

December 11, 1941.

AIR MAIL

Dr. William A. Bishop,
899 Beacon Street,
Boston, Mass.

Dear Dr. Bishop:

I hasten to reply to your letter of December 8. I wish specifically to call your attention to the fact that the questions raised in your letter have been subjected to very extensive investigation. We first made observations on the lead exposure of filling station attendants and garage mechanics in 1925, and reported our observations at a meeting called by the Surgeon General of the Public Health Service, in Washington, in May, I believe, of that year. A subsequent comprehensive investigation made by the United States Public Health Service was followed by further investigation in this laboratory, and also subsequently, by an investigation of the British Ministry of Health. Periodically, since that time, my associates and I have made further observations on filling station attendants and garage mechanics employed under conditions of exposure to leaded gasoline over periods of many years. Most of the observations here referred to have been published in detail. Unfortunately, the bulletins, both of the United States Public Health Service and the British Ministry of Health, are out of print, and they are very difficult to find, and some of our later studies have not been published. On the other hand, the literature has been reviewed and our most extensive investigations have been reported in two articles in the Journal of Industrial Hygiene. The first of these entitled, "Appraisal of the Lead Hazards Associated with the Distribution and Use of Gasoline Containing Tetraethyl Lead", by Kehoe, Thamann, and Cholak, appeared in the Journal of Industrial Hygiene, vol. 16, March 1934, page 100. The second appeared in a later volume of the same journal. I am sending you a copy of the latter, but my supply of reprints of the former has been exhausted.

The result of all these investigations has been to show that occupational lead absorption does not occur among filling station attendants and garage mechanics, as a consequence of their handling of leaded gasoline. It is quite clear that neither of these occupations can be regarded as hazardous in any way, from the point of view of lead absorption. Whereas workmen in the well known lead trades absorb lead to variable degrees, dependent upon the magnitude of their lead exposure, as revealed by an elevation in their rate of urinary lead excretion, these gasoline handlers do not show any change over normal persons with no lead exposure.

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We have made it a point over a period of years to study cases of complaints of illness among filling station attendants and garage mechanics. We have seen a variety of types of illness, but we have never seen a case of lead poisoning. Moreover, there is not a recorded case of lead poisoning from the handling of leaded gasoline in all medical literature, so far as we are able to discover.

We have been interested in the reasons back of these facts. From our studies of a number of years ago, it seems quite clear that there are two main facts responsible for the innocuous character of leaded gasoline. First, the concentration of lead in the gasoline is so low that lead absorption through the skin does not occur to any degree that is measurable. Second, the vapor pressure of tetraethyl lead at ordinary temperature is so much less than that of gasoline that the vapors given off from evaporating gasoline containing the usual concentrations of tetraethyl lead, do not contain an appreciable quantity of lead. For these reasons, exposure to lead in the handling of leaded gasoline is insignificant in proportion, and is distinctly non-hazardous.

With reference to the absorption of tetraethyl lead through the skin, I should point out that this occurs with fair rapidity. So far as we are able to determine, this is true only of organic lead compounds, such as tetraethyl lead. The inorganic lead compounds are not absorbed through the skin in significant quantities. However, the dilution of tetraethyl lead in gasoline interferes with its absorption through the skin, and at concentrations below one part of tetraethyl lead per thousand parts of gasoline, the absorption through the skin is so slight as to be inappreciable. I am sending you a reprint of an article in the American Journal of Hygiene, which illustrates this point. Table 3, on page 486, will interest you in this connection.

It is quite apparent from what I have said above that, if this claimant had a lead line of the gums at any time, it was not due to his absorption of lead out of gasoline. You can be quite sure that he did not absorb any significant or measurable quantities of lead as a result of his work as a filling station attendant. This is true regardless of the frequency with which he washed his hands in gasoline. If you think this is a somewhat sweeping statement, let me refer you to our observations on men with almost infinitely greater exposure, as reported on page 108, et. seq., in the article in the Journal of Industrial Hygiene, vol. 16, 1934.

