Poison Facts:

Low Chemicals: Toluene 2, 4 diisocyanate (2, 4 TDI)

Properties of the Chemical

Toluene 2, 4 diisocyanate is a colorless to yellow liquid at room temperature that darkens on exposure to sunlight. It is insoluble in water and has a sharp, pungent, sweet, fruity odor. Toluene diisocyanate is a combination of 2, 4-toluene diisocyanate and 2, 6-diisocyanate and is usually found in an 80:20 mixture of the isomers.

Uses of the Chemical

The isocyanates are used primarily as starting materials for a variety of plastic products. Included in these are the rigid and flexible polyurethane foams, urethane-based coatings such as paints, and electrical wire insulation. They are also used to produce elastomers and spandex fibers.

Absorption, Distribution, Metabolism and Excretion (ADME)

Toluene diisocyanate may be absorbed into the body by inhalation, ingestion and through the skin. The rate of uptake into the blood is linear during exposure and continues to increase slightly after exposure. The large distribution of water in the human body makes it unlikely for the isocyanates to cause serious toxicity by ingestion as they are quickly hydrolyzed to 2, 4-toluene diamine, a possible carcinogen. Inhalation exposure to toluene 2, 4-diisocyanate results primarily in the formation of acid labile conjugates, with little or no toluene 2, 4-diamine being formed. Inhalation of isocyanates as vapors or aerosols is the main risk to the health of an exposed individual.

Clinical Effects of Acute Exposure

- **Ocular exposures:** Exposure to the vapors can cause severe pain, redness, tearing and blurred vision. Glaucoma and iridocyclitis have been reported with splash contact exposure. Lacrimation, photophobia, profuse lid edema and superficial corneal abrasions are the most common ophthalmologic effects. No cases of blindness or irreversible ocular damage have been found.
- **Dermal exposures:** Dermal absorption is very low, but direct exposure is irritating. Exposure to a high concentration of vapors may cause contact dermatitis, redness, swelling, blistering, pain and a burning sensation.
- **Inhalation exposures:** Toluene diisocyanates are potent respiratory irritants and sensitizers, even at low airborne concentrations. Pulmonary symptoms include cough, burning, substernal pain, dyspnea, a choking sensation, sputum production and hoarseness. Prominent bronchospasm (i.e., wheezing, rhonchi,

dyspnea and cough) may be present. The vapors cause a burning irritation of the nose and throat. Inhalation can also cause nausea, vomiting and dizziness. Long-term effects may include bronchitis, emphysema, pneumonitis and asthma. Several studies on the prognosis of isocyanate-induced asthma show that a significant proportion of patients continue to experience asthmatic symptoms and nonspecific bronchial hyperresponsiveness after cessation of work, and that further exposure to isocyanates in sensitized subjects leads almost invariably to the persistence of respiratory symptoms and of bronchial hyperresponsiveness and the deterioration of airway function.

- **Ingestion exposures:** Gastrointestinal disturbances (i.e., nausea, vomiting and abdominal pain) occur soon after oral exposure. Neurologic symptoms have occurred after both inhalation and ingestion. Symptoms include headache, insomnia, euphoria, ataxia, anxiety neurosis, depression and paranoia, which may persist for several weeks. Persistent memory deficits, personality changes, irritability and depression have been reported after severe exposures to toluene diisocyanate.

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

- **Ocular exposures:** Flush eyes with copious amount of low-pressure, room-temperature water. Continue flushing for 10 to 15 minutes.
- **Dermal exposures:** Wipe exposed skin with a dry cloth, and then wash skin thoroughly with soap and flooding amounts of water. Rubbing alcohol (30 percent) may be used to help remove the chemical if it adheres to the skin.
- **Inhalation exposures:** Move the patient to fresh air. Administer oxygen if available.
- **Ingestion exposures:** Give the patient small amounts of water – 1 cup for adults and 1/2 cup 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.

In the case of a fire, use powdered carbon dioxide. Use water only in flooding amounts. This chemical reacts violently with water.

Treatment of Exposures in a Health Care Facility

- **Ocular exposures:** Irrigate the eyes for 15 minutes with lukewarm, low-pressure water or 0.9 percent room-temperature normal saline. Get an ophthalmic exam.
- **Dermal exposures:** Wipe off the chemical with a dry cloth prior to washing the skin with soap and flooding amounts of water. Isopropyl alcohol (30 percent) can be used to help remove any product adhering to the skin. Treat resulting irritation and inflammation symptomatically.

- **Inhalation exposures:** Administer oxygen, and assist ventilation as needed. Evaluate the respiratory tract for irritation, bronchitis or pneumonitis. Administer inhaled beta2 agonist for bronchospasm. Observe the patient for at least 48 hours for late-onset respiratory distress.
- **Ingestion exposures:** Give the patient small amounts of fluids – 240 ml for adults and 120 ml for children. Administer activated charcoal. Use 25 to 100 grams in adults and 1g/kg (up to 30 grams) in children.

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

KUMED