Chapter 09
Toxicologic Emergencies

Objectives
- Define poison.
- Explain the role of a Poison Control Center.
- Describe the routes of entry of toxic substances into the body.
- Explain why children are at risk for toxic exposures.
- Identify the pediatric age group at the greatest risk for unintentional poisoning.
- Define toxidrome.

Objectives
- List five common toxidromes and typical signs and symptoms associated with each.
- Describe the general management principles for a toxic exposure by ingestion.
- List the principles of gastric decontamination.
Objectives

- Identify the types of ingestions for which activated charcoal should be used.
- Describe the use of specific therapies for poisonings caused by acetaminophen, beta-blockers, calcium channel blockers, iron, opiates, salicylates, and tricyclic antidepressants.

Poisons

- A poison is a substance that, on ingestion, inhalation, absorption, application, injection, or development within the body in relatively small amounts, may cause structural damage or functional disturbance.

Solid Poisons

- Poisons can be found in four forms: solid, liquid, spray, or gas.
  - Solid poisons include medicines, plants, powders.
  - Examples:
    - Laundry detergent
    - Automatic dishwasher detergent
    - Granular pesticides
    - Fertilizers
Poisons

- Liquid poisons
  - Lotions
  - Liquid laundry soap
  - Furniture polish
  - Lighter fluid
  - Syrup medicines

- Poisons in spray form
  - Insecticides
  - Spray paint
  - Some cleaning products

Poisons

- Gases or vapors that are poisonous (invisible poisons) include:
  - Carbon monoxide from hot water heaters and furnaces
  - Exhaust fumes from automobiles
  - Fumes from gas or oil burning stoves

Poisons – Routes of Entry
Poisonings

- Poisonings may be unintentional or intentional
  - Most poisonings are unintentional (accidental)
    - Dosage errors
    - Idiosyncratic reactions
    - Environmental exposure
    - Occupational exposure
    - Childhood poisoning

Poisonings

- Intentional poisonings
  - Acts of terrorism
  - Suicide (self-poisoning)
  - Homicide (murder)

Poison Control Centers

- 1-800-222-1222 is the telephone number for every poison center in the United States
- Call this number 24 hours a day, 7 days a week to talk to a poison expert
Toxic Exposure
and the Pediatric Patient

Children at Risk

- Developmental characteristics
  - Curious by nature
  - Mobile
  - Explore their environment by putting most things in their mouths
  - Imitate the behavior of others
  - Inability to discriminate a toxic substance from a nontoxic one
  - Drawn to attractive packaging and smell of many products found around the home

- Environmental characteristics
  - Toxic substances are often accessible to a child
    - Improper storage
    - Availability of substances in their immediate environment
  - Inattentiveness of caregiver/inadequate supervision
Poisonings

- Poisonings in older children and adolescents usually represent:
  - Manipulative behavior
  - Chemical or drug abuse
  - Genuine suicide attempts

Assessment of the Child with a Possible Toxic Exposure

Scene Safety

- Perform a scene size-up
- Ensure scene safety before proceeding with patient assessment
**History**

- What is the poison?
- How was it taken?
- When was it taken?
- Where was the child found?

**History**

- How much was taken?
  - Number of pills, amount of liquid
  - How many/amount available before ingestion?
  - How many/much now in the container?
  - Where is the substance stored?
- What is the child’s age? Weight?

**Toxidromes**
### Anticholinergic

<table>
<thead>
<tr>
<th>Signs/ symptoms</th>
<th>Agitation or reduced responsiveness, tachypnea, tachycardia, slightly elevated temperature, blurred vision, dilated pupils, urinary retention, decreased bowel sounds; dry, flushed skin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical agents</td>
<td>Atropine, diphenhydramine, scopolamine</td>
</tr>
<tr>
<td>Primary antidote</td>
<td>Physostigmine</td>
</tr>
</tbody>
</table>

### Cholinergic

<table>
<thead>
<tr>
<th>Signs/ symptoms</th>
<th>Altered mental status, tachypnea, bronchospasm, bradycardia or tachycardia, salivation, constricted pupils, polyuria, defecation, emesis, fever, lacrimation, seizures, diaphoresis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical agents</td>
<td>Organophosphate insecticides (malathion), carbamate insecticides (carbaryl), some mushrooms, nerve agents</td>
</tr>
<tr>
<td>Primary antidote</td>
<td>Atropine</td>
</tr>
</tbody>
</table>

