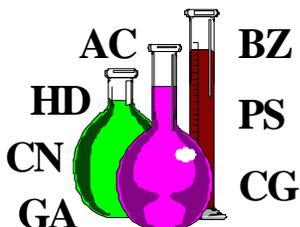


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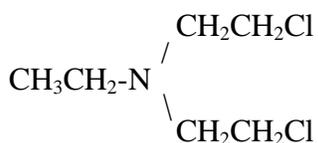


*Detailed Facts About Blister Agent Nitrogen Mustard  
(HN-1)*

218-10-1096

*Physical Properties of HN-1*

*Chemical Structure*



*Chemical Formula*



*Description*

HN-1 is oily, colorless to pale yellow with a faint, fishy, or musty odor.

*Molecular Weight*

170.08

*Vapor Pressure (mm Hg)*

0.0773 @ 10°C  
0.25 @ 25°C  
0.744 @ 40°C

*Boiling Point*

194°C calculated; decomposes.

*Freezing Point*

-34°C

*Density*

Liquid = 1.09 at 25°C  
Vapor = 5.9 times heavier than air

*Solubility*

Sparingly soluble in water; freely soluble in acetone and other organic solvents.

*Flash Point*

No immediate danger of fire or explosion.

**Volatility**  
127 mg/m<sup>3</sup> @ -10°C  
308 mg/m<sup>3</sup> @ 0°C  
1,520 mg/m<sup>3</sup> @ 20°C  
3,100 mg/m<sup>3</sup> @ 30°C

**Toxicity Values**  
IC<sub>50</sub> (eye contact) = 200 mg-min/m<sup>3</sup>  
IC<sub>50</sub> (percutaneous) = 9,000 mg-min/m<sup>3</sup>  
LC<sub>50</sub> (inhalation) = 1,500 mg-min/m<sup>3</sup>  
LC<sub>50</sub> (percutaneous) = 20,000 mg-min/m<sup>3</sup>  
vapor)  
NOAEL (inhalation) = 2 mg-min/m<sup>3</sup>

### **Exposure Limits**

Workplace Time-Weighted Average - 0.003 mg/m<sup>3</sup>  
General Population Limits - No standard identified

## **Toxic Properties of HN-1**

*HN-1 was the first compound of the HN series developed in the late 1920s and early 1930s. HN-1 was designed as a pharmaceutical (to remove warts) and became a military agent; HN-2 was designed as a military agent and became a pharmaceutical; HN-3 was designed as a military agent and is the only one of these agents that remains anywhere as a military agent. These agents are more immediately toxic than the sulfur mustards.*

### **Overexposure Effects**

The vapors are irritating to the eyes and nasal membranes even in low concentration. HN-1 is a vesicant (blister agent) and alkylating agent producing cytotoxic action on the hematopoietic (blood-forming) tissues. HN-1 is not naturally detoxified by the body; therefore, repeated exposure produces a cumulative effect.

### **Emergency and First Aid Procedures**

Inhalation: remove from source immediately; give artificial respiration if breathing has stopped; administer oxygen if breathing is difficult; seek medical attention immediately.

Eye Contact: flush eyes immediately with water for 10-15 minutes, pulling eyelids apart with fingers, and pouring water into eyes; do not cover eyes with bandages; protect eyes with dark or opaque goggles after flushing eyes; seek medical attention immediately.

Skin Contact: don respiratory mask and gloves; remove victim from source immediately and remove contaminated clothing; decontaminate the skin immediately by flushing with a 5 percent solution of liquid household bleach; wash off with soap and water after 3-4 minutes to remove decon agent and protect against erythema; seek medical attention immediately; to prevent systemic toxicity, decontamination should be done as late as 2 or 3 hours after exposure even if it

increases the severity of the local reaction; further cleans with soap and water.

Ingestion: do not induce vomiting; give victims milk to drink; seek medical attention immediately.

### ***Protective Equipment***

Protective Gloves: MANDATORY - Wear Butyl toxicological agent protective gloves (M3, M4, or glove set).

Eye Protection: Wear chemical goggles as a minimum; use goggles and face shield for splash hazard.

Other: Wear full protective clothing consisting of the M3 Butyl rubber suit with hood, M2A1 boots, M3 gloves, treated underwear, M9 series mask and coveralls (if desired). Wear gloves and lab coat with M9, M17, or M40 Mask readily available for general lab work,.

In addition, wear daily clean smock, foot covers, and head cover when handling contaminated lab animals.

### ***Reactivity Data***

Stability: Polymerizes slowly.

Rate of Hydrolysis: Slow.

Hydrolysis Products: Hydroxyl derivatives and condensation products.

Incompatibility: Corrosive to ferrous alloys beginning at 65°C.

Hazardous Decomposition: Toxic intermediate products are produced during hydrolysis. Approximate half-life in water at 25°C is 1.3 minutes. Decomposition comes through slow change into quaternary ammonium salts. Decomposition point is below 94°C.

***Persistency*** Depends on munitions used and the weather; somewhat shorter duration of effectiveness for HD, heavily splashed liquid of which persists 1 to 2 days under average weather conditions, and a week or more under very cold conditions.

### ***References***

1. Department of the Army Field Manual (DA FM) 3-9, *Potential Military Chemical/Biological Agents and Compounds*, 1990.

2. DA FM 8-285, *Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries*, 1990.
3. *The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Eleventh Edition*, Merck & Co., Inc., Rahway, New Jersey, 1989.
4. U.S. Army Chemical Command Materiel Destruction Agency, *Site Monitoring Concept Study*, 15 September 1993.

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