NIOSH EMERGENCY RESPONSE CARD

BLISTER AGENT

HN3 NITROGEN MUSTARD

UN #: 2810 (Guide 153)

$N(CH_2CH_2Cl)_3$

CAS #: 555-77-1

RTECS #: YE2625000

Tris(2 - chloroethyl) amine
2, 2', 2'' - Trichlorotriethylamine
Triethylamine, 2, 2', 2'' - trichloro -
Tri - (2 - chloroethyl) amine
Tris(beta - chloroethyl) amine
Chemical Formula: $C_6H_{12}Cl_3N$

Molecular weight: 204.53

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ CLINICAL SIGNS/ SYMPTOMS	PREVENTION/ PERSONAL PROTECTIVE EQUIPMENT	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Combustion products include nitrogen oxides.	N/A	Water, fog, foam, CO_2. Avoid methods that cause splashing or spreading.
EXPLOSION	No immediate danger.	N/A	N/A
ROUTE OF EXPOSURE			
Synopsis:	**Severe irritant with onset of pain and other symptoms that may be delayed up to 24 hours.** **Contact with vapor or liquid can be fatal.**	**Do not breathe fumes.** **Skin contact must be avoided at all times.** **STRICT HYGIENE!**	**There is no antidote for nitrogen mustard toxicity. Decontamination of all potentially exposed areas within minutes after exposure is the only effective means of decreasing tissue damage.** ***(See Decontamination section.)*** **Seek medical attention immediately.** Triage procedures and medical management guidelines - see ATSDR medical management guidelines for Nitrogen Mustard Blister Agents.
Inhalation:	Delayed buildup of fluid in the lungs (pulmonary edema) resulting in cough and shortness of breath and possibly pneumonia. Nausea and Vomiting.	Pressure-demand, self-contained breathing apparatus (SCBA) (SCBA CBRN, if available) is recommended in response situations that involve exposure to any amount of nitrogen mustard. CBRN, Full Facepiece APR (when available) is recommended in non-routine, emergency situation environments less than IDLH but above REL or PEL levels.	Move patient to fresh air. Administer oxygen and assist ventilation as required. Seek medical attention immediately.

		(see NFPA 1994, Standard on Protective Ensembles for Chemical or Biological Terrorism Incidents.)	
Skin:	Irritation, redness, severe burns and blistering (a vesicant agent), deep ulceration. Symptoms and physical findings may be delayed up to 6-12 hours following exposure to HN3.	Butyl rubber, neoprene, nitril or PVC gloves, Responder® CSM protective clothing including PVC boots. (See NFPA 1994, Standard on Protective Ensembles for Chemical and Biological Terrorism Incidents.)	Remove contaminated clothing and wash exposed area thoroughly with soap and water. Contaminated clothing can expose rescue workers through direct contact or through off-gassing vapor. *(See Decontamination section*.) Seek medical attention immediately.
Eyes:	Excessive tears (lachrymation), irritation, redness, burns, deep ulceration, corneal damage, dilated pupils. Incapacitating dose for the eyes is 100 mg-min/m^3.	Goggles or full-face respirator.	Immediately flush with large amounts of tepid water for at least 15 minutes. Seek medical attention immediately.
Ingestion:	Severe irritation, burns, hemorrhagic diarrhea, nausea, and vomiting; large doses produce neurotoxic effects such as prolonged tremor, uncoordinated movements, ataxia, derangement of positional reflexes, and convulsions.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. Seek medical attention immediately. (See ATSDR medical management guidelines for Nitrogen Mustard Blister Agents.)