### Opioid

<table>
<thead>
<tr>
<th>Signs/ symptoms</th>
<th>Altered mental status, bradypnea or apnea, bradycardia, hypotension, pinpoint pupils, hypothermia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical agents</td>
<td>Codeine, fentanyl, heroin, meperidine, methadone, oxycodone, dextromethorphan, propoxyphene</td>
</tr>
<tr>
<td>Primary antidote</td>
<td>Naloxone</td>
</tr>
</tbody>
</table>
**Sedative/Hypnotic**

<table>
<thead>
<tr>
<th>Signs/ symptoms</th>
<th>Slurred speech, confusion, hypotension, tachycardia, pupil dilation or constriction, dry mouth, respiratory depression, decreased temperature, delirium, hallucinations, coma, paresthesias, blurred vision, ataxia, nystagmus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical agents</td>
<td>Ethanol, anticonvulsants, barbiturates, benzodiazepines</td>
</tr>
<tr>
<td>Primary antidote</td>
<td>Benzodiazepines: flumazenil</td>
</tr>
</tbody>
</table>

**Sympathomimetic**

<table>
<thead>
<tr>
<th>Signs/ symptoms</th>
<th>Agitation, tachypnea, tachycardia, hypertension, excessive speech and motor activity, tremor, dilated pupils, disorientation, insomnia, psychosis, fever, seizures, diaphoresis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical agents</td>
<td>Albuterol, amphetamines (e.g., “ecstasy”), caffeine, cocaine, epinephrine, ephedrine, methamphetamine, phencyclidine, pseudoephedrine</td>
</tr>
<tr>
<td>Primary antidote</td>
<td>Benzodiazepines</td>
</tr>
</tbody>
</table>

**Memory Aids**
Anticholinergic Syndrome

- Mad as a hatter—confused delirium
- Red as a beet—flushed skin
- Dry as a bone—dry mouth
- Hot as Hades—hyperthermia
- Blind as a bat—dilated pupils

Cholinergic Syndrome

- "SLUDGE"
  - Salivation
  - Lacrimation
  - Urination
  - Defecation
  - Gastrointestinal distress
  - Emesis
- "DUMBELS"
  - Diarrhea
  - Urination
  - Miosis (pinpoint pupils)
  - Bronchospasm/
    - Bronchorrhea/
    - Bradycardia
  - Emesis
  - Lacrimation
  - Salivation

Odors and Toxins

<table>
<thead>
<tr>
<th>Odor</th>
<th>Toxin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>Acetone, isopropyl alcohol, salicylates</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Ethanol, isopropyl alcohol</td>
</tr>
<tr>
<td>Bitter almonds</td>
<td>Cyanide</td>
</tr>
<tr>
<td>Carrots</td>
<td>Water hemlock</td>
</tr>
<tr>
<td>Fishy</td>
<td>Zinc or aluminum phosphide</td>
</tr>
<tr>
<td>Fruity</td>
<td>Isopropyl alcohol, chlorinated hydrocarbons (e.g., chloroform)</td>
</tr>
<tr>
<td>Garlic</td>
<td>Arsenic, organophosphates, DMSO, phosphorus, thallium</td>
</tr>
<tr>
<td>Glue</td>
<td>Toluene</td>
</tr>
<tr>
<td>Mothballs</td>
<td>Camphor</td>
</tr>
<tr>
<td>Pears</td>
<td>Chloral hydrate, paraldehyde</td>
</tr>
<tr>
<td>Rotten eggs</td>
<td>Sulfur dioxide, hydrogen sulfide</td>
</tr>
<tr>
<td>Shoe polish</td>
<td>Nitrobenzene</td>
</tr>
<tr>
<td>Vinyl</td>
<td>Ethchlorvynol</td>
</tr>
<tr>
<td>Wintergreen</td>
<td>Methyl salicylates</td>
</tr>
</tbody>
</table>
General Management Guidelines

- Ensure adequate airway, ventilation, and circulation
- If cervical spine trauma is suspected, manually stabilize until fully immobilized to a backboard or c-spine cleared
- Thorough history and focused physical exam
- Consider hypoglycemia in an unresponsive or seizing patient
  - Check blood sugar
- Cardiac monitor
- Obtain vascular access as indicated

