Poison Facts:

High Chemicals: Fluorine

Properties of the Chemical

Fluorine is a pale yellow or light green gas with a sharp, penetrating odor. It is the most chemically reactive of all the gases and the most electronegative of all the elements. It has a higher oxidation potential than the ozone. Fluorine does not exist in nature in its elemental state. Fluorine is available in both gas and liquid forms.

Uses of the Chemical

Fluorine is used in the petrochemical industry, aluminum manufacturing, in dye and ceramics, for etching glass and enamel, as flux for smelting and in agricultural chemicals. Fluorine shipment requires a special permit, and it must be transported in a nonliquefied, compressed gas state in seamless steel or nickel cylinders.

Absorption, Distribution, Metabolism and Excretion (ADME)

Fluorine as a gas or liquid is not absorbed. The chemical is so highly reactive, however, that it forms other chemicals that can be absorbed. Fluorine forms unstable compounds with oxygen. For example, hydrogen fluoride is the most stable of hydrogen halides and is a very strong acid. The other forms of fluorine will not be discussed in this document.

Clinical Effects of Acute Exposure

Fluorine is an extremely strong irritant to all tissues it comes in contact with. It can cause injury ranging from mild irritation to caustic burns depending on the concentration of the gas at the time of exposure. It is a very severe irritant of the lungs, mucous membranes, skin and eyes. The reaction of this gas with moisture produces hydrofluoric acid. Thermal burns have been reported when fluorine gas comes in contact with the skin due to the violent reaction between the skin and the gas. Direct contact with liquid fluorine can cause frostbite. The lungs appear to be the most affected tissue. Respiratory tract irritation may progress to pulmonary edema.

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

- **Ocular exposures:** Irrigate the eyes for 15 minutes with copious amounts of room-temperature water.
- **Dermal exposures:** If skin was exposed to the gas, treat as you would any thermal burn. If the skin was exposed to the liquid form, only start rewarming the tissue if complete rewarming can be assured.
- **Inhalation exposures:** Move patient to fresh air, and administer oxygen if available.

- **Ingestion exposures:** Since fluorine is a gas, ingestion is highly unlikely. The liquid form may cause frostbite injury. Mouth and throat irritation should be treated with small amounts of fluids – no more than 8 ounces (240 ml) for adults or 4 ounces (120 ml) for children.

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

Special note to health care providers: Fluorine interacts with water to produce hydrofluoric acid and oxygen fluoride. Although this document deals with fluorine the gas or pressurized liquid, there is a possibility that these other chemicals will come into play in the patient's treatment plan.

- **Ocular exposures:** Irrigate the eyes for 15 minutes with room-temperature water or 0.9 percent saline solution. Check the eye for possible burns. An early ophthalmologic exam is recommended.
- **Dermal exposures:** If the exposure was a gas, treat the skin for thermal burns. If the skin came in contact with the pressurized liquid, then treat the skin for frostbite injury.
- **Inhalation exposures:** Administer 100 percent humidified oxygen. Provide assisted ventilation as required. Use beta adrenergic agonists if bronchospasm occurs.
- **Ingestion exposures:** Exposures of the gas to the oral mucosa is very irritating. Dilute with a small amount of fluids – 8 ounces (240 ml) for adults and 4 ounces (120 ml) for children. Assess the patient for either thermal burns (gas exposure) or frostbite injury (liquid fluorine).

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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