

May 2, 1940

Mr. Whitman Rice
The National Sugar Refining Co.
129 Front Street
New York City
New York

Dear Mr. Rice:

I am very sorry that I have no reprints or articles which deal in any precise fashion with the questions of lead tolerance in either food materials or in the air breathed by human beings. No doubt you are aware that there are two separate and distinct problems here. We have been interested in a long time experimental approach to these two problems and within the past several years we have been studying the question of lead in food by experimental work on human subjects who have been ingesting known quantities of lead in addition to that which was inevitably present in their diet. Briefly, to summarize our results, we have found that average individuals in the United States take in lead with their food in quantities per day which range from one-tenth of a milligram upward to as high as two milligrams. The mean for a large number of results on twenty-four hour food intakes is approximately one-third of a milligram of lead. At this level of lead intake, a very large proportion of the lead goes through the alimentary tract without absorption, but some is absorbed and there is thus a maintained level of lead in the blood and in the urine. For the blood the mean concentration is approximately .03 milligrams per 100 grams, while in the urine it is approximately .03 milligrams per liter.

On a daily intake of a milligram of lead per day, plus that found in the food, we have found that a normal individual reaches an approximate balance at the end of the first year, or thereabouts, so that from then on he puts out practically as much lead as he takes in. The larger proportion of this, about ninety-five per cent, is evacuated from the alimentary tract while the remainder is lost by way of the urine, and to some degree in the perspiration. We are studying another individual

on an intake of two milligrams a day, and after more than a year and a half, we have found substantially the same relationship here. I am not describing this experimental work in detail because it has not been completed and published. I cite it merely for the purpose of pointing out that it is not possible at present to say just what limits of lead intake in the food are safe. There are certain items in indirect evidence, but there is no present sound experimental background for setting a tolerance other than to say that for a long, long time we have been taking in lead in quantities of the order of magnitude mentioned above without any apparent injurious effects. It would appear from our observations that there is a rather large factor of safety but it would be presumptuous to state this as a fact. It would be foolish to try to support this point of view until more evidence has been obtained.

I expect to give a paper covering our studies at the meeting of the American Industrial Hygiene Association in New York on one of the days between June 4th and June 7th. Moreover when I have reprints of pertinent published articles, I shall be glad to send them to you.

As to the tolerance in terms of inhaled lead, we are somewhat nearer the truth. It is fairly generally accepted that exposure to particulate lead in the air in concentrations less than 1.5 milligrams per 10 cubic meters is reasonably safe. Above this level the danger of lead poisoning increases with increases in the concentration. We have been able to express the magnitude of exposure in terms of a level of lead excretion, and for all practical purposes we have established the fact that persons excreting lead up to the level of nearly one-tenth of a milligram per liter are substantially safe, while exposures which result in higher rates of lead excretion in the urine are dangerous. In terms of lead concentration in the blood, the safe level is approximately .06 to .07 milligrams per 100 grams, while above this figure the danger of poisoning increases with the increased concentration.

I am afraid that much more work will have to be done before we can give you the type of information which you would like to have with adequate precision. Nevertheless I believe some strides are being made in this direction and I am sure we know a great deal more now about the fate of lead when taken into the body than we did some years ago.

I shall put your name on
our reprint list for further publications when they
are available.

Sincerely yours,

RAK:is

Robert A. Kehoe, M.D.