General Management Guidelines

- Consult with a poison control center as needed
  - Decontamination procedures as indicated
  - Opioid overdose: naloxone
  - Organophosphates: high-dose atropine
  - Tricyclic antidepressants: sodium bicarbonate
  - Beta-blockers: glucagon
  - Dystonic reactions: diphenhydramine

General Management Guidelines

- Frequently monitor vital signs and ECG
- Safely obtain any substance or substance container of a suspected poison and transport it with the patient
Decontamination

- Decontamination methods used depend on the toxin and type of exposure

Decontamination—Skin

- Don appropriate personal protective equipment (PPE)
  - May include specific clothing and respiratory gear
- Remove child’s clothing and place it in plastic bags
- Flood exposed areas of the skin with water to remove residual material from the skin
  - Avoid contaminating uninvolved areas
- Wash exposed areas with soap and water for 10 to 15 min with gentle sponging

Decontamination—Eyes

- Don appropriate PPE
- Remove child’s clothing and place it in plastic bags
- Irrigate exposed eye with saline or lukewarm water for at least 20 min
  - Alkali exposures require 30 to 60 min of irrigation
- Attach IV tubing to a bag of NS
  - Use end of IV tubing to flush eye
- Attach nasal cannula to bag of NS
  - Use to flush both eyes
Gastrointestinal Decontamination

**Purpose**
- Prevent further absorption of the toxin by removing it from the GI tract or binding it to a nonabsorbable agent

Charcoal
- Treatment of choice for substances that can adsorb onto charcoal
- Insertion of a tracheal tube is essential in a patient with a depressed gag reflex or altered mental status, especially in those undergoing gastric lavage
**Gastrointestinal Decontamination**

**Gastric lavage**
- **Indications**
  - Orogastric lavage may be useful:
    - In patients who arrive within 1 hour after a life-threatening ingestion
    - And/or those who are obtunded
  - Decision to lavage should be made in consultation with a toxicologist or poison control center
- **Contraindications**
  - Caustic or hydrocarbon ingestions
  - Co-ingestion of sharp objects

**Administration, orally or via gastric tube, of polyethylene glycol solution to mechanically cleanse the GI tract**
- Large volume
- Rapid rate of administration

At present, there is no conclusive evidence that whole-bowel irrigation improves the outcome of poisoned patients.

**Specific Drug Ingestions**
**Aspirin (Acetylsalicylic Acid)**

**Description**
- Common antipyretic, analgesic, anti-inflammatory agent
- More than 200 products contain aspirin
- Metabolic acidosis common in children
- Common products:
  - Pepto-Bismol
  - Excedrin
  - Alka-Seltzer

**Signs/symptoms**
Early signs and symptoms include tachypnea, diaphoresis, hyperpyrexia, vomiting, and tinnitus or deafness
- Mild—nausea/vomiting
- Moderate—tachypnea, tinnitus, dehydration, confusion, fever, metabolic acidosis, respiratory alkalosis
- Severe—severe metabolic acidosis, coma, seizures, renal failure

**Interventions**
- ABCs, O2
- Activated charcoal appropriate for stable patients
- Should not be given to moderately or severely ill patients
- Start IV for moderate to severe ingestion
- Fluid resuscitation if shock present
- Alkalization of urine with sodium bicarbonate
- Severe poisonings require hemodialysis
Acetaminophen

**Description**
- Common analgesic with antipyretic properties
- One of the five most common drugs ingested by children
- Rapidly absorbed from GI tract and metabolized by liver
- Common products:
  - Nyquil
  - Percogesic
  - Comtrex

**Signs/symptoms**
- Initially, mild nausea or no symptoms
- Does not usually present with altered mental status in the first 24 hours; mental status changes suggest poly-drug overdose
- Over several days, vomiting, abdominal pain, and jaundice occur caused by potentially fatal injury to the liver
- Increased liver enzymes

**Interventions**
- ABCs, O2, IV fluids, activated charcoal
- Draw liver enzymes, acetaminophen/paracetamol level
- Specific antidote is N-Acetylcysteine (NAC or Mucomyst)—very effective; give within 8 hours of ingestion
### Barbiturates

