

Poison Facts:

High Chemicals: Hydrogen Chloride

Properties of the Chemical

At room temperature, hydrogen chloride is a colorless to slightly yellow nonflammable gas with a pungent odor. When exposed to air, the gas forms dense, white vapors due to condensation with atmospheric moisture. The vapor is corrosive. Hydrogen chloride is available commercially as an anhydrous gas or as aqueous solutions (hydrochloric acid). Commercial concentrated hydrochloric acid contains 36 to 38 percent hydrogen chloride in water. Aqueous solutions are generally colorless but may be yellow due to traces of iron, chlorine and organic impurities.

Uses of the Chemical

Hydrogen chloride can be used for cleaning, pickling and electroplating metals. It is used in refining mineral ores, in petroleum well extraction, in leather tanning and in the refining of fats, soaps and edible oils. It is also used in producing polymers and plastics, rubber, fertilizers, dyes and pigments. Hydrochloric acid (muriatic acid) is a component of commercial chemicals used to clean and disinfect swimming pools.

Absorption, Distribution, Metabolism and Excretion (ADME)

Hydrogen chloride can produce injury following ingestion, inhalation of vapors or dermal exposure to skin and eyes. Hydrogen chloride is irritating and corrosive to any tissue it contacts.

Clinical Effects of Acute Exposure

- **Ocular exposures:** Exposure of the eyes to concentrated hydrogen chloride vapor or hydrochloric acid can cause corneal cell death, cataracts and glaucoma. Exposure to dilute solutions can cause pain and injuries such as ulcers to the eye surface.
- **Dermal exposures:** Concentrated hydrochloric acid or hydrogen chloride gas can cause deep burns of the skin and mucous membranes with disfiguring scars. Less concentrated acid, vapor or mist can cause irritation, redness and inflammation.
- **Inhalation exposures:** Hydrogen chloride gas is extremely irritating to the mucous membranes of the nose, throat and respiratory tract. The greatest impact is on the upper respiratory tract, with exposures to high concentrations leading to swelling, spasm of the throat and suffocation. Dissolution of hydrogen chloride gas in lung water also produces hydrochloric acid, causing pulmonary toxicity. Massive exposures may lead to chemical pneumonitis, pulmonary edema and Acute Respiratory Distress Syndrome (ARDS).

- **Ingestion exposures:** Ingestion of concentrated hydrochloric acid can cause severe corrosive injury to the mouth, throat, esophagus and stomach, potentially resulting in bleeding, perforation, scarring and stricture formation. This may result in a non-anion gap metabolic acidosis, as both the hydrogen and chloride ions dissociate in the serum and are accounted for in the measurement of the anion gap.

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

- **Ocular exposures:** Remove contact lenses, and irrigate exposed eyes for 15 minutes with tepid water or saline.
- **Dermal exposures:** Remove all contaminated clothing, and flush skin and hair with water for 3 to 5 minutes. Wash thoroughly with soap and water.
- **Inhalation exposures:** Move victim from the toxic environment to fresh air at once. Monitor for respiratory distress. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance. If breathing has ceased, apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
- **Ingestion exposures:** If the victim is conscious and able to swallow, give 4 to 8 ounces of water or milk. Do not induce vomiting. Do not administer activated charcoal or attempt to neutralize the stomach contents. Do not attempt to give anything by mouth to an unconscious person.

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

- **Ocular exposures:** Continue irrigating for at least 15 minutes or until the pH of the conjunctival fluid has returned to normal. Examine eyes for corneal damage, and treat appropriately. Immediately consult an ophthalmologist for patients with corneal injuries.
- **Dermal exposures:** Remove any contaminated clothing, and wash thoroughly with soap and water. Treat dermal burns with standard topical therapy.
- **Inhalation exposures:** Administer 100 percent humidified supplemental oxygen, perform endotracheal intubation and provide assisted ventilation as required. If bronchospasm develops, administer inhaled beta-adrenergic agonists. If bronchospasm and wheezing occur, consider treatment with inhaled sympathomimetic agents. The use of corticosteroids is questionable and unsupported by clinical studies.
- **Ingestion exposures:** If no respiratory compromise is present, dilute patient with milk or water. Obtain consultation concerning endoscopy as soon as possible, and perform endoscopy within 24 hours when indicated.

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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