

Poison Facts:

High Chemicals: Hydrogen Fluoride

Properties of the Chemical

Hydrogen fluoride is a clear, colorless gas in its normal state. It is highly soluble in water and fumes at concentrations greater than 40 percent, forming a white mist when it comes in contact with air. It is most frequently encountered in aqueous solutions.

Uses of the Chemical

Hydrogen fluoride is used in glass etching and cleaning in the manufacture of glass, semiconductors and ceramics, as a rust remover in both commercial and home laundry products, and in petroleum exploration, refining and in the oil fields.

Absorption, Distribution, Metabolism and Excretion (ADME)

Hydrogen fluoride is well-absorbed through all routes of exposure. It would be expected to distribute in body water with high protein binding. It is not metabolized and would be excreted in the urine with some fluoride being incorporated in the bones. This incorporation would be more prominent during a dermal exposure to the digits.

Clinical Effects of Acute Exposure

- **Ocular exposures:** Redness, pain and severe deep burns would be expected.
- **Dermal exposures:** Hydrofluoric acid causes burns. The severity of the burn depends on the concentration of the solution. The hallmark of a less than 20 percent solution is that the pain is out of proportion to the clinical examination. The patient may complain of severe pain while erythema of the exposed skin is the only evidence of exposure. All concentrations of hydrogen fluoride solutions can cause serious systemic effects. However, in the dilute solutions, these effects may be delayed up to 24 hours.
- **Inhalation exposures:** Lower concentrations of hydrogen fluoride cause irritation or corrosion of the mucous membranes of the upper airway, followed by severe systemic effects. The concentrated solutions may cause deep lung injury resulting in pulmonary edema.
- **Ingestion exposures:** Acute effects include corrosion of the oropharynx and the esophagus. After several hours, severe hypocalcemia may result in systemic complications.

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

- **Ocular exposures:** Irrigate immediately for at least 10 to 15 minutes.
- **Dermal exposures:** Flush with copious amounts of water immediately, even in the asymptomatic patient. Flood eyes, nose and mouth if exposed. While wearing latex or rubber gloves, remove all contaminated clothing and bag in plastic containers. Transport patient to a health care facility as soon as possible.
- **Inhalation exposures:** Remove patient to fresh air. Give oxygen if available. Transport to a health care facility as soon as possible.
- **Ingestion exposures:** Give the patient milk or calcium-based antacids. The goal is to give the most calcium in the least amount of volume. Large volumes could cause the patient to vomit, which is contraindicated.

Special note to first responders:

- Wear a positive-pressure Self-Contained Breathing Apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection.

Treatment of Exposures in a Health Care Facility

Note to health care providers: Any route of exposure to hydrofluoric acid may lead to systemic complications. Therefore, all patients need to have labs drawn as recommended. (See “Special Note” section below.)

- **Ocular exposures:** Flush exposed eyes with 2 liters of saline solution. Examine the eye(s) with fluorescein for injury. Slit-lamp examination is desirable.
- **Dermal exposures:** Immediately and thoroughly irrigate the patient with water. Apply a calcium gel to the burn area. When dealing with hand or foot exposures, management of the nail beds can become a complicated process. Call the Poison Control Center for detailed instructions.
- **Inhalation exposures:** Pulmonary edema may occur after inhalation. Patients who may be at risk should be monitored in a critical-care setting for at least 24 hours, due to the delayed onset of this occurrence. Patients should receive an initial and follow-up chest x-ray. Laryngoscopy is recommended, and emergency tracheostomy or endotracheal intubation should be readily available. Monitor pulmonary function and arterial blood gases.
- **Ingestion exposures:** Consider careful nasogastric suction or lavage with a small (18 Fr) soft tube for patients with significant ingestions who present within 90 minutes of exposure and have not spontaneously vomited. Calcium gulconate (10 percent) may be added to the lavage fluid. The amount of calcium actually need to bind the fluoride has not been determined.

Special note: Obtain at least hourly serum electrolytes, including serial total or ionized calcium, magnesium and potassium levels. Total calcium may not reflect true hypocalcemia; it usually has a more rapid turnaround. Therapy should be directed toward signs and symptoms of toxicity. Obtain serial ECGs looking for signs of hypocalcemia (prolonged QTc interval) and hyperkalemia (peaked T waves). Institute continuous cardiac monitoring.

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

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