**Description**
- Highly toxic agents that depress the CNS; anticonvulsant properties
- High abuse potential
- Alcohol enhances toxicity
- Common products: pentobarbital, phenobarbital, secobarbital, amobarbital

**Signs/symptoms**
- Dysrhythmias, hypotension, hypothermia
- "Barb blisters"—hemorrhagic blisters over areas of pressure that develop about 4 hours after ingestion
- Ataxia, slurred speech, flaccid muscle tone; respiratory depression and apnea may occur with severe overdoses
- Infants born to addicted mothers will be physically dependent on the drug and will show signs of withdrawal within 72 hours of birth (high-pitched cry, tremors, vomiting, seizures)

**Interventions**
- ABCs, O2, IV, monitor
- Activated charcoal; intubate if needed
- Urine alkalinization with sodium bicarbonate can increase phenobarbital excretion; consider hemodialysis
- Treat barb blisters as second-degree burns
- Possible fluid challenges and vasopressors to maintain blood pressure
Beta-blockers

**Description**
- Small ingestions may cause serious toxicity in infants.
- Slow-release forms may lead to delayed and prolonged toxicity.
- Common products: propranolol, metoprolol, atenolol.

**Signs/symptoms**
- Bradycardia with variable degrees of AV block and hypotension.
- CNS depression, ranging from drowsiness to coma, is a relatively common effect of beta-blocker toxicity and generally reflects the severity of the poisoning.

**Interventions**
- ABCs, O₂, IV, cardiac monitor.
- Treat bradycardia per resuscitation guidelines; have pacer at bedside.
- Glucagon is the treatment of choice for bradycardia and hypotension.
- Possible fluid challenges and vasopressors to maintain blood pressure.
Calcium Channel Blockers

Description
- Small ingestions may cause serious toxicity in infant
- Slow-release forms may lead to delayed and prolonged toxicity
- Common products: diltiazem (Cardizem), verapamil (Isoptin, Calan)

Calcium Channel Blockers

Signs/symptoms
- Bradycardia with variable degrees of AV block and hypotension, prolongation of QT interval, widening of QRS complex, right bundle branch block
- Altered mental status
- Hyperglycemia (secondary to blockage of insulin release); seizures, coma

Calcium Channel Blockers

Interventions
- ABCs, O₂, IV, cardiac monitor
- Treat bradycardia per resuscitation guidelines; have pacer at bedside
- Possible calcium chloride
- Possible fluid challenges and vasopressors to maintain blood pressure
### Carbamate Insecticides

#### Description
- Less toxic than organophosphates, although effects are similar
- Toxicity is usually limited to muscarinic effects; nicotinic effects uncommon
- Common products: flea and tick powders, ant killers

#### Signs/symptoms
- Muscarinic effects: vomiting, diarrhea, abdominal cramping, bradycardia, excessive salivation and sweating

#### Interventions
- Protective equipment, remove contaminated clothing, ABCs, O₂, IV, cardiac monitor
- Remove affected clothing
- Benefits of GI decontamination after ingestion are controversial because most patients have vomited before seeking medical assistance
- Atropine is given until signs of muscarinic toxicity are reversed
- Treat coma and seizures if they occur
### Caustics (Acids, Alkalis)

#### Description
- Alkaline agents cause deep penetration injury; tissue destruction continues until substance is significantly neutralized or concentration is greatly reduced.
- Common alkaline products: bleach, ammonia, dishwasher detergent, laundry detergent, drain and oven cleaners.
- Acids cause an immediate superficial injury; injury may continue to evolve for up to 90 min after the ingestion.
- Common acid products: sulfuric, hydrochloric, or hydrofluoric acid.

#### Signs/symptoms
- Severe burns to the stomach or esophagus may be present with little external evidence of the severity of the injury.
- Upper airway obstruction with difficulty breathing, speaking, or swallowing; GI hemorrhage, esophageal or gastric perforation.
- Vomiting, stridor, drooling—if 2 of these 3 symptoms are present, likelihood of GI burns is high (vomiting powerful predictor of severe esophageal injury).

