ETHYLENEIMINE AWARENESS TRAINING

Substance: Ethyleneimine

CAS Registry Number: 151-56-4

Synonyms: Aminoethylene, Azirane, Azirdine, azacyclopropane, azindine, 1H-azinne, dihydro-; dihydroazirene, dimethyleneimine, EI, ENT-50324, ethylamine, Ethyleneimine

Ethyleneimine is classified as extremely toxic with a probable oral lethal dose of 5-50 mg/kg which is approximately 7 drops to 1 teaspoonful for a 70 kg (150 lb.) person. Ethyleneimine gives inadequate warning when over-exposure is by inhalation or skin absorption. It is a severe blistering agent, causing third degree chemical burns of the skin. Also, it has a corrosive effect on mucous membranes and may cause scarring of the esophagus. It is corrosive to eye tissue and may cause permanent corneal opacity and conjunctival scarring. Severe exposure may result in overwhelming pulmonary edema and renal damage. Hemorrhagic congestion of all internal organs has been observed.

Properties

Ethyleneimine is a colorless, flammable, mobile liquid that is miscible with water. It has an intense ammoniacal odor, with an odor threshold of 1.5 parts per million (ppm). Ethyleneimine is used as a monomer for polymerization, textile chemicals, adhesives, binders, resins, lubricants, surfactants, and photographic chemicals. Explosive polymerization may occur upon contact with acids. Explosive compounds may form on contact with bleach.

USE

Ethyleneimine has many uses, including in polymerization products and in adhesives and binders. Products of polymerization of ethyleneimine are used in the paper industry and as flocculation aids. Used in textile chemicals, adhesives, binders, petroleum refining chemicals, fuels and lubricants, coating resins, varnishes, lacquers, agricultural chemicals, cosmetics, ion exchange resins, photographic chemicals and surfactants.

Sources and Potential Exposure

Occupational exposure to ethyleneimine may occur during its manufacture and use. No information was located regarding the measurement of personal exposure to ethyleneimine.

Regulations:

OSHA GENERAL INDUSTRY PEL: 0.5 ppm, 1.0 mg/m3 TWA (Skin)

ACGIH TLV: 0.5 ppm, 0.88 mg/m3 TWA (Skin)

Health Effects:

SYMPTOM(s): Nausea, vomiting, headaches, dizziness; pulmonary edema, liver and kidney damage, burning sensation to the eyes, skin sensitization, nose and throat irritation, carcinogenic.

Absorption through the skin may be a significant source of exposure. Ethyleneimine exposure may result in delayed pulmonary edema within 24 to 48 hours. Also, acute effects such as nausea, eye irritation, etc., are often delayed for 30 minutes to 3 hours. Caution is advised.

Acute Effects:

- Acute inhalation exposure to ethyleneimine causes respiratory tract irritation and inflammation in humans, but symptoms may be delayed for several hours. Some symptoms of acute inhalation exposure in humans include tearing and burning of the eyes, sore throat, nausea, vomiting, coughing, headache, dizziness, nasal secretion, laryngeal edema, pronounced changes of the trachea and bronchi, bronchitis, shortness of breath, overwhelming edema of the lungs, and secondary bronchial pneumonia.
- Ethyleneimine is a severe blistering agent, causing third degree chemical burns of the skin. It is also corrosive to eye tissue and may cause permanent corneal opacity and conjunctival scarring in humans.
- Renal damage and hematological effects have also been observed following acute inhalation exposure in humans.
- Ethyleneimine has a corrosive effect on mucous membranes and acute oral exposure may cause scarring of the esophagus in humans.
- Acute animal tests in rats, mice, and guinea pigs, have demonstrated ethyleneimine to have extreme acute toxicity by inhalation, oral, or dermal exposure.

Chronic Effects (Noncancer):

- At low levels, chronic inhalation exposure has been reported to result in hematological effects in humans and in rats.

Cancer Risk:

- No information is available on the carcinogenic effects of ethyleneimine in humans.
- Hepatomas and pulmonary tumors have been observed in mice exposed via gavage.
- Lymphomas, Hepatomas, and pulmonary tumors were reported in mice exposed by subcutaneous injections. Sarcomas were reported at the injection site in rats exposed by injection.

Emergency Procedures: In a medical emergency, call 911, then 4111.

Inhalation Exposure:
Move victims to fresh air. Emergency personnel should avoid self-exposure to ethyleneimine. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. Seek medical attention.

Dermal/Eye Exposure:
Remove victims from exposure. Emergency personnel should avoid self-exposure to ethyleneimine. Remove and isolate contaminated clothing as soon as possible. Immediately flush skin with running water for at least 15 minutes. Seek medical attention.

If eye exposure has occurred, eyes must be flushed with warm water for at least 15 minutes. Seek medical attention.

Ingestion Exposure:
DO NOT induce vomiting. Seek medical attention.

Hazardous Decomposition or Byproducts: Toxic oxides of nitrogen are produced during combustion. Upon treatment with sodium hypochlorite, it gives off the explosive compound 1-chloroazidine. Avoid contact with silver or aluminum. Explosive polymerization may occur upon contact with acids. Polymerization is catalyzed by carbon dioxide.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, Engineering controls are the most effective way of reducing exposure.

ENGINEERING CONTROLS

The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

Good work practices can help to reduce hazardous exposures. The following work practices are recommended:

- Workers, whose clothing has been contaminated by ethyleneimine, should change into clean clothing promptly.
- Do not take contaminated work clothes home. Family members could be exposed.

WAYS OF REDUCING EXPOSURE

- Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, an appropriate respirator should be worn. If you wear a respirator, you must be part of our Respiratory Protection Program.

- A regulated, marked area should be established where ethyleneimine is handled, used, or stored as required by the OSHA Standard 1910.1012.
- Wear protective work clothing.
- Wash thoroughly immediately after exposure to ethyleneimine and at the end of the work shift.
- Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of ethyleneimine to potentially exposed workers.

Signs
Entrances to regulated areas shall be posted with signs bearing the legend:

CANCER-SUSPECT AGENT

AUTHORIZED PERSONNEL ONLY

Before working with any chemical, review the Material Safety Data Sheet.