

Toxic Ingestion

Background

Accidental and intentional exposures to toxic substances occur in children of all ages. Children younger than age 6 years are primarily involved in accidental exposures, with the peak incidence in 2-year-olds. Of the more than 2.5 million exposures reported by the American Association of Poison Control Centers' National Poison Data System in 2008, 51% occurred in children aged 5 years and younger, 6% in those aged 6–12 years, and 7% in those aged 13–19 years. Young children are also occasionally exposed to intentional poisoning through the actions of parents or caregivers.

Motor and cognitive developmental milestones achieved by the infant and toddler increase the risk for a poisoning. Children start to walk at about 1 year of age, and thereafter they can explore a much expanded environment. With well-honed gross motor skills, they can climb onto countertops and open cabinets. Fine motor skills, including a newly developed pincer grasp, allow them to undo the lids of containers and place small objects in their mouths. Their oral exploratory behaviours, matched with a lack of discriminatory abilities for potable versus nonpotable objects, put them at high risk for ingesting poisons.

Table 1. Substances most frequently involved in pediatric exposures (children younger than 5 years old)

Agent Ingested	%
Cosmetics and personal care products	10.7
Cleaning substances (household)	7.6
Analgesics	7.2
Topical preparations	5.4
Vitamins	3.1
Pesticides	2.8
Plants	2.6
Antihistamines	2.5
Gastrointestinal preparations	2.3
Antimicrobials	2.2
Arts/crafts/office supplies	1.8
Hormone and hormone antagonists	1.6

Historical Investigation

History should be taken from the parents and all individuals present at the scene. A complete history should be taken, with special attention to the possibility of exposures to the child. If the patient is in acute distress an AMPLE (allergies, medications, past medical history, last meal, events leading to this presentation) history may be sufficient until the patient is stabilized.

It may be crucial to determine all of the kinds of poisons in the home. These may include drugs used by family members, chemicals associated with the hobbies or occupations of family members, or the purity of the water supply. Unusual dietary or medication habits or other clues to the possible cause of poisoning should also be investigated.

Clinical Presentation

Specific clinical presentation of toxic ingestion is highly variable depending on the nature of the substance. Patients may initially have no symptoms or they may have varying degrees of overt intoxication. Common signs and symptoms associated with poisoning include:

- Nausea and Vomiting
- Coma
- Hypothermia
- Hypotension
- Hypertension
- Arrhythmias
- Seizures
- Hyperthermia

Physical Exam

Inspection

- Note any agitation, confusion or obtundation.
- Examine the skin for cyanosis or flushing, excessive diaphoresis or dryness
- Signs of injury or injections, ulcers, bullae

Head and Neck

- Examine eyes for pupil size, reactivity, nystagmus dysconjugate gaze or excessive lacrimation.
- Examine oropharynx for hypersalivation or excessive dryness

Respiratory and CV Exam

- Auscultate lung fields to assess for bronchorrhea or wheezing
- Determine rhythm, rate and regularity of heart beat.

Abdominal Exam

- Note presence of bowel sounds, enlarged bladder and abdominal tenderness or rigidity.

Neurological Exam

- Examine cranial nerves, tendon reflex, muscle strength, coordination and gait.

Laboratory Investigations

The following tests are recommended for screening:

- Serum osmolality
- Osmol gap
- Electrolytes
- Glucose
- Creatinine
- Blood urea nitrogen (BUN)
- Serum acetaminophen and ethanol
- Urinalysis (eg, oxalate crystals with ethylene glycol poisoning, myoglobinuria with rhabdomyolysis)
- Electrocardiography

Approaches to Treatment of Toxic Ingestion/Poisoning

Treatment of poisoning or potential poisoning has evolved over time, and general measures such as prevention of absorption and enhancement of excretion are only instituted when specifically indicated. Specific therapy should be directed at the specific drug, chemical, or toxin.

