ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

BLISTER AGENTS HN-1, HN-2, HN-3 (nitrogen mustards)

CAS #538-07-8 (HN-1); CAS #51-75-2 (HN-2); CAS #555-77-1 (HN-3)

Division of Toxicology ToxFAQs™ **April 2002**

This fact sheet answers the most frequently asked health questions (FAQs) about nitrogen mustards. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: It is unlikely that the general public will be exposed to nitrogen mustards agents HN-1, HN-2, and HN-3. Exposure to vapors of nitrogen mustards can damage the respiratory airways. Contact with the skin or eyes may cause burns. When nitrogen mustards are absorbed by the body, they may cause damage to bone marrow and the immune system. Exposure to high levels can cause death. Nitrogen mustards HN-1, HN-2, and HN-3 have not been identified in any of the 1,585 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are nitrogen mustards?

Nitrogen mustards (HN-1, HN-2, HN-3) are colorless to yellow, oily liquids that evaporate very slowly. HN-1 has a faint, fishy or musty odor. HN-2 has a soapy odor at low concentrations and a fruity odor at higher concentrations. HN-3 may smell like butter almond.

Although nitrogen mustards could be used in chemical warfare, there are presently no records of such use. HN-1 has been used to remove warts in the past, and HN-2 has been used sparingly in chemotherapy.

What happens to nitrogen mustards when they enter the environment?

❑ Nitrogen mustards HN-1, HN-2, and HN-3 could enter the environment from an accidental release.

❑ When released to air, nitrogen mustards will be broken down by compounds that are found in the air, but they may persist in air for a few days before being broken down.

❑ Nitrogen mustards will be broken down in water quickly, and only small amounts may evaporate.

❑ Nitrogen mustards will be broken down in moist soil quickly, and only small amounts may evaporate.

❑ Nitrogen mustards do not accumulate in the food chain.

How might I be exposed to nitrogen mustards?

❑ The general population will not be exposed to nitrogen mustards.

❑ The nitrogen mustards HN-1, HN-2, and HN-3 are not manufactured in significant commercial quantities in the United States. Although several of the nitrogen mustards have medicinal uses and as chemical warfare agents, they were never stockpiled as part of the U.S. chemical warfare inventory.

How can nitrogen mustards affect my health?

If you breathe nitrogen mustard vapors, you will likely experience such effects as nasal and sinus pain or discomfort, pharyngitis, laryngitis, cough, and shortness of breath. Damage to cells lining your airways may begin within hours and get worse over the next several days. Exposure to high levels could cause death.

Skin contact with nitrogen mustard vapors or liquid, will likely cause initial swelling and rash, followed by blistering. Contact with high levels of nitrogen mustards can result in second- and third-degree burns. If nitrogen mustards touch the eye, you may experience eye inflammation, pain, swelling, corneal damage, burns, and even blindness.

If you swallow nitrogen mustards, you will probably experience burning of the mouth, esophagus, and stomach.

When nitrogen mustards are absorbed by the body, they may cause damage to your immune system and bone marrow.

There is some evidence that nitrogen mustard treatment in humans may result in decreased fertility.

How likely are nitrogen mustards to cause cancer?

The International Agency for Research on Cancer (IARC) has classified nitrogen mustard HN-2 as probably carcinogenic to humans, based on evidence that it causes leukemia in humans and cancers of the lung, liver, uterus, and large intestine in animals.

How can nitrogen mustards affect children?

Children exposed to nitrogen mustards would probably experience the same effects seen in exposed adults. But we do not know whether children differ from adults in their susceptibility to nitrogen mustards.

A few case reports have linked treatment with HN-2 in pregnant mothers to changes in the unborn child. Nitrogen mustards have been shown to cause damage to the fetus in animals.

How can families reduce the risk of exposure to nitrogen mustards?

Families are not likely to be exposed to nitrogen mustards.

Is there a medical test to show whether I've been exposed to nitrogen mustards?

There are no specific tests to indicate whether you have been exposed to nitrogen mustards.

Has the federal government made recommendations to protect human health?

An Airborne Exposure Limit (as recommended by the Surgeon General's Working Group, U.S. Department of Health and Human Services) of 0.003 milligrams of HN-1 per cubic meter of air (0.003 mg/m^3) has been established as a time-weighted average (TWA) for the workplace.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.