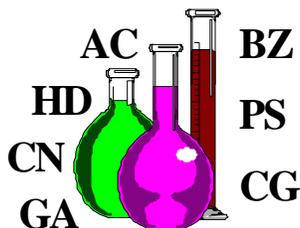


U.S. Army Center for Health Promotion and Preventive Medicine



*Detailed Facts About Blister Agent Nitrogen Mustard
(HN-3)*

218-12-1096

Physical Properties of HN-3

<i>Chemical Structure</i>	$\begin{array}{c} \text{CH}_2\text{CH}_2\text{Cl} \\ / \\ \text{ClCH}_2\text{CH}_2\text{-N} \\ \backslash \\ \text{CH}_2\text{CH}_2\text{Cl} \end{array}$
<i>Chemical Formula</i>	$\text{N}(\text{CH}_2 \text{ CH}_2 \text{ Cl})_3$
<i>Description</i>	HN-3 is a colorless to pale yellow liquid with a butter almond odor; most stable in storage of three nitrogen mustards.
<i>Molecular Weight</i>	204.54
<i>Vapor Pressure (mm Hg)</i>	0.0109 @ 25°C
<i>Boiling Point</i>	256°C calculated, decomposes.
<i>Freezing Point</i>	-3.7°C
<i>Density</i>	Liquid = 1.24 at 25°C Vapor = 7.1 heavier than air
<i>Solubility</i>	Soluble in sulfur mustards and chloropicrin; insoluble in water; soluble in ether, benzene, and acetone.
<i>Flash Point</i>	High enough not to interfere with military use of the agent.

Volatility
13 mg/m³ @ 0°C
121 mg/m³ @ 25°C
180 mg/m³ @ 30°C
390 mg/m³ @ 40°C

Toxicity Values
ICt₅₀ (eye) = 200 mg-min/m³
ICt₅₀ (skin) = 2,500 mg-min/m³
LCt₅₀ (inhalation) = 1,500 mg-min/m³
LCt₅₀ (skin) = 10,000 mg-min/m³
NOAEL (inhalation) = 2 mg-min/m³

Exposure Limits

Workplace Time-Weighted Average - No standard identified
General Population Limits - No standard identified

Toxic Properties of HN-3

HN-3 was the last of the nitrogen mustard agents developed. It was designed as a military agent and is the only one of the nitrogen mustards that is still used for military purposes. It is the principal representative of the nitrogen mustards because its vesicant properties are almost equal to those of HD.

Overexposure Effects

HN-3 is a cumulative poison which is highly irritating to the eyes and throat. Eye irritation, tearing, and photophobia develop immediately after exposure. The median incapacitating dose for eyes is 200 mg-min/m³. Blistering of the skin may occur after liquid exposure, severe or persistent exposure, or vapor condensation in sweat. Usually a rash will develop from liquid contamination within an hour, replaced by blistering between six and twelve hours after exposure.

HN-3 interferes with hemoglobin functioning in the blood, hindering the production of new blood cells and destroying white blood cells.

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, decontaminate as late as 2 or 3 hours after exposure even if it increases the severity of the local reaction; further clean 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, underwear, M9 series mask and coveralls (if desired). For general lab work, wear gloves and lab coat with M9, M17, or M40 mask readily available.

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

Reactivity Data

Stability: Slow but steady polymerization; not stable; decomposes before boiling point is reached or condenses under all conditions; the reactions involved could generate enough heat to cause an explosion.

Incompatibility: No actions on metals or other materials

Hazardous Decomposition: Approximate half-life in water at 25°C is 4 minutes; decomposition point is below boiling point.

Hazardous Polymerization: Polymerized components will present an explosion hazard in open air.

Rate of Hydrolysis: Slow, except in presence of alkalis; products formed are complex polymeric quaternary ammonium salts; dimerizes fairly rapidly in water.

Persistency Considerably longer than for HD. HN-3 use is emphasized for terrain denial. It can be approximately 2x or 3x the persistence of HD and adheres well to equipment and personnel especially in cold weather.

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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