1. Contact local poison control centre- proper telephone management can reduce morbidity and prevent unwarranted or excessive treatment.
 - a. Deduce whether the ingested toxin is high risk (caustic solutions, hydrogen fluoride, drugs of abuse, and etc) or low risk.
 - b. If immediate danger is suspected, transport child to nearest health facility and instruct the parents that everything in the vicinity of the child that may be a cause of poisoning show be brought to the health care facility

2. Evaluation and Stabilization: When child presents at the emergency department, the principle treatment are attention to airway, breathing and circulations (ABCs).
3. Definitive Therapy of Poisoning
 - a. Prevention of Absorption
 - i. **Charcoal**- Charcoal is given with a cathartic such as sorbitol. The use of repeated oral charcoal with sorbitol doses is not recommended. There are some heavy metals, inorganic ions, boric acids, corrosives, hydrocarbons and alcohols that do not bind well to charcoal, it is best to contact poison control before administering.
 - ii. **Gastric Lavage**- nasogastric insertion of the largest possible tube with side holes and then proper position verified by air insufflation into the stomach for retrieval of gastric contents. The stomach contents should be emptied, and then lavage should be performed with 10 mL/kg (up to 200 to 300 mL) aliquots until the effluent is clear. The use of this procedure in patients is controversial. The clinical benefit has not been confirmed in controlled studies. It is no longer recommended by the American or Canadian Pediatric Societies. There are several indications for the use of gastric lavage including, poisoning with sustained-release preparations, mechanical movement of items through the bowel (eg, iron tablets) and poisoning with substances that are absorbed poorly by charcoal (eg lithium, iron).
 - iii. **Whole Bowel Irrigation**- the rationale behind this technique is to prevent absorption of ingested matters by inducing a liquid stool through use of an osmotically balanced polyethylene glycol electrolyte solution (PEG-ES). Administration of PEG-ES generally requires use of a nasogastric tube because of the large volume that must be ingested over a short period of time. Due to the lack of controlled clinical trials showing WBI improves clinical outcome, WBI is not recommended as a routine GI decontamination method for poisoned patient; it should be however be considered in certain situations (e.g, ingestion of a significant or life-threatening amount of medication, ingestion of illicit drug packets).
 - iv. **Ipecac Syrup** – it is an emetic (substance that induces vomiting). It is not to be used at home. It is almost never used in hospital either. It is only indicated in alert, conscious children who are older than six months and who have

ingested a potentially toxic amount of poison. Dosing (7% oral dose):

1. <6-12 months: 5-10ml PO once with 4-8 ounces of water, given only under medical supervision
2. 1-12 years: 15ml PO once with 1-2 glass of water; may repeat once with 15ml once if vomiting does not occur within 20-30 min
3. 13 years or older: as adults; 5-30ml PO once with 3-4 glasses of water; may repeat once with 15ml once if vomiting does not occur within 20-30 min

- v. **Cathartics**- Despite their widespread use, cathartics do not improve outcome. The use of cathartics should therefore be avoided; specifically they should never be used alone.

b. Enhancement of Excretion:

- i. **Urinary Alkalinization**- Drugs that are likely to respond to urine alkalisation usually meet 4 criteria:
 1. They are predominantly eliminated unchanged by the kidney
 2. They are distributed primarily in the extracellular fluid compartment
 3. They are minimally protein-bound
 4. They are weak-acids with pKa ranging from 3-7.5.
- ii. **Dialysis**- hemodialysis (or peritoneal dialysis if hemodialysis is unavailable) is useful in the treatment of a few poisons and in the general management of a critically ill patient. Dialysis should be considered part of supportive care if the patient satisfies any of the following criteria:
 1. Potentially life-threatening toxicity that is caused by a dialyzable drug and cannot be treated by conservative means
 2. Hypotension threatening renal or hepatic function that cannot be corrected by adjusting circulating volume
 3. Marked hyperosmolality or severe acidosis or electrolyte disturbances not responding to therapy
 4. Marked hypothermia or hyperthermia not responding to therapy.

References:

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