#### Interventions
- Protective equipment, ABCs, O₂, IV.
- Priority = airway management.
- Flexible fiberoptic intubation over an endoscope is preferable to standard endotracheal intubation.
- Emergent cricothyrotomy may be necessary.
- Do NOT induce vomiting.
- Activated charcoal contraindicated.
- Controversy exists regarding whether or not attempts should be made to neutralize the caustic substance with water or milk.
  - If a history of significant ingestion with oral lesions or if child is otherwise symptomatic, perform endoscopy to determine extent of injury.
**Description**
- Used for the treatment of hypertension and sometimes used to alleviate opioid and nicotine withdrawal symptoms
- Available in pills and sustained-release transdermal patches
- Several pediatric cases of clonidine toxicity have followed ingestion, mouthing, or inadvertent dermal application of clonidine transdermal patches
- Severe toxicity has been reported after ingestion of as little as 0.1 mg (1 tablet) by a child

**Signs/symptoms**
- Altered mental status, pupil constriction, respiratory depression
- (Note: these symptoms can appear exactly like opiate toxicity making it difficult to distinguish clonidine ingestion from opiate overdose.)
- Hypotension, bradycardia, (may be initially hypertensive)

**Interventions**
- ABCs, O2, IV, cardiac monitor
- Treat coma, hypotension, bradycardia, and hypothermia (usually resolve with supportive measures such as fluids, atropine, dopamine, and warming)
- Naloxone may be helpful in reversing effects (conflicting evidence)
- Gastric decontamination
**Digoxin**

**Description**
- Used for treatment of congestive heart failure and supraventricular dysrhythmias
- Several plants contain cardiac glycosides (digoxin-like substances) including foxglove, oleander, and lily of the valley

**Signs/symptoms**
- Altered mental status, nausea and vomiting, abdominal pain, headache
- Almost any cardiac dysrhythmia may occur

**Interventions**
- ABCs, O₂, IV, cardiac monitor
- Activated charcoal
- Treat symptomatic or unstable dysrhythmias per resuscitation guidelines
- Gastric aspiration or lavage may increase vagal tone and precipitate bradydysrhythmias
- Administer antidote (Digibind) for life-threatening dysrhythmias caused by digoxin overdose
- Avoid calcium chloride and potassium when treating digoxin toxicity
## Ethanol (Ethyl Alcohol, Alcohol)

### Description
- In young children, alcohol suppresses the liver's ability to manufacture glucose; alcohol intoxication increases susceptibility to hypoglycemia and altered mental status.
- As little as 30 to 60 mL of 40% ethanol can cause altered mental status and hypoglycemia in toddlers.
- Common products: Ethanol can be found in many household products including aftershave lotions, cold/allergy medications, cough preparations, glass cleaners, mouthwashes, and perfumes/colognes.

### Signs/symptoms
- Characteristic breath odor
- Hypothermia, hypoglycemia in younger children
- Respiratory depression, altered mental status, slurred speech, sedation
- Gastric irritation, vomiting
- Myocardial depression, hypotension due to vasodilation

### Interventions
- ABCs, $O_2$
- Treatment is primarily supportive
- Administer glucose if hypoglycemia present
**Ethylene Glycol, Methanol**

**Description**
- Ethylene glycol ingestion leads to profound metabolic acidosis and coma; as little as 5 mL may be toxic to an infant
- Methanol, found in window-washer fluid or gas-line antifreeze, is metabolized to formic acid, with the same effect as ethylene glycol; as little as 15 mL may be toxic to an infant

**Signs/symptoms**
- Altered mental status with appearance of inebriation or reduced responsiveness, or coma
- Tachypnea, tachycardia, nausea and emesis, abdominal pain, muscle incoordination, seizures
- Blurred vision possible with methanol

**Interventions**
- ABCs, O₂, IV
- Administer glucose if hypoglycemia present
- Fomepizole antidote for methanol and ethylene glycol poisoning, indications for use are levels ≥20 mg/dL or high anion gap metabolic acidosis
  - Ethanol may be used when fomepizole is not available
  - Consider hemodialysis in severe cases
- Methanol level, glucose

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### Hydrocarbons

#### Description
- Toxic dose varies depending on agent involved and whether it was aspirated, ingested, or inhaled
- Common products:
  - Lamp oil
  - Gasoline
  - Lighter fluid
  - Kerosene
  - Furniture polish
  - Turpentine
  - Pine oil
  - Phenol

