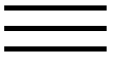


Extraction of lead, cadmium and zinc from overglaze decorations on ceramic dinnerware by acidic and basic food substances.

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Abstract

Dinnerware decorated with overglaze designs can release toxic metals into food substances in amounts high enough to constitute health hazards. When dishes made in the US before 1970 were filled with 4% acetic acid for 24 h, lead concentrations of up to 610 $\mu\text{g/ml}$ and cadmium concentrations of up to 15 $\mu\text{g/ml}$ were measured. Acetic acid leachates from more than half the dishes tested for lead (78 of 149) contained levels exceeding the US Food and Drug Administration (FDA) allowable concentration of 3.0 $\mu\text{g/ml}$. One-fourth of dishes tested for cadmium (26 of 98) exceeded the FDA limit of 0.5 $\mu\text{g/ml}$. High concentrations of lead, cadmium and zinc were also released into 1% solutions of citric and lactic acids. Significant amounts of these metals were extracted by basic solutions of sodium citrate and sodium tripolyphosphate, as well as by commercial food substances including sauerkraut juice, pickle juice, orange juice, and low-lactose

milk. Relative concentrations of lead, zinc and cadmium released depend on the leaching agent used. Citric acid leachates contain higher lead:cadmium and zinc:cadmium (but lower lead:zinc) ratios than do acetic acid leachates from nominally identical dishes. Repeated extractions with acetic acid show that even after 20 consecutive 24-h leachings many dishes still release lead in concentrations exceeding FDA limits.



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Keywords

Cadmium; Glazed ceramic dinnerware; Lead; Toxic metals; Zinc

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