International Chemical Safety Cards

ETHYLBIS(2-CHLOROETHYL)AMINE **ICSC: 1655**

Bis(2-chloroethyl)ethylamine
2-Chloro-N-(2-chloroethyl)-N-ethylethanamine
2-Chloro-N-(2-chloroethyl)-N-ethyl-ethanamine
2,2'-Dichloro-triethylamine
HN1
Nitrogen Mustard
$C_6H_{13}Cl_2N$ / $(ClCH_2CH_2)_2NC_2H_5$
Molecular mass: 170.1

ICSC # 1655
CAS # 538-07-8
RTECS # YE1225000
UN # 2810
April 10, 2008 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Heating will cause rise in pressure with risk of bursting. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Water spray , alcohol-resistant foam , carbon dioxide , powder .
EXPLOSION			In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Sore throat. Burning sensation. Cough. Tremor. Loss of movement co-ordination. Convulsions. Laboured breathing. Shortness of breath. Wheezing.	Closed system.	Half-upright position. Artificial respiration may be needed. No mouth-to-mouth artificial respiration. Refer immediately for medical attention.

	Symptoms may be delayed (see Notes).		
•SKIN	MAY BE ABSORBED! Redness. Pain. Blisters. These may be delayed. (Further see Inhalation).	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer immediately for medical attention.
•EYES	VAPOUR WILL BE ABSORBED! Causes watering of the eyes. Redness. Pain. Spasms, photophobia and dilated pupils . Blurred vision. Severe deep burns. Loss of vision.	Safety goggles . Face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
•INGESTION	Sore throat. Abdominal pain. Burning sensation in the throat and chest. Nausea. Vomiting. Diarrhoea. (Further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer immediately for medical attention. See Notes.

SPILLAGE DISPOSAL	**STORAGE**	**PACKAGING & LABELLING**
Evacuate danger area immediately! Consult an expert! Gas-tight chemical protection suit including self-contained breathing apparatus. Collect leaking liquid in sealable air tight containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. NEVER direct water jet on liquid. Do NOT let this chemical enter the environment.	Keep in the dark. Separated from food and feedstuffs and metals . Keep in a well-ventilated room. Store in an area without drain or sewer access.	Do not transport with food and feedstuffs. UN Hazard Class: 6.1 UN Packing Group: I Signal: Danger Skull-Corr-Health haz Fatal if inhaled Fatal in contact with skin Causes skin irritation Causes serious eye damage May cause genetic defects May cause cancer Causes damage to nervous system and bone marrow May cause respiratory irritation Causes damage to nervous system and bone marrow through prolonged or

		repeated exposure
SEE IMPORTANT INFORMATION ON BACK		
ICSC: 1655	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

International Chemical Safety Cards

ETHYLBIS(2-CHLOROETHYL)AMINE **ICSC: 1655**

I **M** **P** **O** **R** **T** **A** **N** **T** **D** **A** **T** **A**	**PHYSICAL STATE; APPEARANCE:** COLOURLESS , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance will polymerize under the influence of heat and light . Attacks many metals forming flammable/explosive gas (hydrogen - see ICSC 0001). **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its vapour, by inhalation of its aerosol, through the skin, and by ingestion . Serious local effects and systemic effects by all routes of exposure . **INHALATION RISK:** A harmful contamination of the air will be reached quickly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster. **EFFECTS OF SHORT-TERM EXPOSURE:** Blistering agent. Lachrymation. The substance is severely irritating to the eyes, the skin and the respiratory tract . The substance may cause effects on the central nervous system and bone marrow . Inhalation of the substance may cause lung oedema (see Notes). The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**

		The substance may have effects on the bone marrow and central nervous system . This substance is probably carcinogenic to humans. May cause heritable genetic damage to human germ cells. See Notes.
PHYSICAL PROPERTIES	Decomposes at 194 °C Melting point: -34°C Relative density (water = 1): 1.09 g/cm³ Solubility in water, g/100 ml: (very poor) at 25°C	Vapour pressure, kPa at 25°C: 0.03 Relative vapour density (air = 1): 5.9 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00
ENVIRONMENTAL DATA	 No data available.	

