Poison Facts:

High Chemicals: Hydrogen Sulfide

Properties of the Chemical

Hydrogen sulfide exists as a gas under normal conditions. It is a colorless, poisonous gas with the characteristic odor of rotten eggs and a sweet taste. It is perceptible in air at concentrations of 0.02 to 0.13 PPM. It is heavier than air. Reducing the temperature or increasing pressure may liquefy it; however, it is not stable in the liquid form. It is flammable and explosive in air and may be ignited by static discharge.

Uses of the Chemical

Hydrogen sulfide is a naturally occurring compound, found in the environment in volcanic gases, marshes, swamps and sulfur springs. It is also a byproduct of bacterial action during the decay of plant and animal protein. Hydrogen sulfide is used or encountered in farming, brewing, tanning, glue-making, rubber-vulcanizing, metal recovery processes, heavy water production, oil refinery and gas exploration.

Absorption, Distribution, Metabolism and Excretion (ADME)

Hydrogen sulfide is readily absorbed from the lungs and the GI tract. Once absorbed, hydrogen sulfide is distributed in the blood and taken up by the brain, liver, kidneys, pancreas and small intestine. Hemoglobin and liver enzymes then oxidize the compound. Hydrogen sulfide is excreted in the urine in lesser amounts as sulfides and can also be excreted unchanged through the lungs.

Clinical Effects of Acute Exposure

- **Ocular exposures:** Hydrogen sulfide is very irritating to the eyes, causing painful conjunctivitis and corneal abrasions. Injection of the conjunctivae, seeing colored halos, ocular pain, corneal bullae, blurred vision and blepharospasm may be noted following exposure.
- **Dermal exposures:** Skin exposures may result in severe pain, itching, burning and erythema, especially in moist areas. Cyanosis may be noted. Direct contact with the liquefied material or escaping compressed gas can cause frostbite injury.
- **Inhalation exposures:** Hydrogen sulfide can be detected at very low concentrations by the offensive odor of rotten eggs. Olfactory fatigue may occur after 2-15 minutes of exposure at lower concentrations and is more rapid at higher concentrations. Inhalation exposures can cause respiratory

depression, cyanosis, pulmonary edema, bronchitis, dyspnea and acute lung injury following nonlethal concentrations. Exposures to high concentrations will result in rapid respiratory paralysis leading to sudden collapse and death. The central nervous system (CNS) effects of hydrogen sulfide are considered to be a result of enzyme poisoning at the cellular level. Following rapid absorption from the alveoli, hydrogen sulfide is transported to the brain. CNS depression and symptoms such as drowsiness, fatigue and dizziness occur at lower concentrations. As the concentration rises, headache, weakness of the extremities, spasms, nausea, agitation, dizziness and staggering become more prominent. Delirium, coma and convulsions, along with other neurologic symptoms, may also occur in certain conditions of acute exposure. Cardiac effects may also be noted. ECG tracing indicative of cardiac arrhythmia, myocardial ischemia and myocardial infarction have been observed in cases of hydrogen sulfide intoxication.

- **Ingestion exposures:** Hydrogen sulfide irritates the mucous membranes producing nausea and vomiting.

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

Hydrogen sulfide is a gas at room temperature. Ensure that medical personnel are aware of the material involved and take precautions to protect themselves. Do not use mouth-to-mouth artificial respiration. Give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

- Move victim to fresh air.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Immediately flush skin or eyes with running water for at least 20 minutes.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to the skin.

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. It may provide little or no thermal protection.

Treatment of Exposures in a Health Care Facility

- **Ocular exposures:** Remove contact lenses, and irrigate exposed eyes with copious amounts of room temperature 0.9 percent saline or water for at least 15 minutes. Get an ophthalmologic examination.
- **Dermal exposures:** Remove contaminated clothing, and wash exposed area extremely thoroughly with soap and water. If frostbite is present, do not institute rewarming unless complete rewarming can be assured. Place affected area in a water bath with a temperature of 40 to 42 degrees Celsius for 15 to 30 minutes until thawing is complete. The bath should be large enough to permit complete immersion of the injured part, avoiding contact with the sides of the bath. Rewarming may be associated with increasing pain, requiring narcotic analgesics.
- **Inhalation exposures:** Administer 100 percent oxygen. Patients should be monitored for 72 hours for development of pulmonary edema. Use the lowest amount of PEEP possible while maintaining adequate oxygenation. Note: Amyl nitrate by inhalation and sodium nitrite (found in the cyanide antidote kit) may be beneficial in preventing severe anoxia by converting hemoglobin to methemoglobin and protecting the cytochrome oxidase enzyme. Use the cyanide therapy schedule, but do not administer the sodium thiosulfate.
- **Ingestion exposures:** Hydrogen sulfide is a gas at room temperature, making ingestion unlikely.

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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