

November 29, 1967

Mr. G. A. Hunter, F.R.C.S.
First Assistant
The Radcliffe Infirmary
Oxford, England

Dear Mr. Hunter:

I have been neglectful of my correspondence for a time, by reason of my absence from my office much of the time for the past month. I regret the delay in replying to your letter of October 9, and I trust that I may not have caused you undue inconvenience thereby.

In the matter of injury to human skin due to contact with petrol (which is called gasoline, as you doubtless know, in this country), my associates and I, who for many years maintained a critical survey of all types of illnesses and injuries that were attributed to the presence of tetraethyllead (or to the mixture of tetraethyllead with the halogenated hydrocarbons that entered into the formulation of the antiknock compound) in gasoline, were never able to find any type of injury that was not produced in equivalent severity, by the base gasoline. In the early stages of the distribution of leaded gasoline (or petrol), there were many allegations of injury, the worst of which (aside from a few cases of severe reactions of "sensitization") resulted from gasoline-soaked clothing left in contact with the skin for some time. At that time, neither these patients, nor their physicians appeared to have any real concept of the capacity of gasoline to induce cutaneous damage, and we were put to the necessity, in some instances, of doing patch-tests with the specific base gasoline and with the leaded product, in search of specific effects. None were found.

The problem is a bit more complex at present, in that other additives are being introduced into gasoline, while there is also a much wider spectrum of petroleum hydrocarbons in much of present-day gasoline. Especially is there a much higher percentage of aromatic hydrocarbons, of higher toxicity. Nevertheless, I do not believe there is any valid evidence for the belief that the antiknock preparation adds to, or in any way augments the injurious effect of the gasoline alone.

You have referred to a statement of mine made in 1925 in connection with the contact of the skin with tetraethyllead. I have never taken the trouble to explain that statement, which turned out to be the result of carrying out my early observations with tetraethyllead containing traces of triethyllead oxide or carbonate. It was not recognized at that time that this decomposition product of tetraethyllead tended to form fairly promptly and that special precautions had to be taken to purify (and also to stabilize) tetraethyllead/. This publication was not too widely distributed and the matter was not of sufficient significance (or so it seemed to me) to call for correction. In any case, the statement was incorrect. The application of tetraethyllead, by itself, on the skin, causes no sensation of irritation and no evidence in the form of redness or swelling or cutaneous damage.

On the other hand the halogenated hydrocarbons, ethylene dichloride and (in aviation gasoline) ethylene dibromide, as well as other homologous halogenated compounds, are irritating to the skin (the dibromide is quite destructive) in concentrated form. However, the dilution in gasoline is sufficient to suppress this effect altogether and the effect cannot be differentiated from that induced by the gasoline.

You ask concerning the mechanism of action of the injurious effect, speaking of it as a chemical "burn". I do not like the term, since I think it is misleading. The mechanism of a thermal burn is difficult enough to explain, that is, when it is not directly responsible for the thermal death of cells, but it is, I think, relatively simple. On the other hand, chemical injury to cells, in the main, is a complex process, which varies, I suspect, from chemical compound to chemical compound. Perhaps the simplest way to look at the matter, in the face of our present ignorance of the details, is to consider the toxicity of a chemical to be an intrinsic characteristic, which is subject to description and quantitative measurement, but not to definition. I realize, of course, that the organic solvents, including the petroleum hydrocarbons, injure the skin by removing its oil, thus causing an appearance of dryness and desquamation. That, however, is a very incomplete description of the injurious process. I trust that my reply may be of some benefit to you.

Cordially,

Robert A. Kehoe, M.D.
Professor Emeritus of
Occupational Medicine

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P.S. I have not mentioned any other of the alkyllead compounds (except the triethyl group), but the same things can be said of tetramethyllead.

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