N O T E S

Do NOT take working clothes home. Depending on the degree of exposure, periodic medical examination is suggested. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation is therefore essential. Because many of the effects resemble those of ionizing radiation, the term radiomimetic is frequently used.

Transport Emergency Card: TEC (R)-61GT1-I

NFPA Code: H4; F2; R0;

ADDITIONAL INFORMATION

ICSC: 1655 ETHYLBIS(2-CHLOROETHYL)AMINE

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

NITROGEN MUSTARD HN-1 :: Blister Agent

Print

CAS #: 538-07-8
RTECS #: YE1225000

Common Names:

UN #: 2810 (Guide 153)

- bis(2-Chloroethyl)ethylamine
- Ethylbis(2-chloroethyl)amine

Agent Characteristics

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- **APPEARANCE**: Colorless to pale yellow oily liquid.

- **DESCRIPTION**: HN-1 is one of three nitrogen mustard blister agents (vesicants). Nitrogen mustards have not previously been used in warfare. The properties of nitrogen mustards are only slightly different from those of sulfur mustards, another major class of blister agents. However, exposure to nitrogen mustards may be more immediately toxic than exposure to sulfur mustard. Nitrogen mustards are alkylating agents that affect DNA and other molecules in the body. Exposure to nitrogen mustard damages the eyes, skin, and respiratory tract and suppresses the immune system. Although the nitrogen mustards cause cellular changes within minutes of contact, the onset of pain and other symptoms is delayed. Exposure to large amounts can be fatal. HN-1 has a faint fishy or musty odor. It evaporates slowly.

- **METHODS OF DISSEMINATION**:
  - Indoor Air: HN-1 can be released into indoor air as a liquid spray (aerosol) or as a vapor
  - Water: HN-1 can contaminate water.
  - Food: HN-1 can contaminate food.
  - Outdoor Air: HN-1 can be released into outdoor air as a liquid spray (aerosol) or as a vapor.
  - Agricultural: If HN-1 is released into the air as a liquid spray (aerosol), it has the potential to contaminate agricultural products. If HN-1 is released as a vapor, it is highly unlikely to contaminate agricultural products.

- **ROUTES OF EXPOSURE**: HN-1 can be absorbed into the body by inhalation, ingestion, eye contact, and skin contact. Inhalation is an important route of exposure. Ingestion is an uncommon route of exposure. Warm, moist areas with thin skin, the moist lining of body passages and cavities (mucous membranes) and perspiration-covered skin are more sensitive to the effects of this agent.

Personal Protective Equipment

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- **GENERAL INFORMATION**: First Responders should use a NIOSH-certified Chemical, Biological, Radiological, Nuclear (CBRN) Self Contained Breathing Apparatus (SCBA) with a Level A protective suit when entering an area with an unknown contaminant or when entering an area where the concentration of the contaminant is unknown. Level A protection should be used until monitoring results confirm the contaminant and the concentration of the contaminant.
  NOTE: Safe use of protective clothing and equipment requires specific skills developed through training and experience.

- **LEVEL A: (RED ZONE)**: Select when the greatest level of skin, respiratory, and eye protection is required. This is the maximum protection for workers in danger of exposure to unknown chemical hazards or levels above the IDLH or greater than the AEGL-2.
    - A NIOSH-certified CBRN full-face-piece SCBA operated in a pressure-demand mode or a pressure-demand supplied air hose respirator with an auxiliary escape bottle.
    - A Totally-Encapsulating Chemical Protective (TECP) suit that provides protection against CBRN agents.
    - Chemical-resistant gloves (outer).
    - Chemical-resistant gloves (inner).
    - Chemical-resistant boots with a steel toe and shank.
    - Coveralls, long underwear, and a hard hat worn under the TECP suit are optional items.