You asked about the lead concentration in regular Socony gasoline. The maximum concentration permitted in commercial automobile fuels is 3 c.c. per American gallon, or approximately one part in 1260 parts of gasoline by volume. Regular gasoline, as differentiated from premium fuels, contains much less than this concentration. I have no direct knowledge of the precise concentration in Socony regular. However, it is not more than 1 c.c. per gallon in all probability, and it may well be as little as 0.3 to 0.5 c.c. per gal-

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lon. Actually, this is a matter of little consequence, since in any case it is below the concentration that gives rise to skin absorption. I should point out to you that all of the investigations which have been carried out have had the primary purpose of determining whether or not there would be any danger of lead poisoning among the handlers of leaded gasoline. If experimental workers had found any reason whatever for believing that contact with such gasoline would produce lead poisoning, even in unusual instances, it is quite certain that the product would not have been permitted to appear commercially. It is utterly inconceivable to me that any responsible person or group of persons could ever have contemplated the use of such a commodity, if there was any reason for believing that it would give rise to lead poisoning. It is, of course, for this reason that government health authorities felt it necessary to conduct extensive and expensive investigations. Everyone who has worked in any extensive way on this problem has concluded that there is no such danger. Despite that fact, those of us who have had direct responsibility for experimental work in this field have been keeping our eyes and ears open for any evidence indicating that our conclusions might be in error. I believe I can say safely that my associates and I have had more experience with this question than any other persons or combinations of groups anywhere. Fifteen years of experience has not afforded us the slightest reason for changing the opinions originally based on experimental observations.

I trust I have given you the information required, but if I can be of any further service in connection with your case, please do not hesitate to let me know. As a doctor and a medical investigator, I feel it is important that these cases be settled on their merits.

Very truly yours,

Robert A. Kehoe, M. D.

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Enc.

P. S. I am sending two other reprints which may be of interest to you.

RE 0004529

WILLIAM A. BISHOP, M. D.
699 BEACON STREET
BOSTON MASS.

December 8, 1941

Dr. Robert Kehoe
Kettering Laboratory
College of Medicine
Eden Avenue
Cincinnati, Ohio

Dear Dr. Kehoe:-

For a number of years I have been interested in the problems of Industrial Medicine and frequently am requested by various insurance companies to make examinations and report on cases in which disability is claimed as the result of conditions arising out of a workman's employment.

In August 1941 I was requested by the United States Fidelity & Guaranty Co., to examine a gasoline station attendant who under the Workman's Compensation Act of Massachusetts was claiming disability from lead poison allegedly from the use of regular Socony gasoline. I have had to see a number of cases of lead poison but have never had such a claim made by a garage worker or gasoline station attendant before.

I am informed that some time in the near future this case will come up for trial before the Industrial Accident Board, and I have been endeavouring to secure information relative to the possible effects of the contact with gasoline containing tetra ethyl lead. One of my first inquiries was to inquire how much tetra ethyl lead is contained in regular Socony gasoline. Inquiry of Mr. M. A. Taylor of the Boston office of the Ethyl Corporation would indicate that one part in thirteen thousand is the proportions in regular Socony gasoline. It was at this time that Mr. Taylor suggested that possibly you could furnish me with facts regarding the action or effects of tetra ethyl lead in such concentration, and I would appreciate very much any data or remarks that you might care to forward to me. Am I correct in believing that of all the lead compounds tetra ethyl lead is the only one that can possibly be absorbed thru the unbroken skin? I have the feeling that this will be one question that we will have to meet.

I am enclosing a copy of a report that I rendered to the Insurance Company on my examination made on Aug. 18, 1941. Another point that will probably be made is the fact that my negative examination was made so long after the first evidences of alleged lead poison was noted that the signs had time to disappear. It has been my impression that lead line if presented lasts a number of months, yet at the time I examined him he still complained of pain in the lower abdomen (now and then". Surely if this abdominal pain on Aug. 18th is to be attributed to the persistence of lead poison (even tho he had stopped washing his hands in gasoline back in April) would you not expect the lead line to persist and evidences in the blood be present?

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