#### Signs/symptoms
- Coughing and choking on initial ingestion; gradual increase in work of breathing
- Odor of hydrocarbon on breath
- Dry, persistent cough; crackles, wheezes, diminished breath sounds, tachypnea
- Nausea/vomiting, dizziness, altered mental status, dysrhythmias possible
- May cause skin surface burns

#### Interventions
- Protective equipment, remove contaminated clothing and wash skin with soap and water
- ABCs, O₂, assist ventilations as necessary, anticipate need for intubation
- Activated charcoal contraindicated
- Consult Poison Control
**Iron**

**Description**
- In an infant, ingestion of 600 to 900 mg supplemental iron (generally 2 to 3 tablets) can cause severe toxicity
- In survivors, severe scarring and obstruction of GI tract may develop
- Common products: multi-vitamins, prenatal vitamins

**Signs/symptoms**
- Nausea (initial symptoms may appear flu-like), emesis and diarrhea, possibly with blood; abdominal pain
- Severely poisoned child may present with lethargy or coma and signs of shock

**Interventions**
- ABCs, O₂, IV (aggressive IV fluids)
- NOT bound to activated charcoal
- Antidote: deferoxamine (child’s urine will turn pink, salmon, or rose in color)
- Obtain abdominal radiograph because most iron tablets are radiopaque (except chewable vitamins and children’s liquid)
Isoniazid (INH)

**Description**
- Used in the treatment of tuberculosis; depletes vitamin B₆, which is required for synthesis of GABA, an inhibitory neurotransmitter. Reduced GABA concentration can lead to seizures.
- Initial signs of poisoning typically appear within 30 minutes to 2.5 hours of ingestion.

**Signs/symptoms**
- Slurred speech, dizziness, ataxia, vomiting, and tachycardia may progress to seizures or coma; metabolic acidosis, altered mental status, tachypnea, hypotension.

**Interventions**
- ABCs, O₂, IV
- Activated charcoal
- Treat coma, seizures, and metabolic acidosis if they occur
- Pyridoxine (vitamin B₆) is specific antidote and usually terminates diazepam-resistant seizures.
Isopropyl Alcohol

Description

- Isopropyl alcohol is a potent CNS depressant (twice as potent as ethanol) and is metabolized to acetone, which may contribute to and prolong CNS depression
- Adsorbs poorly to activated charcoal (approximately 1 g of charcoal will bind 1 mL of 70% alcohol)
- Widely used as a disinfectant and antiseptic

Isopropyl Alcohol

Signs/symptoms

- Altered mental status with the appearance of inebriation, slurred speech, reduced responsiveness, coma; tachycardia, hypotension, nausea and emesis, abdominal pain due to gastric irritation; hypoglycemia and hemorrhagic gastritis are possible
- Distinct breath odor of acetone (because isopropyl alcohol is metabolized to acetone)

Isopropyl Alcohol

Interventions

- ABCs, O₂, IV, cardiac monitor; monitor airway closely
- Treatment is primarily supportive—observe for at least 6 to 12 hours
- Administer glucose if hypoglycemia present
- Do NOT induce vomiting (risk of rapidly developing coma)
- Glucose level, serum isopropyl alcohol levels, basic metabolic profile, serum osmolality
- Large ingestion may require dialysis if coma or myocardial depression occurs
### Opioids

**Description**
- Common products: Codeine, fentanyl, heroin, meperidine, methadone, oxycodone, dextromethorphan, propoxyphene

**Signs/symptoms**
- Altered mental status, bradypnea or apnea, bradycardia, hypotension, pinpoint pupils, hypothermia
- Suspect opioid toxicity when the clinical triad of CNS depression, respiratory depression, and miosis (pinpoint pupils) are present

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**Interventions**
- ABCs, O₂, IV, cardiac monitor; cervical spine stabilization if trauma is suspected; tracheal intubation is indicated in patients who cannot protect their airway
- Obtain serum glucose level; give dextrose if indicated
- Administer naloxone for significant CNS and/or respiratory depression
- Larger than usual doses of naloxone may be required for diphenoxylate/atropine (Lomotil), methadone, propoxyphene, pentazocine, and fentanyl derivatives

