

## CADMIUM POISONING FROM A REFRIGERATOR SHELF USED AS AN IMPROVISED BARBECUE GRILL

Timothy D. Baker, M.D., M.P.H.

William G. Hafner, M.D., M.P.H.

ON THE MORNING of June 11, 1959, the Syracuse district office of the New York State Department of Health investigated a report of alleged food poisoning in a family of two adults and two children. According to the report given by the father, within 1 hour after the evening meal the previous day all members of the family experienced headaches followed almost immediately by severe nausea and vomiting. The symptoms persisted until midnight, when they began to subside. No ill effects were noted the next day.

The meal, eaten by the family at 7 p.m., was prepared out of doors and consisted of the following items: boiled potatoes, tossed green salad without dressing, commercially canned string beans, steaks grilled over an outdoor barbecue, soft drinks for the children, and one glass of beer for each adult. No dessert was eaten.

Since none of the food was available for analysis, a careful epidemiological investigation was made. It was learned that all foods were freshly prepared under sanitary conditions. The salad and drinks were prepared in glass containers. The string beans were commercially canned and were freshly opened. The steak, of the prepackaged type, appeared fresh. It had been purchased 4 days earlier at a local supermarket and had been kept under refrigeration until the time of use.

The father had not eaten his noon meal at home and yet was affected by the illness. All members of the family ate portions of all the foods except the beverages. The investigation did not reveal the presence of any obvious staphylococcal lesions on members of the family.

On further questioning, it was learned that the steak was grilled on an improvised outdoor barbecue. The grill consisted of an old refrigerator shelf which was being used for this purpose for the first time. Cadmium poisoning was suspected, and the shelf was submitted to the Syracuse Police Department laboratory for chemical analysis of the plating remaining on the unburned portions. This examination revealed that the metal contained cadmium in greater than trace amounts.

### Discussion

Cadmium has long been recognized as a potentially toxic material. One of the first cases of cadmium poisoning was reported in 1858 in Belgium and was due to inhalation of cadmium fumes. In 1866, a case of cadmium poisoning by ingestion was reported from India.

Up to 1942, 346 cases had been reported in the literature (1). The majority of these cases were attributed to ingestion because the series included large outbreaks of food poisoning resulting from cadmium-plated containers. A number of outbreaks have been reported since 1942 from such sources as fruit-flavored pop-sicles prepared in cadmium-plated ice trays and alcoholic beverages mixed in a cadmium container. Poisoning from Algerian wine which had been stored in a cadmium-plated crock has also been cited (2).

---

*Dr. Baker is assistant dean of the Johns Hopkins University School of Hygiene and Public Health, Baltimore, Md. Dr. Hafner is district health officer for the New York State Department of Health, Syracuse.*

The literature carries many reports of poisoning by inhalation (3-7). However, the symptoms of inhalation are so different from cadmium ingestion that the two conditions could not be easily confused. Although heat was involved in the present cases, the symptoms were not in any way similar to those resulting from the inhalation of cadmium fumes.

Cadmium ingestion rarely leads to death, while cadmium inhalation often does. Our search of the literature reveals only one report of death from ingestion of cadmium, and this apparently resulted from direct ingestion of a considerable quantity of cadmium chloride rather than dissolved cadmium plating (8). (Although this case was reported from Calcutta in 1866, it appeared to be authentic.) Dreisbach (9) reports two recent deaths from cadmium ingestion but gives no details, and the original articles could not be located.

As little as 10 mg. of cadmium has been reported to cause the familiar symptom complex of headache, nausea, vomiting, diarrhea, salivation, stomach pains, and muscular pains occurring 1/2 to 2 hours after ingestion. Also, cadmium usually affects all persons who have ingested it, in contrast with bacterial food poisonings which often spare a number of exposed individuals (10).

Cadmium metal melts at 320° C. and boils at 778° C. It is possible that a charcoal fire would melt cadmium plating on any material used as a grill. The fire would also oxidize cadmium and loosen it from its bond to the base metal. That this was, in fact, what happened was borne out by a close inspection of the shelf which revealed large areas where the plating had been scaled off and the base metal denuded. We therefore believe that, under the conditions described, the amount of cadmium ingested was sufficient to account for the illness.

## Summary

A cadmium-plated refrigerator shelf which was used as a barbecue grill for the first time apparently caused cadmium poisoning in a family in Syracuse, N.Y. All four members of the family became ill shortly after eating steaks prepared on this device. The symptoms were similar to those of chemical toxicity and more specifically of cadmium poisoning. Recovery of all those affected was spontaneous and without sequelae. This experience emphasizes the ever-present danger of eating food which has in any way come in contact with cadmium utensils.

## REFERENCES

- (1) U.S. Public Health Service: Cadmium poisoning. *Pub. Health Rep.* 57: 601, Apr. 24, 1942.
- (2) Monnet, R., and Sabon F.: Du danger de l'emploi de recipients cadmies pour la conservation des aliments et des boissons. *Presse méd.* 54: 677, October 1946.
- (3) Christensen, F. C., and Olson, E. C.: Cadmium poisoning. *A.M.A. Arch. Indust. Health* 16: 8, July 1957.
- (4) Friberg, L.: Proteinuria in chronic cadmium poisoning after comparatively short exposure to cadmium dust. *A.M.A. Arch. Indust. Health* 16: 30, July 1957.
- (5) Friberg, L.: Deposition and distribution of cadmium in man in chronic poisoning. *A.M.A. Arch. Indust. Health* 16: 27, July 1957.
- (6) Decker, L. E., et al.: Chronic toxicity studies. *A.M.A. Arch. Indust. Health* 18: 228, September 1958.
- (7) Manley, C. H., and Dalley, R. A.: A fatal case of cadmium poisoning. *Analyst* 82: 287, April 1957.
- (8) Hinder, J.: Poisoning by chloride of cadmium. *Indian M. Gaz.* 1: 156, June 1, 1866.
- (9) Dreisbach, R. H.: *Handbook of poisoning: Diagnosis and treatment.* Ed. 2. Los Altos, Calif., Lange Medical Publications, 1957.
- (10) Brookes, V. J., and Jacobs, M. B.: *Poisons.* Ed. 2. Princeton, N.J., D. Van Nostrand, 1958, p. 60.