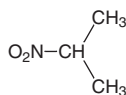


## 2-Nitropropane

### CAS No. 79-46-9

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



### Carcinogenicity

2-Nitropropane is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (IARC 1982a, 1982b, 1987, 1999). When administered through inhalation, 2-nitropropane induced hepatocellular carcinomas in male rats and hepatocellular nodules in rats of both sexes (NCI DCE 1985, IARC 1982a, 1999). An inhalation study in rabbits was considered to be inadequate for evaluation by an IARC Working Group (IARC 1982a, 1999).

No adequate data were available to evaluate the carcinogenicity of 2-nitropropane in humans (IARC 1987, 1999).

### Properties

2-Nitropropane is a clear, colorless liquid with a mild, fruity odor. It is slightly soluble in water, and miscible with most aromatic hydrocarbons, ketones, esters, ethers and the lower carboxylic acids. 2-Nitropropane is flammable when exposed to heat, open flame, or oxidizers; when heated in the liquid or vapor form, it may explode. It is available in the United States in at least two commercial grades, one of which is a mixture with 1-nitropropane (HSDB 2000).

### Use

2-Nitropropane is used principally as a solvent and chemical intermediate. As a solvent, it is used in inks, paints, adhesives, varnishes, polymers, and synthetic materials. It is a feedstock for the manufacture of 2-nitro-2-methyl-1-propanol and 2-amino-2-methyl-1-propanol (IARC 1982a). 2-Nitropropane is also used as a component of explosives and propellants, and in fuels for internal combustion engines (IARC 1999).

### Production

Chem Sources (2001) identified 10 U.S. suppliers of 2-nitropropane. The Chem Sources USA directory identified 3 U.S. companies producing an unreported quantity of 2-nitropropane in 1986 and 21 suppliers (Chem Sources 1986). USITC identified one major U.S. producer from 1977 to 1987 and two producers in 1988, but no production data were reported (USITC 1987). Data provided by the major domestic producer of 2-nitropropane suggest that worldwide sales of 2-nitropropane in 1986 had declined to approximately 5 million to 6 million lb with an unreported quantity used internally by the production company as a chemical intermediate. The 1979 TSCA Inventory identified one producer of 2-nitropropane in 1977, with a production volume of 500 lb; further, one importer was identified with no information on the amount imported (TSCA 1979). However, NIOSH reported one U.S. producer had an estimated production volume in 1977 of 30 million lb. Of this amount, 18 million lb were used internally by the manufacturer or exported (NIOSH 1977).

### Exposure

The primary routes of potential human exposure to 2-nitropropane are inhalation, ingestion, and dermal contact. Potential occupational exposure to 2-nitropropane occurs during its manufacture and

formulation in industrial construction and maintenance, printing, highway maintenance, and food packaging. The number of U.S. workers potentially exposed to 2-nitropropane had been variably estimated to be 29,842 in 1970 (NIOSH 1976), 100,000 in 1977 (NIOSH 1977), and 185,000 in 1980 (NIOSH 1980). The National Occupational Exposure Survey (1981-1983) indicated that 10,000 workers in the United States were potentially exposed to 2-nitropropane (IARC 1999). Limited occupational monitoring data were available for 2-nitropropane. Sampling at a production plant in 1977 indicated that 141 of 144 samples were in the time-weighted average (TWA) concentration range of 0.2 to 10 ppm. Monitoring in 1962 indicated that concentrations in the air during drum-filling operations ranged between 580 and 1640 ppm (NCI DCE 1985). Concentrations in the air at a tire manufacturing plant and chemical plant were 0.05 ppm and 1 ppm, respectively (IARC 1982a). The maximum airborne concentration of 2-nitropropane is 22,000 ppm. The accepted odor threshold has recently been reduced from  $\geq 80$  ppm to 3 to 5 ppm (NCI DCE 1985). ACGIH has noted the potential contribution to overall exposure by the cutaneous route, including mucous membranes and eyes, either by airborne contact, or more particularly, by consumption of the substance (ACGIH 2002). The FDA (1983) estimated that based on its presence in food, food additives, or food packaging, potential daily intake of 2-nitropropane per person in the United States was 0.1  $\mu\text{g}$ . Use of the compound in food packaging includes printing inks for flexible food packages, a solvent for coating beer and beverage cans, and a solvent for film laminating adhesives. The worst case exposure from these uses was estimated to be 36 ng/person/day. FDA measured concentrations between 77 and 204 ppb in vegetable oil fractionated with 2-nitropropane. Use for these oils include products such as frying fats, oil dressings, and imitation cocoa butter in chocolates. EPA's Toxic Chemical Release Inventory (TRI) listed 13 industrial facilities that produced, processed, or otherwise used 2-nitropropane in 1988 (TRI88 1990). The facilities reported releases of 2-nitropropane to the environment which were estimated to total 650,000 lb. TRI listed five facilities which reported a total release of 21,228 lb of 2-nitropropane to the environment in 1999. Total air emissions and surface water discharge accounted for 98.7% and 1.3%, respectively (TRI99 2001).