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### Organophosphates

**Description**
- Widely used pesticides; signs and symptoms usually occur within 30 minutes to 2 hours of exposure but may be delayed up to several hours
- In the acute phase, there is no test that can identify organophosphate toxicity; initial management based on clinical findings
- Common products: No-Pest Strips, roach killers, diazinon, malathion, and parathion
### Organophosphates

**Signs/symptoms**
- Early signs are muscarinic: nausea, vomiting, abdominal cramps, urinary and fecal incontinence, increased bronchial secretions, cough, wheezing, dyspnea, sweating, salivation, miosis, blurred vision, lacrimation
- Nicotinic effects include twitching, fasciculations; death is usually caused by respiratory muscle paralysis
- There is frequently a solvent odor and some describe a garlic-like odor of the organophosphate

Pay careful attention to respiratory muscle weakness; sudden respiratory arrest may occur

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**Interventions**
- Protective equipment, remove contaminated clothing, decontamination procedures; ABCs, O₂, IV, cardiac monitor, administer activated charcoal
- Benefits of GI decontamination after ingestion are controversial
- Atropine is antidote for muscarinic effects; goal is drying of airway secretions to maintain oxygenation and ventilation—tachycardia is NOT a contraindication to use
- Pralidoxime is antidote for nicotinic effects
- If intubation is required, note potential interactions between neuromuscular blockers and organophosphates

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### Sedatives/Hypnotics

**Description**
- CNS depressants with primary effect of respiratory depression
- Category includes barbiturates, benzodiazepines, and antihistamines
Sedatives/Hypnotics

**Signs/symptoms**
- Slurred speech, confusion, hypotension, tachycardia, pupil dilation or constriction, decreased temperature
- Overdose in children tends to cause excitation rather than CNS depression

**Interventions**
- ABCs, O₂
- Activated charcoal
- Benzodiazepine antidote (flumazenil) as directed
  - Flumazenil should not be used routinely in setting of overdose

Tricyclic Antidepressants

**Description**
- Toxicity causes direct effects on vascular tone (vasodilation), decreased cardiac contractility, intraventricular conduction delays, and serious dysrhythmias including VT (most common), torsades de pointes, and AV blocks (less common)
- Progression from early to late symptoms may be rapid
- Common products: amitriptyline, desipramine, doxepin, trazodone, nortriptyline
### Tricyclic Antidepressants

#### Signs/symptoms
- Early signs: tachycardia, restlessness, anxiety, increased temperature
- Late signs (3 C’s): \textit{Coma}, \textit{Convulsions}, \textit{Cardiac dysrhythmias} (with widening of QRS complex, prolonged QT interval)
- Refractory hypotension, dilated pupils, slurred speech, dry mouth, urinary retention, seizures, altered mental status

#### Interventions
- ABCs, \textit{O}, IV, cardiac monitor
- Treat seizures, prevent injury
- Continuous ECG monitoring, even in the patient who is asymptomatic at presentation
- Treat symptomatic or unstable dysrhythmias per resuscitation guidelines; sodium bicarbonate is the primary treatment modality for severe intoxication
- If hypotension present, IV fluid bolus of 10 mL/kg; monitor for pulmonary edema; vasopressors for persistent hypotension
- Signs of significant toxicity (QRS prolongation, lethargy, or hypotension) mandate continuous monitoring until symptom free for 24 hours
Toxicity in Small Doses

Benzocaine

**Description**
- Found in many first aid ointments and infant teething formulas
- Benzocaine can cause methemoglobinemia (especially in infants younger than 4 months)
- Methemoglobinemia has occurred in an infant after ingestion of 100 mg of benzocaine (amount in ¼ teaspoon of Baby Orajel)
- Common products: Americaine Topical Anesthetic First Aid Ointment (20% benzocaine), Baby Orajel (7.5%), Baby Orajel Nighttime Formula (10%)

**Signs/symptoms**
- Symptoms begin 30 minutes to 6 hours after ingestion
- Tachycardia, tachypnea, cyanosis that does not respond to oxygen
- Agitation, hypoxia, metabolic acidosis, coma, seizures with more severe exposures
Benzocaine

Interventions

• Gastric lavage if patient presents within 30 minutes of ingestion and has ingested less than ¼ teaspoon of benzocaine-containing substance, followed by activated charcoal

• Antidote is methylene blue. Indication for use = methemoglobin levels above 30% and symptoms of respiratory distress or altered mental status