- **LEVEL B: (RED ZONE)**: Select when the highest level of respiratory protection is necessary but a lesser level of skin protection is required. This is the minimum protection for workers in danger of exposure to unknown chemical hazards or levels above the IDLH or greater than AEGL-2. It differs from Level A in that it incorporates a non-encapsulating, splash-protective, chemical-resistant splash suit that provides Level A protection against liquids but is not airtight.
    - A NIOSH-certified CBRN full-face-piece SCBA operated in a pressure-demand mode or a pressure-demand supplied air hose respirator with an auxiliary escape bottle.
    - A hooded chemical-resistant suit that provides protection against CBRN agents.
    - Chemical-resistant gloves (outer).
    - Chemical-resistant gloves (inner).
    - Chemical-resistant boots with a steel toe and shank.
    - Coveralls, long underwear, a hard hat worn under the chemical-resistant suit, and chemical-resistant disposable boot-covers worn over the chemical-resistant suit are optional items.

- **LEVEL C: (YELLOW ZONE)**: Select when the contaminant and concentration of the contaminant are known and the respiratory protection criteria factors for using Air Purifying Respirators (APR) or Powered Air Purifying Respirators (PAPR) are met. This level is appropriate when decontaminating patient/victims.
    - A NIOSH-certified CBRN tight-fitting APR with a canister-type gas mask or CBRN PAPR for air levels greater than AEGL-2.
    - A NIOSH-certified CBRN PAPR with a loose-fitting face-piece, hood, or helmet and a filter or a combination organic vapor, acid gas, and particulate cartridge/filter combination or a continuous flow respirator for air levels greater than AEGL-1.
    - A hooded chemical-resistant suit that provides protection against CBRN agents.
    - Chemical-resistant gloves (outer).
    - Chemical-resistant gloves (inner).
    - Chemical-resistant boots with a steel toe and shank.
    - Escape mask, face shield, coveralls, long underwear, a hard hat worn under the chemical-resistant suit, and chemical-resistant disposable boot-covers

worn over the chemical-resistant suit are optional items.

- **LEVEL D: (GREEN ZONE)**: Select when the contaminant and concentration of the contaminant are known and the concentration is below the appropriate occupational exposure limit or less than AEGL-1 for the stated duration times.
  - Limited to coveralls or other work clothes, boots, and gloves.

Emergency Response

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- **CHEMICAL DANGERS**:
  - HN-1 is corrosive to iron alloys beginning at 149°F (65°C).
  - Toxic intermediate products are produced during hydrolysis of HN-1.
  - Contact with metals may evolve flammable hydrogen gas.

- **EXPLOSION HAZARDS**:
  - No immediate danger of fire or explosion.
  - When heated, vapors may form explosive mixtures with air, presenting an explosion hazard indoors, outdoors, and in sewers.
  - Containers may explode when heated.

- **FIRE FIGHTING INFORMATION**:
  - HN-1 is combustible.
  - The agent may burn but does not ignite readily.
  - Fire may produce irritating, corrosive, and/or toxic gases.
  - For small fires, use dry chemical, carbon dioxide, or water spray.
  - For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. Move containers from the fire area if it is possible to do so without risk to personnel. Dike fire control water for later disposal; do not scatter the material.
  - Avoid methods that will cause splashing or spreading.
  - For fire involving tanks or car/trailer loads, fight the fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after the fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tanks. Always stay away from tanks engulfed in fire.
  - Runoff from fire control or dilution water may be corrosive and/or toxic, and it may cause pollution.
  - If the situation allows, control and properly dispose of run-off (effluent).

- **INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES**:
  - If a tank, rail car, or tank truck is involved in a fire, isolate it for 0.5 mi (800 m) in all directions; also, consider initial evacuation for 0.5 mi (800 m) in all directions.
  - Small spills (involving the release of approximately 52.83 gallons (200 liters) or less), when HN-1 is used as a weapon
    - First isolate in all directions: 100 ft (30 m).
    - Then protect persons downwind during the day: 0.1 mi (0.2 km).
    - Then protect persons downwind during the night: 0.1 mi (0.2 km).

- Large spills (involving quantities greater than 52.83 gallons (200 liters)), when HN-1 is used as a weapon
  - First isolate in all directions: 200 ft (60 m).
  - Then protect persons downwind during the day: 0.4 mi (0.6 km).
  - Then protect persons downwind during the night: 0.8 mi (1.3 km).