OCCUPATIONAL EXPOSURE LIMITS (OELs):	OSHA PEL: N/A NIOSH REL: N/A ACGIH TLV: N/A TLV: 0.003 mg/m^3 (U.S. Military) NIOSH IDLH: N/A
SAMPLING AND ANALYTICAL METHODS:	NIOSH: N/A OSHA: N/A

DECONTAMINATION	• **Patients/Victims:** Remove clothes and place contaminated clothes and personal belongings in a sealed double bag. Decontamination of mustard-exposed victims by either vapor or liquid should be performed within the first two minutes following the exposure to prevent tissue damage. If not accomplished within the first several minutes, decontamination should still be performed to ensure any residual liquid mustard is removed from the skin or clothes or to ensure any trapped mustard vapor is removed with the clothing. Removing trapped mustard vapor will prevent vapor off-gassing or subsequent cross-contamination of other emergency responders/health care providers or the healthcare facility. Physical removal of the mustard agent, rather than detoxification or neutralization, is the most important principle

	in patient decontamination. Mustard is not detoxified by water alone and will remain in decontamination effluent (in dilute concentrations) if hydrolysis has not taken place. (1) Patients exposed to vapor should be decontaminated by removing all clothing in a clean air environment and shampooing or rinsing the hair to prevent vapor off-gassing. (2) Patients exposed to liquid should be decontaminated by – a. Washing in warm or hot water at least three times. Use liquid soap (dispose of container after use and replace), large volumes of water, and mild to moderate friction with a single-use sponge or washcloth in the first and second washes. Scrubbing of exposed skin with a brush is discouraged, because skin damage may occur which may enhance absorption. The third wash should be to rinse with large amounts of warm or hot water. Shampoo can be used to wash the hair. The rapid physical removal of a chemical agent is essential. If warm or hot water is not available, but cold water is, use cold water. Do not delay decontamination to obtain warm water. b. Rinsing the eyes, mucous membranes, or open wounds with sterile saline or water. (3) The healthcare provider should – a. Check the casualty after the three washes to verify adequate decontamination before allowing entry to the medical treatment facility. If the washes were inadequate, repeat the entire process. b. Be prepared to stabilize conventional injuries during the decontamination process. Careful decontamination can be a time consuming process. The health cared provider may have to enter the contaminated are to treat the casualty during this process. Medical personnel should wear the proper PPE and evaluate the exposed workers. (See the following for more information ATSDR medical management guidelines Nitrogen Mustard Blister Agents, SBCCOM Guidelines for Mass Casualty Decontamination During a Terrorist Chemical Agent Incident (January 2000), and SBCCOM Guidelines for Cold Weather Mass Decontamination During a Terrorist Chemical Agent Incident (January 2002).) • **Equipment:** N/A • **Environment:** *(See Spillage Disposal.)* **NOTE**: Chlorinating agents destroy nitrogen mustards. Dry chlorinated lime and chloramines with a high content of active chlorine vigorously chlorinate nitrogen mustards to the carbon chain giving low toxicity products. In the presence of water this interaction proceeds less actively. They are rapidly oxidized by peracids in aqueous solution at weakly alkaline pH. In acid solution the oxidation is much slower.
SPILLAGE DISPOSAL	**Small amounts:** Clean up all spills immediately. Avoid breathing vapors and contact with skin and eyes. Control personal contact by using protective equipment. Contain and absorb spill with sand, earth, inert material or vermiculite. Wipe up. Place in a suitable labeled container for waste disposal. **Large amounts:** Clear area of personnel and move upwind. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or water course. Contain spill with sand, earth or vermiculite. Collect recoverable product into sealed labeled containers for disposal. Wash area and prevent runoff into drains. After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using. If contamination of drains or waterways occurs, advise emergency services.
PACKAGING & LABELLING	UN# 2810 (Guide 153)
	Proper Shipping Name: Toxic liquids, organic, n.o.s.
	Hazard Class: 6.1, Packing Group I, Hazard Zone B.
	Label: Poison.
	Marking: Toxic liquids, n.o.s. UN 2810, Inhalation Hazard

	Placard: Poison
	NFPA 704 Signal: Health - N/A Flammability - N/A Reactivity - N/A Special - 0

