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February 20, 1945

Dr. Robert A. Nehoe
 Lettering Laboratory of Applied Physiology
 College of Medicine
 Eden Avenue
 Cincinnati, 19, Ohio

Dear Dr. Nehoe:

I very much appreciated receiving your letter of February 3, which awaited my return from the East. My reason for sending you the copies of letters was that I wanted to be sure I was not in any way misquoting you. Your letter indicates something I already knew, which was that it is pretty easy for a layman to get the wrong viewpoint on a scientific matter.

I am particularly appreciative of the length to which you have gone into the matter, as it gives me considerable information I did not have. I always have had a question in my mind as to whether the weathering of spray material on the apples in any way reduces its toxicity. I presume this is something which could be determined.

We had lead poisoning here in this district last fall to a few of the Mexican Nationals. I expect to send you a report on this when it is available from the officials of the U. S. Public Health Service who were serving in the state for the Public Health Service Office. Briefly, several Mexicans were hospitalized and diagnosed by local doctors as lead poisoning. The number finally ran 25 to 30 and Major Forner and Dr. Laws of the U. S. Public Health Service of the State Public Health Service Office in Seattle made an investigation. The case histories of 19 men were taken of those who seemed the most likely ones to have acquired lead poisoning, and of these urine and blood tests definitely showed 9 of them to have lead poisoning. The case histories show that they had been organized into spraying teams and sprayed 10 hours a day for 7 days of the week for a period of two, three and four months, and during that time some of them drank out of spray taps; that is drinking the spray mixture itself, and most of them drank out of the ditches, using their hands as cups, when there was scum and spray in the water. One Mexican had eaten one apple and one had eaten a pear, so it was clearly shown that ingestion of the fruit had nothing to do with the injury.

The Public Health Service officials held a meeting with me. We were fearful that those who had partially recovered from the lead poisoning would again become ill and have to go to the hospital, and we, therefore, arranged to have all suspected cases sent to the hospital and in the meantime to

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WASHINGTON STATE APPLE ADVERTISING COMMISSION

Dr. Robert A. Kehoe
College of Medicine
Cincinnati, Ohio

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of them did start picking apples and immediately returned to the hospital. This showed conclusively that the picking of apples is far more dangerous because of the inhalation of spray material, than the spraying itself.

Our handling the matter in the manner which we did took care of everything and there was no further illnesses. However, it was a serious matter, particularly if the Mexican authorities had found out about it and had moved the Mexicans from this area before we had taken steps to correct the problem. The U. S. Public Health officials have drawn up several suggestions along the lines of proper sanitation on drinking water, and men not spraying too long at the time before being put at other work, which we feel will preclude the possibility of anything like this happening in the future.

The U. S. Public Health Service bulletin No. 267, dealing with the spray residue investigation made out here, much to the surprise of some officials who had not read it clearly, definitely pointed out this hazard and warned against it. Their findings that the picking of apples was ten times more hazardous than spraying and seven times more hazardous than thinning was pretty definitely borne out in the experience here this fall. The feeling of the officials here in connection with last fall's experience was that the actual picking of the apples during the short period it takes place does not represent a hazard, but it definitely does where the men involved have been spraying all summer and have already accumulated quite a heavy lead intoxication.

I thought this would be of interest to you. I am quite sure I have not expressed it as scientifically as I should, but I am sure it will be understandable to you even in my language. One point definitely brought out here was that the usual liability insurance in connection with orchard operations does not include occupational diseases. Insurance companies have agreed to include this coverage in the policy for a slight increase in the premium rate. Had some of these Mexicans who were leaded here returned to Mexico and then died from any cause whatsoever and a diagnosis had shown they had lead poisoning the matter might have become a very serious one.

With kindest personal regards.

Sincerely yours,



C. E. CHASE, Secretary-Manager

CEC:s

KE 0008475

February 3, 1945

Mr. C. E. Chase, Secretary-Manager,
Washington State Apple Commission,
Wenatchee, Washington.

Dear Mr. Chase:

I have received copies of the exchange of correspondence between you and Mr. Dunbar of the Food and Drug Administration, and this I have examined with considerable interest, since the subject of discussion is one in which I have taken some part for some time.