Camphor

Description

• Found in over-the-counter liniments and cold preparations

• Rapid acting neurotoxin that produces CNS excitation and depression

• Rapid onset of symptoms 5 to 120 minutes after ingestion

• Common products: Campho-Phenique (10.8% camphor), Vicks Vaporub (4.18%), camphorated oil (20% camphor), Mentholatum (9% camphor), Ben-Gay Children’s Rub (5%)

Camphor

Signs/symptoms

• Initial feeling of generalized warmth that may be followed by altered mental status (confusion, delirium, restlessness, hallucinations)

• Muscle twitching and fasciculations may precede seizures, but seizures may occur without preceding symptoms
Camphor

**Interventions**
- GI decontamination if it can be accomplished within 1 hour of ingestion followed by activated charcoal
- Seizures are managed with benzodiazepines, supportive care

Chloroquine

**Description**
- Used for treatment and prophylaxis of malaria and specific connective tissue diseases
- Powerful rapidly-acting cardiotoxin capable of causing sudden cardiorespiratory collapse
- One 300-mg tablet resulted in the death of a 3-year-old and 750 mg caused ventricular fibrillation in a 13-year-old

**Signs/symptoms**
- Bradycardia, ventricular tachycardia/fibrillation, torsades de pointes, profound hypotension, shock; drowsiness followed by excitability; dyspnea, sudden apnea; dysphagia, facial paresthesias, tremor, slurred speech, hyporeflexia, seizures, coma
Chloroquine

Interventions
- Diazepam appears to have a cardioprotective effect in chloroquine poisoning
- IV fluids and vaspressors as needed to manage hypotension, sodium bicarbonate for severe intoxication

Lomotil

Description
- Antidiarrheal that is a combination opiate/anticholinergic preparation
- Onset is biphasic—early anticholinergic toxicity, opiate toxicity delayed 8 to 30 hours
- Respiratory depression can occur as late as 24 hours after ingestion and does not appear to be correlated with the dose ingested and severity of symptoms

Lomotil

Signs/symptoms
- Signs and symptoms vary and depend on the time since the ingestion—manifestations may represent either anticholinergic or opioid intoxication; opioid effects often predominate
- Opioid—constricted pupils, respiratory depression, respiratory arrest
- Anticholinergic—dilated pupils; warm, dry skin; tachycardia, flushed face
### Lomotil

**Interventions**
- Naloxone—repeated doses may be necessary because duration of effect is much shorter than that of Lomotil; anticholinergic symptoms may appear when naloxone is given.
- Because of the risk of sudden respiratory arrest, admit and observe all children with Lomotil ingestion for at least 24 hours.

### Methyl Salicylate

**Description**
- **Mechanism:** salicylate toxicity
  - Oil of wintergreen contains 98% methyl salicylate; one teaspoon contains 7 g of salicylate (equivalent to 21 adult aspirin tablets).
  - Less than 1 teaspoon has resulted in a child’s death.
  - Common products: topical liniments (e.g., Ben Gay, Icy Hot Balm), oil of wintergreen food flavoring.

**Signs/symptoms**
- Onset of symptoms typically within 2 hours of ingestion
- Tachypnea, diaphoresis, hyperpyrexia, vomiting, tinnitus, hyperthermia, seizures, coma.
Methyl Salicylate

Interventions
- Activated charcoal, urine alkalinization, hemodialysis, serum salicylate level (toxicity of salicylates correlates poorly with serum levels)

Tetrahydrozoline (Imidazolines)

Description
- Structurally similar to clonidine
- Toxicity: 1 to 2 drops of 0.1% solution in infants
- Onset of symptoms delayed 2 to 6 hours after ingestion
- Common products: Visine (tetrahydrozoline), Afrin (oxymetolazine)

Signs/symptoms
- Initial hypertension followed by hypotension, bradycardia, seizures, coma
**Tetrahydrozoline (Imidazolines)**

<table>
<thead>
<tr>
<th>Interventions</th>
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<tbody>
<tr>
<td>- GI decontamination</td>
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<tr>
<td>- If initial hypertension severe, consider titratable medication (e.g., esmolol, nitroprusside)</td>
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<tr>
<td>- Fluids, vasopressors may be necessary for treatment of hypotension</td>
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**Questions?**