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** Colorless to pale yellow liquid with faint odor resembling fish and soap. **PHYSICAL DANGERS:** N/A (*See Notes.*) **CHEMICAL DANGERS:** Avoid contamination with oxidizing agents, e.g., nitrates, oxidizing acids, chlorine bleaches, pool chlorine, which may result in ignition. Heated to decomposition emits Hydrogen Chloride and Nitrogen Oxide. Unstable in the presence of light and heat and forms dimers at temperatures above 50 °C. Corrosive to ferrous alloys beginning at 65 °C. Polymerizes slowly, so munitions would be effective for several years. **ROUTES OF EXPOSURE:** Vapor and liquid are readily absorbed by respiratory tract, eyes and skin contact. **INHALATION RISK:** Nitrogen Mustard is a blister agent (vesicant) that causes severe, delayed damage to the respiratory tract. It is an alkylating agent that damages the cells within the bone marrow that are necessary for making blood cells. **EFFECTS OF SHORT-TERM EXPOSURE:** Extremely toxic and may damage the eyes, skin, and respiratory tract and suppress the immune system. Although these agents cause cellular changes within minutes of contact, the onset of pain and other symptoms is delayed. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Bone marrow suppression resulting in damage to the blood forming (hematopoietic) system. Early signs of bone marrow suppression include: a low white blood cell count; an increased risk for developing infections; a tendency for easy bruising and bleeding. May cause lymph node damage and a weakened immune system. It also causes liver and kidney damage, damage to the reproductive systems of both men and women leading to decreased fertility. It is mutagenic, toxic to the developing embryo, and carcinogenic.
PHYSICAL PROPERTIES	Melting Point: 25°F (-3.9°C)
	Boiling Point: 446°F (230°C)
	Vapor Pressure (20°C): 0.0106 mm Hg
	Density (25°C): 1.2347
	Volatility(25°C): 0.120 mg/L
	Aqueous solubility (20°C): slightly soluble
	Aqueous solubility(25°C): 160 mg/L (sparingly soluble)
	Miscible with Dimethylformamide (DMF), Carbon Disulfide (CS_2), Carbon Tetrachloride(CCl_4).
	Estimated log K_{ow} N/A
	Flashpoint: N/A
	Flammability: N/A
ENVIRONMENTAL DATA	Hydrolysis is expected to be a major fate process if released to either soil or water, especially under weakly alkaline conditions. In weakly alkaline soil medium (pH=8), hydrolysis proceeds quickly and within 24 hours is 90-95% complete. In weakly alkaline water medium (pH=8)

	hydrolysis proceeds quickly with the loss of the first chlorine equivalent after 15 minutes, the 2nd equivalent after 4 hours, and with the hydrolysis 90 to 95% complete after 24 hours. An estimated Biological Concentration Factor (BCF) value of 30 suggests that this compound will not bioconcentrate in aquatic organisms and hydrolysis should preclude bioconcentration from being a major fate process. If released to the atmosphere, the chemical is expected to degrade rapidly with a half-life of five hours.

ACUTE EXPOSURE GUIDELINES (AEGLs)

	10 min	30 min	1hr	4 hr	8 hr
AEGL 1 (discomfort, non-disabling)	N/A	N/A	N/A	N/A	N/A
AEGL 2 (irreversible or other serious, long-lasting effects or impaired ability to escape)	N/A	N/A	N/A	N/A	N/A
AEGL 3 (life-threatening effects or death)	N/A	N/A	N/A	N/A	N/A

NOTES

The undiluted liquid decomposes on standing and forms polymeric quaternary ammonium salts which precipitate from solution.

ADDITIONAL INFORMATION

Trade Names and Other Synonyms:

- TL 145
- TS 160
- Nitrogen Lost
- ethanamine, 2-chloro-N,N-bis(2-chloroethyl)-
- trichlormethine
- tri-(2-chloroethyl)amine
- tris(beta-chloroethyl)amine

GLOSSARY OF ACRONYMS

APR - Air-purifying Respirator
CBRN - Chemical, Biological, Radiological, Nuclear
IDLH - Immediately Dangerous to Life and Health
REL - Recommended Exposure Limit
PEL - Permissible Exposure Limit
SCBA - Self-Contained Breathing Apparatus

IMPORTANT NOTICE:

HN3 NITROGEN MUSTARD (ERC555-77-1) The user should verify compliance of the cards with the relevant STATE or TERRITORY legislation before use. NIOSH, CDC 2003