- **PHYSICAL DANGERS**:
  - Vapors are heavier than air. They will spread along the ground and collect and stay in poorly-ventilated, low-lying, or confined areas (e.g., sewers, basements, and tanks).
  - Hazardous concentrations may develop quickly in enclosed, poorly-ventilated, or low-lying areas. Keep out of these areas. Stay upwind.
  - HN-1 is mildly persistent.

- **NFPA 704 Signal**:
  - **Health:** 4
  - **Flammability:** 2
  - **Reactivity:** 0
  - **Special:**

- **SAMPLING AND ANALYSIS**:
  - OSHA: Not established/determined
  - NIOSH: Not established/determined
  - Additional Sampling and Analysis Information

Signs/Symptoms

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- **TIME COURSE**: Clinical effects do not appear until hours after nitrogen mustard exposure. Nitrogen mustards penetrate and bind quickly to cells of the body, but their health effects develop slowly. The full extent of cellular injury may not be known for days. The sooner after exposure that health effects occur, the more likely it is that the patient/victim was exposed to a high concentration of mustard. Similarly, the sooner that health effects occur, the more likely it is that they will progress and become severe. Eye exposure: The eyes are the organs that are most sensitive to mustard vapor; eye injury may occur within 1 to 2 hours after severe exposure, or 3 to 12 hours after a mild to moderate exposure. Inhalation exposure: Airway injury may occur within 2 to 6 hours after severe exposure and within 12 to 24 hours after mild exposure. Skin exposure: The symptom-free (latent) period is 6 to 12 hours in temperate conditions; hot, humid weather strikingly increases the action of nitrogen mustards. Some skin injury may appear as late as 48 hours after exposure.

- **EFFECTS OF SHORT-TERM (LESS THAN 8-HOURS) EXPOSURE**: Nitrogen mustards damage the tissues of the eyes, skin, and respiratory tract. The skin healing process following mustard exposure is very slow. In addition to being blister agents (vesicants), nitrogen mustards are alkylating agents: when absorbed into the body, they can injure the bone marrow, lymph nodes, and spleen, causing a drop in white blood cell counts and increasing the risk of developing infections.

Internal bleeding (hemorrhage) and a deficiency of red blood cells (anemia) may also result from bone marrow injury. Nitrogen mustards also affect the central nervous system (CNS). Nitrogen mustard exposure may be fatal; the cause of death is usually respiratory failure.

- **EYE EXPOSURE**:
  - Mild (onset within 4 to 12 hours): Tear production (lacrimation), irritation, itching, burning, spasmodic blinking (blepharospasm), dryness or gritty feeling, possible pinpoint pupils (miosis).
  - Moderate (onset within 3 to 6 hours): Above plus increased redness, fluid accumulation (edema) in the eyelids, and moderate pain.
  - Severe (usually from liquid agent; onset within 1 to 2 hours): Increased fluid accumulation (edema) in the eyelids, painful sensitivity to light (photophobia), damage to the cornea (ulceration), blindness, and severe pain.

- **INGESTION EXPOSURE**:
  - Nausea, vomiting (emesis), pain, hemorrhagic diarrhea, and chemical burns of the gastrointestinal (GI) tract.

- **INHALATION EXPOSURE**:
  - Mild (onset within 2 to 24 hours): Runny nose (rhinorrhea), sneezing, nosebleed (epistaxis), hoarseness progressing to "toneless" voice, barking cough, loss of taste and smell, wheezing and difficulty breathing or shortness of breath (dyspnea) in smokers and asthmatics, and nasal and sinus pain (occurring later).
  - Severe (onset within 2 to 6 hours): Same as above, plus acute inflammation of the upper and lower airways, tissue death (necrosis) of the airway lining (respiratory epithelium), possible obstruction of both upper and lower airways due to formation of a false membrane or fibrous deposit (pseudomembrane); airway blockage (occlusion) from inflamed and dead (necrotic) cells; and death, due to inflammatory lung disease (pneumonia).
  - Exposures to higher concentrations of vapor result in health effects that occur sooner and are more severe.
  - Damage to the airways (and to tissues immediately surrounding the airways) begins with the upper airways and descends to the lower airways. The severity of damage increases as the concentration of nitrogen mustard increases.