### Regulations

#### EPA

##### Clean Air Act

NESHAP: Listed as a Hazardous Air Pollutant (HAP)

##### 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

##### Resource Conservation and Recovery Act

Listed Hazardous Waste: Waste codes in which listing is based wholly or partly on substance - U171, F005

Listed as a Hazardous Constituent of Waste

#### OSHA

Permissible Exposure Limit (PEL) = 25 ppm (90 mg/m<sup>3</sup>)

### Guidelines

#### ACGIH

Threshold Limit Value - Time-Weighted Average Limit (TLV-TWA) = 10 ppm

#### NIOSH

Immediately Dangerous to Life and Health (IDLH) = 100 ppm

Listed as a potential occupational carcinogen

### REFERENCES

- ACGIH. 2002. Threshold Limit Values and Biological Exposure Indices for Chemical Substances and Physical Agents. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.
- ChemSources. 1986. Chem Sources, USA, 27th ed. Omond Beach, FL: Directories Publishing Company, Inc.
- ChemSources. 2001. Chemical Sources International, Inc. <http://www.chemsources.com>.
- FDA. 1983. Memorandum of November 22, 1983. Washington, D.C.: Department of Health and Human Services.
- HSDB. 2000. Hazardous Substances Data Base. National Library of Medicine. <http://toxnet.nlm.nih.gov/>

## SUBSTANCE PROFILES

cgi-bin/sis/htmlgen?HSDB.

- IARC. 1982b. Chemicals, Industrial Processes and Industries Associated with Cancer in Humans. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, Supplement 4. Lyon, France: International Agency for Research on Cancer. 292 pp.
- IARC. 1982a. Some Industrial Chemicals and Dyestuffs. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, vol. 29. Lyon, France: International Agency for Research on Cancer. 416 pp.
- IARC. 1987. Overall Evaluations of Carcinogenicity. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, Supplement 7. Lyon, France: International Agency for Research on Cancer. 440 pp.
- IARC. 1999. Re-evaluation of Some Organic Chemicals, Hydrazine, and Hydrogen Peroxide. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, vol. 71. Lyon, France: International Agency for Research on Cancer. 1589 pp.
- NCI. 1985. Monograph on the Potential Carcinogenic Risk to Humans: Nitropropanes. Bethesda, MD: Department of Health and Human Services.
- NIOSH. 1976. National Occupational Hazard Survey (1972-74). Cincinnati, OH: Department of Health, Education and Welfare.
- NIOSH. 1977. NIOSH Current Intelligence Bulletin 17: 2-Nitropropane. DHHS (NIH) Publication No. 78-127. Cincinnati, OH: Department of Health, Education and Welfare.
- NIOSH. 1980. Health Hazard Alert - 2-Nitropropane. DHHS (NIH) Publication No. 80-142. Cincinnati, OH: Department of Health and Human Services.
- TRI88. 1990. Toxic Chemical Release Inventory 1988. Data contained in the Toxic Chemical Release Inventory (TRI). National Library of Medicine. <http://www.epa.gov/triexplorer/>.
- TRI99. 2001. Toxic Chemical Release Inventory 1999. Data contained in the Toxic Chemical Release Inventory (TRI). National Library of Medicine. <http://www.epa.gov/triexplorer/>.
- TSCA. 1979. Toxic Substances Control Act, Chemical Substances Inventory.
- USITC. 1987. Synthetic Organic Chemicals, United States Production and Sales, 1986. USITC Publication No 2009. Washington, D.C.: U.S. Government Printing Office.
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