September 21, 1960

Christine Einert, M.D.
Bureau of Occupational Health
Department of Public Health
2151 Berkeley Way
Berkeley 4, California

Dear Doctor Einert:

I hasten to reply as well as I can to your letter of September 16th. I do not have the clinical records of the two patients yet, but I expect to have them soon for forwarding to you. (I am dependent upon the courtesy of the patients and their physicians in obtaining the records.) I am enclosing copies of a report of a pertinent series of observations during which unsatisfactory tableware was used by a member of our staff (also an experimental subject) in the course of a balance experiment. (Certain deletions of identifying words and numbers make it possible to send this report to you for your information, but even so, I shall appreciate your exercise of some discretion in its use.)

In advance of these items of documentation (clinical records) I am setting down the essential facts. The two persons rendered ill by the use of the tableware were a recently married pair, the young wife being the laboratory technician of Dr. Morton Hamburger, Associate Professor of Internal Medicine in the Medical School, who is an extremely competent physician, a friend of mine of long standing, as well as a clinical investigator. Dr. Hamburger and a junior member of the Department of Internal Medicine, Dr. John Will, took care of both the husband and wife. The history relevant to the exposure to lead is quite clear, in that these two were married in June, went on a honeymoon to an Atlantic Coast beach and returned to Cincinnati to their small, but spic and span, and well-appointed apartment, on or about July 1st, in suburban Cincinnati (near the Kettering Laboratory). Both became ill at about the same time in the first week of August, with abdominal pain, quite severe at times, and other alimentary disturbances including constipation alternating with diarrhrea. Neither patient had fever at the onset but the husband had some irregular fever later. This appears to have been incidental. They were found to have stippling of the erythrocytes and the wife suffered a mild diminution in hemoglobin (a hypochronic anemia) which has not cleared up even yet.

Considering all aspects of the case history and the close acquaintance of the physicians with the patients, the existence of an intoxication was strongly suggested, but, while the pattern fitted lead intoxication, there seemed to be no source of exposure. (The pair had done some painting in their newly acquired apartment, but close questioning gave no basis for serious

consideration of this as a source of exposure to lead.) This was the situation when I was consulted. I suggested that samples of the blood and urine of both patients be obtained for analyses for metals and arsenic, and that I would see both patients as soon as I should find it convenient after I had obtained the results from the laboratory (this, admittedly is not the best clinical procedure, but Dr. Hamburger had examined this pair, and I had little hope of finding anything that had escaped him.)

The blood and urine of the husband and the blood of the wife were examined spectrographically; quantitative determinations of lead were made and the lines of other metallic elements were examined to determine whether or not any of them were indicative of unusual concentrations. The lead determinations proved to be the only source of information, they being indicative of the absorption of significant quantities of lead by both patients (reports attached).

Armed with this evidence, I examined the clinical records, conferred with the physicians concerned, and interviewed both patients at length in search of information as to their exposure to lead. In neither instance was evidence elicited of any exposure to lead, but a reference to the use of pottery tableware with a dull glaze, by the wife, and the recollection by the husband, of a black (dark)discoloration caused by heating an egg in one of the dishes, led to the consideration of this dubious clue, when I examined the contents of the apartment (two days later) with great care. Only three items among the contents appeared to be worthy of examination, since, in general, the staple articles on the shelves, as well as the refrigerated foods, were of the common brands that have been investigated thoroughly in The Kettering Laboratory over a period of years. Water was taken from the hot and cold taps in the kitchen (these having been untouched for nearly 2 weeks), in view of the possibility that the water-heater might be a source of contamination; two cups of the tableware (this was the sole type of tableware available for use in this household) were taken; and two packets of tea for use in test brewing were taken, for examination. (Some home-canned vegetables were considered but were left for later and more extensive sampling (after further questioning of the wife) if the other samples should yield negative results. The results of the tests of the cups have been reported to you, as have the other results which, as expected, were negative. This completes the clinical narrative, which is to be documented and filled in, as to details, in the clinical records.

Now as to the significance of the findings. There is no reasonable doubt as to the correctness of the diagnosis of lead poisoning in these two cases. The concentration of lead in the blood of [redacted], at the first sampling, was slightly below the level which, of itself, was capable of proving that a dangerous amount of lead had been absorbed by this patient. However, the period of exposure had been brief and a little more than two full weeks had elapsed since the exposure to lead had been terminated. The temporal relationships between the duration of exposure and the interval of freedom therefrom, were such as to establish the likelihood that the concentration

in the blood had been up to, or somewhat above, the threshold value (0.08 mg. per 100 g.) (No sample of the urine of [redacted] was supplied with the first sample of blood. A sample of small volume was supplied later and was examined for arsenic as a check on the possibility, which existed at that time, of the involvement of this element in the situation.) The initial analytical results on the blood and urine of [redacted] are clearly indicative of a dangerous degree of absorption of lead, the concentration in the blood being at a somewhat above the threshold level of danger (the average of the two results may be taken, or that obtained by the less variable dithizone method may be regarded as the nearer to the truth). This finding adds a degree of support to the interpretation of the result on the blood of [redacted]

Subsequent analyses (10 days later) of the blood and urine of the two patients demonstrated the occurrence of a reduction in the concentration of lead in the blood of both, and in the urine of the husband. The decrease was of modest proportions, thus indicating that the quantities of lead absorbed by these two had been considerable.