- **SKIN EXPOSURE**:
  - Tender skin, the moist lining of body passages and cavities (mucous membranes), and perspiration-covered skin are more sensitive to the effects of nitrogen mustard.
  - Skin effects of liquid mustard occur sooner than do the effects of mustard vapor.
  - Mild to moderate: Erythema (redness) begins to appear 1 to 24 hours after exposure (typically within 4 to 8 hours); blistering (vesication) begins 2 to 18 hours after onset of redness; possible intense itching (pruritus), and burning pain.
  - Severe: As above, with more severe blistering (vesication) with areas of

central tissue death (necrosis), plus whole-body (systemic) health effects including weakness (malaise), vomiting (emesis), fever, and complete exhaustion (prostration).
    - Skin exposure to nitrogen mustard can be fatal. An area of redness (erythema), with or without blistering (vesication), that covers 25% or more of the body's surface area, suggests a lethal exposure.

Decontamination

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- **INTRODUCTION**: The purpose of decontamination is to make an individual and/or their equipment safe by physically removing toxic substances quickly and effectively. Care should be taken during decontamination, because absorbed agent can be released from clothing and skin as a gas. Your Incident Commander will provide you with decontaminants specific for the agent released or the agent believed to have been released.

- **DECONTAMINATION CORRIDOR**: The following are recommendations to protect the first responders from the release area:
    - Position the decontamination corridor upwind and uphill of the hot zone.
    - The warm zone should include two decontamination corridors. One decontamination corridor is used to enter the warm zone and the other for exiting the warm zone into the cold zone. The decontamination zone for exiting should be upwind and uphill from the zone used to enter.
    - Decontamination area workers should wear appropriate PPE. See the PPE section of this card for detailed information.
    - A solution of detergent and water (which should have a pH value of at least 8 but should not exceed a pH value of 10.5) should be available for use in decontamination procedures. Soft brushes should be available to remove contamination from the PPE.
    - Labeled, durable 6-mil polyethylene bags should be available for disposal of contaminated PPE.

- **INDIVIDUAL DECONTAMINATION**: The following methods can be used to decontaminate an individual:
    - Decontamination of First Responder:
        - Begin washing PPE of the first responder using soap and water solution and a soft brush. Always move in a downward motion (from head to toe). Make sure to get into all areas, especially folds in the clothing. Wash and rinse (using cold or warm water) until the contaminant is thoroughly removed.
        - Remove PPE by rolling downward (from head to toe) and avoid pulling PPE off over the head. Remove the SCBA after other PPE has been removed.
        - Place all PPE in labeled durable 6-mil polyethylene bags.

    - Decontamination of Patient/Victim:
        - Remove the patient/victim from the contaminated area and into the decontamination corridor.
        - Remove all clothing (at least down to their undergarments) and

place the clothing in a labeled durable 6-mil polyethylene bag.
- Thoroughly wash and rinse (using cold or warm water) the contaminated skin of the patient/victim using a soap and water solution. Be careful not to break the patient/victim's skin during the decontamination process, and cover all open wounds.
- Cover the patient/victim to prevent shock and loss of body heat.
- Move the patient/victim to an area where emergency medical treatment can be provided.

First Aid

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- **GENERAL INFORMATION**: Nitrogen mustards are 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. Thus, patients/victims arriving immediately from the scene of nitrogen mustard exposure are not likely to have signs and symptoms. The sooner after exposure that symptoms occur, the more likely they are to progress and become severe. Decontamination of all potentially exposed areas within minutes after exposure is the only effective means of decreasing tissue damage.

- **ANTIDOTE**: 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.

