - Kehoe, Thamann and Cholak
The Occupational Lead Exposure of Men Engaged in Mixing TEL (Ethyl Fluid) with Gasoline - Kahoe and Machle
An Appraisal of the Lead Hazards Associated with the Distribution and Use of Gasoline Containing TEL. II. The Occupational Lead Exposure of Filling Station Attendants and Garage Mechanics - Kehoe, Thamann and Cholak
Hazards in the Handling of Ethyl Fluid and Leaded Gasoline - Kehoe
Experimental Studies on the Ingestion of Lead Compounds - Kehoe, Cholak, Hubbard, Bambach, McNary and Story
Report on Methods for the Purification of Water after Its Transportation and Storage in Cans, Drums, and Tanks That have been Employed as Containers for Leaded Gasoline - Cholak, McNary, Bambach and Burkey
The Plasma-Cell Partition of Blood Lead - Bambach, Kehoe and Logan
Lead Poisoning Symposium - Ref: Experimental Studies on Lead Absorption and Excretion and Their Relations to the Diagnosis and Treatment of Lead Poisoning - Kehoe Cholak, Hubbard, Bambach and McNary
Exposure to Lead - Kehoe
Treatment of Organic Lead (TE) Intoxication with Edathamil Calcium-Disodium - Kitzmiller, Cholak and Kehoe
Isolation From Liver of TEL After its Inhalation - Stevens, Feldhake and Kehoe
Collection and Analysis of Solids in Urban Atmospheres - Cholak, Schafer and Hoffer
The Nature of Atmospheric Pollution in a Number of Industrial Communities - Cholak
Results of a Five-Year Investigation of Air Pollution in Cincinnati - Cholak, Schafer and Hoffer
Measurement of Air Pollution - Cholak
Air Pollution in a Number of Am. Cities - Cholak, Scaefer, Younker and Yeager
A Comparison of Particulate Loadings in the Atmospheres of Certain Am. Cities - Chambers, Foter and Cholak
Regulations Governing the Transportation of Motor Fuel Antiknock Compounds ("Ethyl" Aviation and Motor Fluids)

Over

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Instructions for Handling "Ethyl" Antiknock Compounds in Cans
Regulations for Handling and Mixing "Ethyl" Antiknock Compounds - Partial Drum Mixing Equipment - Drum Equipment - Drum to Weigh Tank Equipment - Tank Equipment
Methods for Determining Lead in Air and Biological Materials - ~~USPHS~~ A.P.H.A

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