August 19, 1960

R. E. Eckardt, M D.
Esso Research and Engineering Company
Medical Research Division
P.O. Box 45
Linden, N.J.

Dear Doctor Eckardt:

The questions raised in your letter of August 17 impinge upon a matter which has been considered frequently in the past, and has been decided hitherto in a manner that differs both in principle and quantitatively fror that suggested in your postscript. I shall state both the principle and the concentration. If you find that these are inapplicable in practice to your problem, and will let me know the facts, I shall try to deal with your problem in some manner that may be made to apply generally.

In theory, white gasoline contains no tetraethyl lead; whether or not it contains some quantity of inorganic lead as a contaminant from a variety of possible sources is of some significance but is irrelevant so far as the tetraethyl lead industry is concerned. In fact, white gasoline may contain some tetraethyl lead, or some quantity of the organic degradation products of tetraethyl lead because of the manner of its transportation. There should never be contamination in excess of traces, and the criterion employed hitherto, with respect to its usage as a solvent, is that its content of tetraethyl lead should not be in excess of the error of the analytical method employed in a routine manner to detect such contamination. That is to day, that if you can prove the presence of TEL by the routine procedures the gasoline is contaminated, and, in keeping with general practice, it should be colored. At any rate it should <u>not</u> be used as a solvent in relation to <u>any</u> food product.

If you could be sure that any lead in the gasoline is derived from other sources than those you have indicated, i.e., from sources entirely unrelated to TEL - then the problem becomes one of setting a specification that will certainly not result in an appreciable contamination of a food product. I have no idea where your figure of 0.15 p.p.m. (as the average lead content of the food materials to which you refer) came from, and I would be interested to know. I have never seen it stated previously, although data on the mean daily intake of lead in the mixed food and mealtime beverages of normal, healthy, well-fed adults (on a moderate work load) is of about this order of magnitude - that is, the daily intake of lead in the composite samples of food (and milk or coffee taken at mealtimes) is about 0.30 - 0.36 mg., and the mean weight of the food is about 2 kilograms). I am also ignorant of the probable extent to which lead in such a solvent would be taken up by a food product subjected to extraction. I would suspect that your specification would be reasonably satisfactory, but I would tend to recommend a figure which

recurs over and over again in the determination of the lead content of natural food products - values of the order of 0.01 to 0.05 p.p.m. This is simply because, in the consideration of food materials generally, and their processing for human consumption, I prefer to recommend methods that will avoid studiously additions of lead, in microgram quantities, to our composite diet, in view of the fact that the opportunities for contamination are legion. In the consideration of emergencies, and of products that enter only slightly into the human dietary, one need not be quite so "sticky," but such precautions as I suggest, across the board, are necessary in order to avoid progressive increase in the lead content of our food along with the increase in the applications of modern technology (processing etc.) to the national food supply. The average situation, which is now satisfactory in the U.S.A., is such that the adult takes in about a third of a milligram of lead per day in his food. The amount which he can take in daily from this source (other factors remaining essentially unchanged), over a life time, and remain within the bounds of safety is somewhat less than 1 mg. per day and is not far from 0.6 mg. per day. This, as you can see, does not allow a tremendous leeway.

The foregoing remarks may or may not answer your questions satisfactorily, especially your second. They will, however, give you the basis in my thinking for the consideration of this and a host of kindred problems. If you should so desire I can supply you with the published evidence which is the physiological foundation of what I have said.

Sincerely yours,

Robert A. Kehoe, M. D.

RAK:ss