

Poison Facts:

High Chemicals: Sulfur Dioxide

Properties of the Chemical

Sulfur dioxide (SO₂) is a colorless, nonflammable gas with a strong, suffocating odor. It condenses at -10 degrees at ordinary pressure to form a colorless liquid. It is sometimes referred to as sulfurous anhydride or sulfurous oxide. When sulfur dioxide comes in contact with water, it forms sulfurous acid. The formation of sulfurous acid (H₂SO₃) accounts for its significant irritancy to eyes, mucous membranes and skin. The odor is detectable at 0.5 ppm, although concentrations above 6 ppm have been reported to produce instantaneous mucous membrane irritation.

Uses of the Chemical

Sulfur dioxide is used as a preservative for fruits and vegetables. It is also used as a disinfectant in breweries, granaries and food factories. The majority of sulfur dioxide is used in the sulfuric acid and wood pulp industries.

Absorption, Distribution, Metabolism and Excretion (ADME)

Sulfur dioxide is highly soluble in water and, therefore, is efficiently absorbed in the upper respiratory tract as sulfurous acid. The direct irritant properties of sulfur dioxide on the eyes and respiratory tract mucosa are due to the acid formation. Direct contact with the liquid SO₂ will freeze tissues. Greater than 90 percent of inhaled sulfur dioxide is absorbed in the nasopharynx. However, mouth breathing (voluntary hyperventilation or exercise) can increase the exposure of the lungs to sulfur dioxide.

Clinical Effects of Acute Exposure

- **Ocular exposures:** Sulfur dioxide is extremely irritating to the eyes, resulting in irritation and lacrimation. Severe corneal damage has occurred after direct contact with liquefied sulfur dioxide.
- **Dermal exposures:** Exposure to the gas causes pain (a burning sensation), itching and possibly a rash. Exposure to escaping compressed gas or liquid can cause frostbite injury.
- **Inhalation exposures:** Inhalation of the gas produces choking, coughing, sneezing, runny nose, bronchitis and bronchoconstriction. Laryngeal/glottal edema and upper airway edema or obstruction with increased airflow resistance has also occurred when a patient is exposed to high concentrations.
- **Ingestion exposures:** Ingestion is highly unlikely since SO₂ is a gas at normal temperatures and pressures.

In-Field Treatment Prior to Arrival at a Health Care Facility

- **Ocular exposures:** Irrigate the exposed eyes for 10 to 15 minutes with tepid, low-pressure water. Topical administration of sodium bicarbonate solution may alleviate eye irritation.
- **Dermal exposures:** Flood exposed skin with water for 10 to 15 minutes.
- **Inhalation exposures:** Move the patient from the contaminated area. If symptoms such as cough or difficulty breathing are present, administer oxygen if available. Topical administration of sodium bicarbonate solution aerosol may alleviate respiratory mucous membrane irritation. Asthmatic episodes triggered by sulfur dioxide should be treated with bronchodilator administration.
- **Ingestion exposures:** Although ingestion is virtually impossible, it is likely that open-mouthed breathing will cause irritation of the mouth and throat. Have the patient rinse and spit with water, then dilute with fluids. It is recommended that no more than 8 ounces (240 ml) of fluids be given to an adult or 4 ounces (120 ml) to a child.

Special notes to first responders:

- Wear a positive-pressure Self-Contained Breathing Apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer.
- There is usually minimal danger to medical personnel attending a patient who has been removed from the contaminated environment.

Treatment of Exposures in a Health Care Facility

- **Ocular exposures:** Irrigate exposed eyes with copious amounts of room-temperature 0.9 percent saline solution or water for at least 15 minutes. Topical administration of sodium bicarbonate solution may alleviate eye irritation. If irritation, pain, swelling, lacrimation or photophobia persists, obtain an ophthalmic exam.
- **Dermal exposures:** Irrigate exposed skin with water. Wash exposed skin thoroughly with soap and water. If there is indication of frostbite, institute rewarming. It is imperative that rewarming be complete. Incomplete rewarming can lead to refreezing of thawed tissue and can, thus, increase tissue damage. Chemical burns can occur with direct contact with SO₂ and water. Treat with standard topical therapy.

- **Inhalation exposures:** All patients with a history of significant inhalation exposure should be admitted for 24 hours and monitored for pulmonary edema and systemic acidosis. Onset of acute lung injury after exposure may be delayed 24 to 72 hours after exposure. Initial treatment should be with 100 percent humidified oxygen for symptomatic patients. Administer beta-adrenergic agonists if bronchospasm develops. Perform endotracheal intubation, and provide assisted ventilation as required.
 - **Ingestion exposures:** It is unlikely that ingestion will occur since the chemical is a gas at room temperature and normal atmosphere. There may be tissue damage to the mouth and oropharynx from open-mouthed breathing. Treat symptomatically.
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For more poison prevention and first aid information, call the

Poison Control Center

Serving the Residents of Kansas

Toll-free Hotline

1-800-222-1222

THE UNIVERSITY OF KANSAS HOSPITAL

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