Poison Facts:

Medium Chemicals: Acrylonitrile

Properties of the Chemical

Acrylonitrile is a colorless, explosive, flammable liquid. It is a man-made chemical with a sharp, onion- or garlic-like odor. It can be dissolved in water and evaporates quickly. Acrylonitrile should be stored and used in closed systems whenever possible. Work areas should be free from open lights, flames and equipment that is not explosion-proof. **Note: Handle acrylonitrile in a ventilation hood.** It may polymerize spontaneously, particularly in the absence of oxygen or through exposure to visible light. Acrylonitrile polymerizes violently in the presence of concentrated alkali.

Uses of the Chemical

Acrylonitrile is a heavily produced, unsaturated nitrile. It is used to make other chemicals such as plastics, synthetic rubber and acrylic fibers. It has been used as a pesticide fumigant in the past; however, all pesticide uses have been discontinued. This compound is a major chemical intermediate used in creating such products as pharmaceuticals, antioxidants and dyes, as well as in organic synthesis.

Absorption, Distribution, Metabolism and Excretion (ADME)

Acrylonitrile (acrylan, vinyl cyanide) can be readily absorbed by mouth, through intact skin or by inhalation. As a vapor, it is a potent eye, mucous membrane and skin irritant. It may act as a chemical asphyxiant similar to hydrogen cyanide. There is no clear evidence in humans to confirm or deny cyanide as being the toxic metabolite of acrylonitrile. It is metabolized by mammals (mice, rats, hamsters, guinea pigs, rabbits, dogs and monkeys) into cyanide, which is then transformed to thiocyanate and eliminated as such in the urine. There is marked disagreement as to what percentage is metabolized, and values from 4 to 30 percent have been reported. It is believed that toxicity is due to acrylonitrile and its metabolites. There is evidence that children are more sensitive to acrylonitrile than adults. It is reasonably anticipated to be a human carcinogen.

Clinical Effects of Acute Exposure

- **Ocular exposures:** The vapors are irritating to the eyes. Splash contact causes only transient disturbances without corneal injury. Diminished vision has been reported following long-term exposure.
- **Dermal exposures:** Dermal contact may result in burning, erythema, blister formation, swelling, itching, and drying, scaling, cracking and peeling of the skin. Prolonged skin contact with liquid acrylonitrile can result in systemic toxicity and the formation of large dermal vesicles after a period of several hours. The affected skin area may resemble a second-degree, thermal burn.

- **Inhalation exposures:** Inhalation will cause nose and throat irritation, dizziness, impaired judgment, tightness in the chest, difficulty breathing, nausea and headache. Severe intoxication may be followed by abrupt loss of consciousness, seizures, pulmonary edema, respiratory arrest and death.
- **Ingestion exposures:** Ingestion may result in nausea, vomiting and diarrhea. Severe exposures may cause gastrointestinal hemorrhage. When poisoning cases do occur, symptoms are caused by tissue anoxia and include: dyspnea, a burning sensation in the throat, dizziness, impaired judgment, cyanosis, nausea, seizures and death.

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:** Rinse with plenty of water, then remove contaminated clothing and rinse again.
- **Inhalation exposures:** Move patient to fresh air at once. If breathing is difficult, administer oxygen. DO NOT use mouth-to-mouth resuscitation if the patient ingested or inhaled the substance. If breathing has ceased, give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- **Ingestion exposures:** DO NOT INDUCE EMESIS. Consider pre-hospital administration of activated charcoal as an aqueous slurry in patients with a potentially toxic ingestion who are also awake and able to protect their airways.

Special note to first responders:

- Fully encapsulating, vapor-protective clothing should be worn for spills and leaks that do not involve fire.
- Acrylonitrile has a very low flash point. Use of water spray when fighting fire may be insufficient.

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. Patients with significant eye exposure should be carefully observed for signs and symptoms of acrylonitrile and/or cyanide toxicity.
- **Dermal exposures:** Remove contaminated clothing, and wash exposed area extremely thoroughly with soap and water. Leather gloves and shoes absorb this chemical. Contaminated clothing should be placed in containers for disposal, preferably by incineration.
- **Inhalation exposures:** Administer 100 percent humidified supplemental oxygen, perform endotracheal intubation, and provide assisted ventilation as required. Administer inhaled beta-adrenergic agonists if bronchospasm develops. Carefully observe the patient for systemic signs or symptoms.

- **Ingestion exposures:** Administer charcoal as an aqueous slurry. Gastric lavage may be considered if ingestion was within an hour and a potentially life-threatening amount has been ingested. The patient's airway must be protected. Administer 100 percent oxygen, and establish vascular accesses. Obtain CBC, electrolytes, glucose, lactate, arterial blood gases, serum, urine thiocyanate and whole blood cyanide levels, and perform renal function tests. Limited experience with treating human acrylonitrile toxicity using the traditional cyanide antidotes has generally proved ineffective. However, it has been suggested that treatment should include intravenous N-acetylcysteine and the traditional cyanide antidotes.
