July 1, 1936

Dr. A. Ray Wiley
512 Medical Arts Building
Tulsa, Oklahoma

Dear Dr. Wiley:

I am glad to reply to your letter of June 17th and to give you the facts with regard to exposure to leaded gasoline. I shall summarize these facts briefly in my letter, but I shall send you under separate cover two articles which refer to all the literature on the subject, and which give the details of investigations made for the purpose of determining the facts.

Exposure to leaded gasoline is apparently not more dangerous than is exposure to any ordinary gasoline. The lead compound present in gasoline to the extent of never more than 1 part in 1260, and usually in considerably lower concentrations, does not result in lead absorption from skin contact, or from inhalation. Tetraethyl lead itself is a compound of low volatility and is absorbed directly through the skin. The absorption is generally interfered with by dilution in gasoline, and if the dilution is as high as 1 part of tetraethyl lead to 1000 of gasoline, skin absorption is completed prevented. Thus animals exposed for months to daily contact with leaded gasoline do not accumulate lead in their tissues, and when killed and analyzed after such exposure, do not show lead in greater quantities than can be found in the tissues of normal, unexposed animals. Likewise the volatility of gasolines is so much greater than that of tetraethyl lead that the vapors arising from tanks do not contain appreciable quantities of lead until between 40 or 50 per cent of the gasoline has been evaporated. Thus if half the gasoline is evaporated off, there will be at least 98 per cent of the lead left behind in the remaining gasoline. When gasoline is spilled and entirely evaporated, most of the lead goes with it, but under these circumstances the lead concentration has never been found to be high enough to be dangerous. A portion of the tetraethyl lead is left behind in a more or less waxy material, and is absorbed to some extent by the ground or by asphalt or concrete floors. This problem has been investigated in detail not only by ourselves, but by two governmental agencies, one in this country and one in Great Britain. No one has succeeded in finding evidence of the danger of lead absorption. The correctness of the experimental work has been amply confirmed, I believe, by the experiences of the last twelve years during which leaded fuel has been on the market. We have investigated numerous cases lf alleged injury, and have been quite unable to find any case of

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bona fide lead poisoning. Moreover our investigation of filling station attendants and garage mechanics has failed to disclose any evidence of significant lead absorption. Most of the complaints of injury have had to do with various types of dermatitis and skin irritation. These have not been different from the lesions associated with exposure to ordinary gasoline, and since the ingredients of Ethyl Fluid are not as irritating to the skin as gasoline, it is not to be expected that any lesion characteristic of lead would be found as the result of contact with gasoline.

We have no record of any examination of [redacted] As a matter of fact, we do not now and never have made periodic examinations of all men exposed to leaded gasoline, nor did we ever contemplate any such program. There are tens of thousands of such men in the country and it would not be possible to maintain medical supervision of all of the men who are connected with the handling of leaded gasoline. What we have done is to follow, from time to time, selected groups of men with the longest and worst exposures in order to arrive at definite conclusions as to the magnitude, if any, of the lead exposure associated with the handling of gasoline. Perhaps it is not quite clear to you that this occupation is and has been apparently entirely free of any incidence of lead poisoning. It was anticipated from the start that this would be the case on the basis of experimental evidence which indicated that no lead absorption occurred in this occupation. As a matter of fact, if there had ever been any evidence that the handlers of gasoline could absorb appreciable quantities of lead in their every day work, no one could ever have contemplated for a moment the continuance of the distribution of this type of gasoline. It has not been so much our purpose to study this problem from the point of view of its incidence of lead poisoning. Rather it has been our purpose to determine if there was any lead absorption. Rather obviously, with the absence of lead absorption, lead poisoning can not be expected to occur. I repeat that in my opinion the evidence is entirely sound and convincing that there is no danger of lead poisoning among gasoline handlers. Such cases of tetraethyl lead poisoning as have been seen, have all occurred in connection with manufacturing operations. (There have been a few cases of poisoning in gasoline refineries in connection with the cleaning of gasoline storage tanks which have contained gasoline over a period of years. A peculiar set of circumstances here resulted in some degree of lead exposure. This has been discussed in the literature and the cases have been reported. However, they have nothing whatever to do with the daily handling of gasoline in tank cars or in filling stations.) The matter is discussed to some degree in an article which I am sending you.

Now as to patient Mr. [redacted] I have gone over the information available on Mr. [redacted] and I have gone over your examination record with some interest. It would seem to me that if lead exposure were eliminated from the situation, the diagnosis would be fairly clear. It seems quite apparent from your physical examination, and from your report, that his

cardiovascular condition provides an adequate explanation of his illness. There is no specific evidence of lead absorption, and from what I have said in the paragraphs above, I think you will gather that I consider the history of exposure as entirely insignificant. From the story given me as to the onset of Mr. [redacted] illness, I should suspect that he had a slight cerebral accident. On the other hand, you have had the privilege of examining him and of going over his story with him in person, and your opinion on this point should be worth more than mine.

If there is any other way in which I can contribute any information on this patient, I should be very glad to do so.

Obviously there will be no charge for the reprints which I am sending you, nor will there any charge for the time which I have taken in studying the records and in writing you.

Very truly yours,

RAK:is

Robert A. Kehoe, M.D.