There is one aspect of this which seems to require a bit of explanation from me, but since you have made reference to it in your letter to Mr. Dunbar, I feel that it is only proper to send him a copy of this letter. I refer here to your remarks concerning my point of view on the feasibility of establishing a legal tolerance on lead arsenate. In order that there may be no misunderstanding, let me quote a sentence or two, "I believe Dr. Kehoe was of the opinion that the amount of lead on apples before being washed.....should be dangerous to public health if it were straight lead. However, the investigation by the Public Health Service indicated without doubt that this lead combined with arsenic was not dangerous to public health. The combining of the lead and arsenic therefore must have something to do with lessening the toxicity of both. I believe that Dr. Kehoe's thorough research in connection with lead alone indicated very clearly to him that something transpires in the combination to lessen the toxicity of lead."

The above quotation leaves something to be desired from the point of view of clarity. Moreover, through no intention of yours my opinion on this subject has been a little distorted. Without going into the question at the moment as to whether the time is right for a hearing on this subject, I should like to clarify my point of view so that there can be no mistaking it. Our experimental work on human subjects who ingested known quantities of lead in solution, in addition to that contained in other food, has demonstrated quite clearly that a daily intake of lead equivalent to (1) milligram in soluble form plus 0.25 milligram per day in the food, constitutes a level of lead intake that is potentially dangerous if continued indefinitely. Our subjects did not become ill on this or on higher dosage, but they accumulated lead at a regular rate and gradually approached a point which in terms of industrial exposure we have come to regard on

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adequate evidence as potentially dangerous. Mind you, this was not intermittent exposure such as that which characterizes that of the eaters of unwashed apples on the west coast. Rather it was regular daily ingestion of known quantities of lead over periods of years. On the basis of this evidence I would conclude that the ingestion of lead compounds of that order of magnitude would be potentially dangerous, provided the compound in question could be absorbed from the alimentary tract with anything like the ease and speed that occurred in our experiments. On this basis I would conclude, not that the toxicity of lead arsenate is less than that of the compounds we used, but rather that the lead compound available in spray residues of the type studied in the investigation of the Public Health Service, is relatively unabsorbable by the alimentary tract. It is true, of course, in the main, that lead exposure in the apple eaters is intermittent, and this intermittency may be the sole answer, practically speaking, to the problem at issue. On the other hand, the weathering of spray residue very probably results in some impairment of the solubility and absorbability of the spray residue. This would have to be demonstrated experimentally in order to be accepted, but quite possibly it is true. On the other hand, in some brief observations we have thought spray residues on apples are absorbed at least to a limited extent, and in fact we have no experimental support at present for the hypothesis advanced above. I think it would be very useful to carry out an experiment comparable to those we have done on soluble salts, in which a weathered spray residue on apples was used for the lead compound. By suitable preparation of apple powder an adequate amount of this material with a known concentration of lead and arsenic could be used and the curves of absorption, excretion and accumulation could be compared with those available for the soluble salts. This would be a laborious and time-consuming experiment, but it would be well worth doing, and in fact, we have considered doing it and probably shall when the pressure of war work is somewhat relieved. However, that is neither here nor there. The point I wish to make is that I have never said or supposed that lead arsenate is less toxic than other lead compounds. The evidence is actually to the contrary, for it appears that the toxic effects of the two radicals are additive. Now the question is one of the absorption from the alimentary tract.

I should not like to conclude these comments without making one observation. I am in agreement essentially with the conclusions arrived at by the investigators of the Public Health Service in their investigation on the west coast. However, from the purely scientific point of view in relation to the problem of lead absorption and lead metabolism, there is one flaw in this work. One does not know how much lead arsenate was ingested from day to day by the persons included in other observations. One knows roughly what was absorbed in terms of rates of lead and arsenic excretion, but one does not know the dosage, the periodicity of the dosage, nor the total duration of the day to day exposure. For this reason

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the analytical data can not be fitted into the picture which we have drawn in terms of day to day ingestion of known quantities of lead. For this reason it is not wise to draw too direct comparisons between our observations and theirs.

Finally with reference to the establishment of a legal tolerance, I feel that the big question relates not to a single source of exposure or a few sources of exposure, but rather to the composite dosage that citizens are likely to be exposed to under a given set of conditions in relation to a given tolerance. I feel that I could say with reasonable assurance, what levels of exposure in this manner should be permitted. On the other hand, I do not quite know how we can get at the information that will enable us to know what the composite sources of lead exposure in food will yield in various parts of the country. If I knew how to get at the latter with any reasonable assurance, I would be willing to express an opinion on what the tolerance should be and would feel that I could back my opinion with very sound evidence.

I trust that this will make my position entirely clear both to you and Mr. Dunbar.

Cordially yours,

Robert A. Kenoe, M. D.

RAK ef

C.C.: Mr. F. B. Dunbar, Commissioner,
Food and Drug Administration,
Federal Security Agency,
Washington, D. C.

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