- **EYE**:
  - Immediately remove the patient/victim from the source of exposure.
  - Immediately wash eyes with large amounts of tepid water for at least 15 minutes.
  - Eyes must be decontaminated within minutes after exposure to reduce tissue damage.
  - Do not cover eyes with bandages.
  - Seek medical attention immediately.

- **INGESTION**:
  - Immediately remove the patient/victim from the source of exposure.
  - Ensure that the patient/victim has an unobstructed airway.
  - Do not induce vomiting (emesis).
  - Administer nothing by mouth (NPO).
  - Seek medical attention immediately.

- **INHALATION**:
  - Immediately remove the patient/victim from the source of exposure.
  - Evaluate respiratory function and pulse.
  - Ensure that the patient/victim has an unobstructed airway.
  - If shortness of breath occurs or breathing is difficult (dyspnea), administer oxygen.
  - Assist ventilation as required. Always use a barrier or bag-valve-mask device.

- If breathing has ceased (apnea), provide artificial respiration.
- Seek medical attention immediately.

- **SKIN**:
  - Immediately remove the patient/victim from the source of exposure.
  - See the decontamination section for patient/victim decontamination procedures.
  - Skin must be decontaminated within minutes after exposure to limit injury.
  - To reduce the potential for whole-body (systemic) toxicity, decontaminate the patient/victim as late as 2 or 3 hours after exposure. Note that decontamination at this time may increase the severity of the skin reaction.
  - Seek medical attention immediately.

See ATSDR Medical Management Guidelines for Blister Agents -- Nitrogen Mustard for more detailed recommendations, http://www.atsdr.cdc.gov/MHMI/mmg164.pdf.

Long-Term Implications

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- **MEDICAL TREATMENT**: Because health effects due to nitrogen mustard may not occur until several hours after exposure, patients/victims should be observed in a hospital setting for at least 24 hours. Gastric lavage is contraindicated following ingestion of this agent due to the risk of perforation of the esophagus or upper airway. Following significant whole-body (systemic) absorption of nitrogen mustard, injury to the bone marrow, lymph nodes, and spleen may cause a drop in white blood cell counts (beginning on days 3 to 5), which can result in an increased risk for developing (life-threatening) infections. Counts of red blood cells and platelets may also fall due to bone marrow damage.

- **DELAYED EFFECTS OF EXPOSURE**: Following eye exposure, visual loss may return within days to months depending on the severity of exposure; however, permanent visual loss is rare. Chronic eye infections are possible. After-effects (sequelae) of inhalation exposure may include loss of taste and smell; chronic respiratory illness, including asthmatic inflammation of the large airways (bronchitis), recurrent respiratory infections, and increased fibrous tissue in the lung (fibrosis); and cancer of the airways (following repeated exposures). Skin scarring and pigment changes may follow a severe skin lesion from nitrogen mustard exposure; cancer sometimes develops in scarred skin. Nitrogen mustard exposures may produce lasting central nervous system (CNS) effects; minor psychological problems can last for a year or more after exposure.

- **EFFECTS OF CHRONIC OR REPEATED EXPOSURE**: HN-1 is a known carcinogen, developmental toxin, and reproductive toxin. Chronic or repeated exposure to HN-1 may cause bone marrow suppression, lymph node damage, weakening of the immune system, kidney damage, and reproductive system damage.

On-Site Fatalities

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- **INCIDENT SITE**:

- Consult with the Incident Commander regarding the agent dispersed, dissemination method, level of PPE required, location, geographic complications (if any), and the approximate number of remains.
- Coordinate responsibilities and prepare to enter the scene as part of the evaluation team along with the FBI HazMat Technician, local law enforcement evidence technician, and other relevant personnel.
- Begin tracking remains using waterproof tags.

- **RECOVERY AND ON-SITE MORGUE**:
  - Wear PPE until all remains are deemed free of contamination.
  - Establish a preliminary (holding) morgue.
  - Gather evidence, and place it in a clearly labeled impervious container. Hand any evidence over to the FBI.
  - Remove and tag personal effects.
  - Perform a thorough external evaluation and a preliminary identification check.
  - See the Decontamination section for decontamination procedures.
  - Decontaminate remains before they are removed from the incident site.