In view of the detailed history of these cases, together with the available information concerning the quantities of lead involved in the metabolism of lead under roughly corresponding conditions of dosage and time, it seems certain that the average daily intake of lead by each of the two patients was well in excess of 3 milligrams. Unfortunately, we have not investigated the intake, output and storage of lead, with the associated changes in the concentration in the blood, when the daily oral dose is in excess of 3 milligrams. One can extrapolate, conservatively, from the results obtained when the daily dose was 1, 2 and 3 mg. respectively, in addition to that which occurred incidentally in the diet, and I would judge that the dose required to produce the results shown by these two persons could hardly have been less than 10 mg. per day. It may well take an even higher level of dosage to produce blood levels of the order of 0.08 to 0.10 mg. per 100 grams within a month.

Considering now the likely dosage actually obtainable from this tableware, one recognizes that there was considerable variability from day to day, dependent upon the food. This pair had no other tableware; they used the plates, cups and saucers, the vegetable and salad dishes, and the soup bowls daily. They had fruit and green vegetables from her parents in plentiful quantity, and these were their principal dietary components. Salads with vinegar and oil, fruit, stewed fruit, and cooked fresh and uncooked (tomatoes were plentiful) vegetables, were used. They drank tea, coffee and fruit juices, the latter from glasses which were above suspicion. Considering the newness of their set of tableware, and the possibility, which is not a certainty, that they used many of the pieces (not just those on the top of the stack over and over), they had the maximum of opportunity to maintain a fairly high dosage every day. They ate out rarely during the month under consideration. (I am not sure about the existence or use of a pitcher, but glasses were used rather than mugs.)

Use of the tableware for storage of other than at meal time, seems to have been

negligible. The young wife - a capable laboratory technician - is a good housekeeper, and her things are kept in a clean and orderly condition. The dishes were not used for cooking, and rarely ever for warming things.

In my view it is not at all far fetched to conclude that this source of alimentary exposure to lead contributed in the aggregate to the ingestion of 10 mg. or more of lead per day, every day. This, I think - i.e., the regularity of this dose - is the factor that was somewhat unusual in this situation. Many, if not most, housewives use different dishes in the kitchen (or breakfast alcove), than they do in the dining room. If husband or wife or both have lunch away from home, the meals at home number two per day. Under these circumstances the use of the potentially dangerous dishes would be fifty per cent or less of the time, and the dose of lead per day would be reduced materially. Since time is one of the most important factors in the overall dosage, intermittency of dosage may well make the difference between danger and freedom from danger.

With reference to your problem of protecting the public, I should say that no very useful purpose would likely be served by warning the possessors of this brand of tableware that they should turn it in to the dealers from whom it was purchased. I would insist, however, that this is dangerous ware and that it must be called back from the dealers who are now handling it. I feel certain that there have been and will continue to be other cases of lead poisoning among the owners of such tableware. These will be mild, in all likelihood, because of the variance in the usage of these dishes, but these cases in Cincinnati cannot be unique. Most of such cases, moreover, will not be recognized as lead poisoning, for even when the symptoms are characteristic or fairly so, mild cases being what they are, almost no one will be aware of the source of exposure. Moreover, satisfactory analytical facilities, in association with general clinical facilities, are so rare as to make case-finding of this sort a most unlikely circumstance. Indeed, I, myself, who has probably seen about as many cases and types of poisoning as almost anyone in the country, did not think these were cases of lead poisoning until I had seen the patients and had talked to them myself. Even so, I would have been very dubious, without the analytical evidence of the significance of their exposure.

There is one other thing which I would do if I were a responsible officer of your State. I would look into the putput of articles of this sort by other and similar organizations. This situation fills me with concern, amounting to dismay. If the artists and craftsmen of this type in the United States are operating in ignorance or disregard of common technical knowledge and skill, they should be ferreted out and put on the proper course, for they are a source of considerable hazard to the community. I cannot believe this is common in the U.S.A., for lead poisoning is rare among the adult population except in relation to occupational exposure, but it may be much more common than we know. I have certainly learned something from this experience, and I shall be more alert in the future. I do not believe, however, that anything but confusion and anxiety will come out of a public announcement or warning to the public.

We shall write up these cases for the information of our colleagues, both as an example of a public danger, and as an example of the kind of evidence that must be obtained to reach a valid diagnosis.

Sincerely yours,

Robert A. Kehoe, M. D.

RAK:ss

Enclosures - copy of report on a set of dinnerware.
copies of 4 analytical reports of patients