HYPOCHLORITES

Description

Hypochlorite salts (sodium, potassium, calcium and magnesium) in aqueous solution are used as bleaches, disinfectants, deodorizers and water purifiers. Produced by reaction of chlorine gas with water. Household bleach commonly contains 3-6% sodium hypochlorite (can be up to 10% in some products) and has a pH ranging from 10.5-11.0.
Dakin solution contains 1% sodium hypochlorite. Industrial products contain higher concentrations of hypochlorite salts (15-20%).
Chlorine bleach mixed with acidic products produces *chlorine* gas; mixed with ammonia produces *chloramine* gas. **See** CHLORINE.

Toxicity

Toxicity varies with concentration and duration of contact.
Dilute household bleach produces mild to moderate mucosal irritation; rarely causes serious burns.
Concentrated industrial bleach can produce severe caustic burns.
Inhalation of bleach mixed with acid or ammonia can produce respiratory irritation. **See** CHLORINE.

Mechanism of Toxicity

Hypochlorites upon contact with water or mucous membranes produce hydrochlorous and hydrochloric acids. Hypochlorite ion is a potent oxidizer. Toxicity results from corrosive effect of acids on skin and mucous membranes and from free radical production by hypochlorite ion.

Toxic Dose

Toxic dose varies with concentration of product.
Dilute household bleach: Unintentional ingestion of small quantities results in minimal toxicity. Deliberate ingestion of large amounts also typically results in minimal toxicity, although there have been case reports of more severe injury.
Concentrated industrial bleach: Ingestion of small quantities can result in severe burns.

Case Reports

ingestion In a case series of 74 children who ingested household bleach and had endoscopy performed, 66 had grade 0 (no mucosal changes). Eight children had grade 1 (mild) esophageal burns.
In a series of 129 ingestions of 5.25% sodium hypochlorite bleach, 65 received esophagoscopy. Two patients had esophageal injury (ulcer, edema), and 3 had non-esophageal injuries (whitish discolouration of lips, superficial lesion of buccal mucosa, and bleb at angle of mouth).
A 38-year-old ingested 125 mL of 5.25% sodium hypochlorite bleach and developed oral and pharyngeal burns. Endoscopy at 3 weeks post exposure revealed an esophageal stricture. Surgical intervention was required to bypass the stricture.
A 66-year-old ingested 500 mL of 10% sodium hypochlorite bleach and developed dysphagia, esophagitis, hypernatremia and hyperchloremic acidosis. Patient was discharged 5 days post ingestion.

injection A 31-year-old injected 0.3 mL of 5.25% sodium hypochlorite bleach into a right antecubital vein and 0.3 mL into a left antecubital vein. Patient immediately developed left-sided chest pain, vomiting and erythema on both antecubital areas. ECG, urinalysis, electrolytes, glucose and arterial blood gases were normal. Patient was treated with warm compresses to each antecubital area and recovered with no further sequelae.
A 69-year-old was admitted with fever, neck stiffness and lower limb paralysis, and inadvertently received 150 mL of a 1% sodium hypochlorite solution IV over one hour. Patient immediately developed bradycardia (40 beats/minute), mild hypotension (90/60 mmHg), and an increased respiratory rate (36 breaths/minute). Blood pressure responded to fluids and dopamine; respirations normalized. Bradycardia persisted for 3 days despite atropine administration. Laboratory values remained normal throughout and patient was discharged 58 days later after treatment for meningoencephalomyelitis.

Clinical Effects

- **Topical:** Minor irritation from dilute bleach solutions (3-6%). Potential burns from concentrated solutions (> 10%). Allergic contact dermatitis has been reported.

- **Ocular:** Burning discomfort, conjunctival erythema and superficial corneal injury with rapid recovery has been seen with a splash of *dilute* bleach solution (5%). Conjunctival hemorrhage, conjunctival and corneal edema, and residual corneal damage have been reported from one drop of a 15% solution (animal data).

- **Inhalation:** Sodium hypochlorite mixed with acid or ammonia can produce respiratory irritation. **See** CHLORINE.

- **Injection:** Localized pain, erythema can occur with < 1 mL of household bleach. Vomiting and left-sided chest pain have been reported rarely with injection of < 1 mL of household bleach. Bradycardia, hypotension, hemolysis and cardiac arrest may occur with injection of larger amounts.

- **Ingestion:**
  General: Vomiting and mild irritation of mucous membranes is common following ingestion of dilute household bleach solutions (3-6%). More severetoxicity is uncommon with dilute solutions.
  Severe burns may result from concentrated industrial solutions. **See** ALKALI.
  HEENT: Mild oral and pharyngeal irritation (common with dilute solutions). Drooling, dysphagia, oral burns can be seen with concentrated solutions (> 10%).

Respiratory: Coughing, stridor and glottic edema have been reported following ingestion of concentrated solutions (rare following dilute solutions).
GI: Vomiting and mild esophageal irritation (common with dilute solutions).
Hematemesis, esophageal/gastric burns with subsequent stricture formation following large, intentional ingestions of dilute household bleach solutions is rare.
Severe caustic burns, necrosis and perforation may occur following ingestion of concentrated solutions. **See** ALKALI.
Fluids/Lytes/Acid-Base: Hyperchloremia, hypernatremia, metabolic acidosis have been reported following intentional, large ingestions of dilute solutions.

Treatment

1. **Topical**: Wash skin thoroughly with water. Treat burns if present. **See** ALKALI.

2. **Ocular**: Flush eyes with a gentle stream of tepid water for 15 minutes. If irritation persists, **see** ALKALI.

3. **Inhalation**: **See** CHLORINE.

4. **Injection**: Apply a warm compress to site. Monitor vital signs and electrolytes with large exposures. Symptomatic and supportive care.

5. **Ingestion**: Immediately dilute with ½ to 1 glass of water. Do not induce vomiting. Do not administer sodium bicarbonate or fruit juices.

6. If drooling, dysphagia, oral burns or stridor are present, or if patient has ingested a solution of > 10% concentration, **see** ALKALI for further management.

7. Monitor electrolytes and anion gap in patients with ingestions of large volumes of dilute solutions.