See Guidelines for Mass Fatality Management During Terrorist Incidents Involving Chemical Agents, U.S. Army Soldier and Biological Chemical Command (SBCCOM), November, 2001 for detailed recommendations.

Occupational Exposure Limits

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- **NIOSH REL**:
  - Not established/determined
- **OSHA PEL**:
  - Not established/determined
- **ACGIH TLV**:
  - Not established/determined
- **NIOSH IDLH**: 1 ppm
- **DOE TEEL**:
  - TEEL-0: 1.5 mg/m^3
  - TEEL-1: 4 mg/m^3
  - TEEL-2: 7.5 mg/m^3
  - TEEL-3: 30 mg/m^3
- **AIHA ERPG**:
  - ERPG-1: Not established/determined
  - ERPG-2: Not established/determined
  - ERPG-3: Not established/determined

Acute Exposure Guidelines

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	5 min	10 min	30 min	1 hr	4 hr	8 hr

AEGL 1 (discomfort, non-disabling) - mg/m^3	Not established/ determined	Not recommended	Not recommended	Not recommended	Not recommended	Not recommended
AEGL 2 (irreversible or other serious, long-lasting effects or impaired ability to escape) - mg/m^3	Not established/ determined	0.13 mg/m^3	0.044 mg/m^3	0.022 mg/m^3	0.0056 mg/m^3	0.0028 mg/m^3
AEGL 3 (life-threatening effects or death) - mg/m^3	Not established/ determined	2.2 mg/m^3	0.74 mg/m^3	0.37 mg/m^3	0.093 mg/m^3	0.047 mg/m^3

The conversion factor in air can be calculated using the following formulas:

- *ppm = (mg/m^3) * 24.5) / molecular mass*
- *mg/m^3 = (ppm * molecular mass) / 24.5*

Acute exposure guidelines are not recommended for AEGL 1 due to insufficient data.
The technical support document for these values is in preparation.

Decontamination (Environment and Equipment)

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- **ENVIRONMENT/SPILLAGE DISPOSAL**: The following methods can be used to decontaminate the environment/spillage disposal:
  - Do not touch or walk through the spilled agent if at all possible. However, if you must, personnel should wear the appropriate PPE during environmental decontamination. See the PPE section of this card for detailed information.
  - Keep combustibles (e.g., wood, paper, and oil) away from the spilled agent.
  - Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact the spilled agent.
  - Do not direct water at the spill or the source of the leak.
  - Stop the leak if it is possible to do so without risk to personnel, and turn leaking containers so that gas rather than liquid escapes.
  - Prevent entry into waterways, sewers, basements, or confined areas.
  - Isolate the area until gas has dispersed.
  - Ventilate the area.

- **EQUIPMENT**: Agents can seep into the crevices of equipment making it dangerous to handle. The following methods can be used to decontaminate equipment:
    - Not established/determined

Agent Properties

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Chemical Formula $C_6H_{13}Cl_2N$

Aqueous solubility Slightly soluble
Boiling Point 381°F (194°C)
Density Liquid: 1.09 g/mL at 77°F (25°C)
Vapor: 5.9 (air = 1)

Flammability Combustible
Flashpoint No immediate danger of fire or explosion
Ionization potential Not established/determined
Log $K_{benzene-water}$ Not established/determined
Log K_{ow} (estimated) 2.02
Melting Point 29.2°F (-3.4°C)
Molecular Mass 170.08
Soluble In Miscible in organic solvents
Specific Gravity 1.09
Vapor Pressure 0.25 mm Hg at 77°F (25°C)
Volatility 127 mg/m^3 at 14°F (-10°C)
308 mg/m^3 at 32°F (0°C)
1,520 mg/m^3 at 68°F (20°C)
3,100 mg/m^3 at 86°F (30°C)

Hazardous Materials Warning Labels/Placards

top

Shipping Name Toxic liquids, organic, n.o.s.
Identification Number 2810 (Guide 153)
Hazardous Class or Division 6.1
Subsidiary Hazardous Class or Division
Label Poison (Toxic)
PG III

Placard Image


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