TABLETS WERE NOTED in the vomitus of a 20-month-old girl. Unwitnessed, she had ingested a quantity of her grandmother’s medication from a prescription container labeled “Procardia XL, 30 mg” (Pfizer Inc, New York, NY). Examination of the vomitus revealed 9 tablets and some activated charcoal (Figure 1). Concern arose because the tablets did not match the appearance of Procardia XL tablets (Figure 2). A Procardia XL tablet was obtained from an inpatient pharmacy and rinsed under water (Figure 3). Figure 4 is a schematic drawing of the nifedipine Gastrointestinal Therapeutic System (GITS).

From the Department of Pediatrics, Children’s Memorial Hospital, Chicago, Ill.
Denouement and Discussion

Ingestion of Nifedipine Sustained-Release Tablets

Figure 1. Saliva and gastric fluid have dissolved the outer pink coating, revealing the bilayer brown and yellow appearance of the Gastrointestinal Therapeutic System.

Figure 2. Procardia XL 30-mg tablet (Pfizer Inc, New York, NY).

Figure 3. The tablet’s pink coating dissolves readily under tap water.

Figure 4. The nifedipine Gastrointestinal Therapeutic System.1

The nifedipine GITS is the key functional element in Pfizer’s extended-release Procardia formulation.1 This proprietary technology was designed to provide zero-order delivery of the drug over a 24-hour period. The convenient dosing regimen is believed to have improved compliance with calcium channel blocker therapy in hypertensive patients.2 Many pediatricians may be unfamiliar with this product, encountering it only in the setting of a suspected poisoning. A review of the product’s formulation design is necessary to understand the appearance of tablets after ingestion.

PRODUCT DESIGN

Nifedipine is poorly soluble in water. The GITS utilizes a “push-pull” osmotic pump process to control drug delivery.3 A 2-layer core is surrounded by a rigid cellulose acetate semipermeable membrane, allowing only water to enter.1 Osmotic forces move the drug from the lower “push” layer to the upper “pull” layer, where it is expelled through a precision laser-drilled hole (Figure 4).4 The tablet shell remains intact as it passes through the gastrointestinal tract, and ultimately, it appears in the stool. The manufacturer applies a thin, rapidly dissolving pink film over the surface of the tablet, obscuring the bilayer nature of the design.

PHARMACOKINETICS AND TOXIC EFFECTS

After a single GITS dosage, plasma nifedipine concentrations begin to rise in 3 hours and reach a plateau at 6 hours.3 Concentrations begin to decline at 24 hours, at which time the patient is recommended to take a second therapeutic dose. Even in therapeutic doses, the time to peak plasma concentration is known to be highly variable, as late as 24 hours, and may be affected by other stomach contents.5,6 In supratherapeutic ingestions, high levels of the drug may persist for several days.

The main toxic effects of nifedipine and other calcium channel blocking agents are hypotension and bradycardia.7 Additional toxic effects include nausea, vomiting, confusion, and hyperglycemia. Therapeutic interventions in face of toxic effects are directed primarily at the cardiovascular effects. Hypotension may require intravenous fluids and pressor agents. Administra-