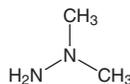


1,1-Dimethylhydrazine

CAS No. 57-14-7

Reasonably anticipated to be a human carcinogen
First Listed in the *Fourth Annual Report on Carcinogens* (1985)



Carcinogenicity

1,1-Dimethylhydrazine (unsymmetrical dimethylhydrazine; UDMH) is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (IARC 1974, 1982, 1999). When administered by gavage, 1,1-dimethylhydrazine increased the incidence of lung tumors in female mice. When administered in drinking water, 1,1-dimethylhydrazine induced high incidences of angiosarcomas in various organs and tumors of the kidneys, lungs, and liver in mice of both sexes. The same route of administration induced liver carcinomas in rats.

No adequate data were available to evaluate the carcinogenicity of 1,1-dimethylhydrazine in humans (IARC 1974, 1999).

Properties

1,1-Dimethylhydrazine is a clear, colorless, flammable, hygroscopic liquid with an ammonia-like, fishy odor. 1,1-Dimethylhydrazine is miscible with water, ethanol, ether, dimethylformamide, and hydrocarbons. The liquid fumes in air and gradually turns yellow. It is easily ignited by heat, flame, or oxidizers, and its vapor may form explosive mixtures with air. During combustion, it emits toxic fumes of nitrogen oxide. 1,1-Dimethylhydrazine is available in the United States as a single grade containing 98% (minimum) active ingredient with 1.9% (maximum) dimethylamine and 0.3% (maximum) water content (IARC 1999, HSDB 2000).

Use

1,1-Dimethylhydrazine is primarily used as a component of jet and rocket fuels. Other uses include an intermediate for chemical synthesis, a stabilizer for organic peroxide fuel additives, an absorbent for acid gases, a plant growth control agent, and in photography (ATSDR 1997, IARC 1999, HSDB 2000).

Production

Production of 1,1-dimethylhydrazine was first reported to the U.S. Tariff Commission in 1956 (IARC 1974). Two current U.S. manufacturers and nine suppliers were identified (ATSDR 1997, HSDB 2000, Chem Sources 2001). Current information on production volumes for 1,1-dimethylhydrazine and data on past or current import or export quantities were not publicly available (ATSDR 1997). However, U.S. imports and exports of non-aromatic organic derivatives of hydrazine or of hydroxylamine were approximately 4.3 million lb and 6.1 million lb, respectively, in 2000 (ITA 2001). Past production quantities reported for the chemical were 45 metric tons (99,000 lb) in 1977 and 4.5 metric tons (9,900 lb) in 1982 (ATSDR 1997, HSDB 2000). The 1979 TSCA Inventory identified four companies that produced 55,000 lb of 1,1-dimethylhydrazine in 1977 (TSCA 1979).

Exposure

The primary routes of potential human exposure to 1,1-dimethylhydrazine are inhalation, ingestion, and dermal contact. Possible human exposure may occur during its production and use as a chemical intermediate or when applied to control the growth of crops and vegetation. Potential exposure by ingestion may occur if residues are present on foods treated with 1,1-dimethylhydrazine. For

the general population, exposure to 1,1-dimethylhydrazine is expected to be very low due to its rapid environmental degradation; it has not been detected in air, water, or soil (ATSDR 1997).

Small amounts of 1,1-dimethylhydrazine (up to 147 ng/g) have been found in tobacco products; therefore, people who chew tobacco, smoke cigarettes, or are exposed to cigarette smoke indirectly may be exposed to small amounts of 1,1-dimethylhydrazine. In the past, humans have been exposed to 1,1-dimethylhydrazine following ingestion of fruits sprayed with the plant growth regulator Alar® (daminozide). Alar® is no longer used on food plants in the United States. It continues to be used on some non-food plants, and therefore, greenhouse workers who use Alar® may be exposed to small amounts of 1,1-dimethylhydrazine (ATSDR 1997).

The potential for exposure to 1,1-dimethylhydrazine is higher for workers that manufacture or use the chemical, people that live near a military installation where the chemical is used, or people that live near hazardous waste sites contaminated with hydrazines. In the workplace, exposure to 1,1-dimethylhydrazine may occur during its production, transportation, or use, especially if proper protective equipment is not used (ATSDR 1997). The National Occupational Exposure Survey (1981-1983) indicated that 2,917 workers were potentially exposed to 1,1-dimethylhydrazine (NIOSH 1984). This estimate was based only on observations of the actual use of the compound. The National Occupational Hazard Survey, conducted by NIOSH from 1972 to 1974, estimated that only 16 people were potentially exposed to 1,1-dimethylhydrazine as a decomposition product in the workplace (NIOSH 1976). EPA's Toxic Chemical Release Inventory (TRI) listed five industrial facilities that produced, processed, or otherwise used 1,1-dimethylhydrazine in 1999 (TRI99 2001). In 1999, five industrial facilities in the United States reported releasing 998 lb of 1,1-dimethylhydrazine to the air and approximately 8,000 lb were transferred off-site for treatment.

Regulations

EPA

Clean Air Act

NESHAP: Listed as a Hazardous Air Pollutant (HAP)

NSPS: Manufacture of substance is subject to certain provisions for the control of Volatile Organic Compound (VOC) emissions

Prevention of Accidental Release: Threshold Quantity (TQ) = 15,000 lb

Comprehensive Environmental Response, Compensation, and Liability Act

Reportable Quantity (RQ) = 10 lb

Emergency Planning and Community Right-To-Know Act

Toxics Release Inventory: Listed substance subject to reporting requirements

Reportable Quantity (RQ) = 10 lb

Threshold Planning Quantity (TPQ) = 1,000 lb

Resource Conservation and Recovery Act

Listed Hazardous Waste: Waste codes in which listing is based wholly or partly on substance - U098, K107, K108, K109, K110

Listed as a Hazardous Constituent of Waste

OSHA

Permissible Exposure Limit (PEL) = 0.5 ppm (1 mg/m³)

Guidelines

ACGIH

Threshold Limit Value - Time-Weighted Average Limit (TLV-TWA) = 0.01 ppm

NIOSH

Ceiling Recommended Exposure Limit = 0.06 ppm (0.15 mg/m³) (2 hour exposure)

Immediately Dangerous to Life and Health (IDLH) = 15 ppm

Listed as a potential occupational carcinogen

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