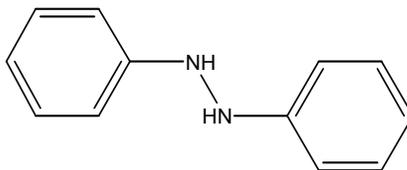


HYDRAZOBENZENE

CAS No. 122-66-7

First Listed in the *Second Annual Report on Carcinogens*



CARCINOGENICITY

Hydrazobenzene is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (NCI 1978). When administered in the diet, hydrazobenzene induced hepatocellular and squamous cell carcinomas, squamous cell papillomas of the Zymbal gland, ear canal, and skin of the ear in male rats, mammary adenomas in female rats, and hepatocellular carcinomas in female mice (NCI 1978). When injected subcutaneously in sunflower seed oil, hydrazobenzene induced mammary microfollicular carcinomas and adenomas associated with fibroadenomas, liver adenomas, and sebaceous squamous cell carcinomas of the Zymbal gland in female rats, and rhabdomyosarcomas of the subcutaneous fat, liver adenomas and hemangiomas, and lung adenomas in mice of both sexes. When applied topically in benzene, hydrazobenzene induced increased incidences of lung and liver adenomas and hemangiomas in mice of both sexes (Pliss 1974). When injected intraperitoneally in tricapylin, hydrazobenzene induced pulmonary alveolar-bronchial adenomas in mice of both sexes (Maronpot 1986). In view of an NCI/OTA correlative interpretation, these data can be considered sufficient evidence of carcinogenicity in animals (OTA 1981, Griesemer and Cueto 1980).

It has been reported that there is one epidemiology study that supports some carcinogenic effects of hydrazobenzene in humans (CHIP 1981).

PROPERTIES

Hydrazobenzene is a colorless to light yellow or orange crystalline powder. It is insoluble in acetic acid, slightly soluble in water and benzene, and very soluble in ethanol and acetone. When heated to decomposition, hydrazobenzene emits toxic fumes of carbon monoxide, carbon dioxide, and nitrogen oxides. It is incompatible with strong oxidizers, strong acids, acid chlorides, and acid anhydrides (HSDB 2000, NTP 2001). Hydrazobenzene reacts with hot mineral acid to produce benzidine (NCI 1978).

USE

Hydrazobenzene has been used primarily in the dye manufacturing industry as the precursor of the dye intermediate benzidine. It is also utilized as an intermediate in the manufacture of pharmaceuticals such as sulfapyrazone and phenylbutazone (antiarthritic drugs). Some minor direct uses of hydrazobenzene are as an anti-sludging additive to motor oil, desuckering agent for tobacco plants, reductant in the reclamation of rubber, component of experimental organometallic polymers, component in photochromic resin compositions, and in polymerization reactions (CHIP 1981, HSDB 2000). It is also used in the manufacture of

hydrogen peroxide and has been evaluated as an agent for insecticides (Spectrum 2001).

PRODUCTION

No information was available on current production of hydrazobenzene in the U.S; however, 16 and 15 U.S. suppliers were identified in 1986 and 2001, respectively (Chem Sources 1986, 2001). U.S. imports of hydrazobenzene exceeded 22,000 lb in 1983 (USITC 1984). The TSCA (1979) Inventory identified one company producing 550,000 lb of hydrazobenzene and three companies importing 550,000 lb in 1977. Earlier data indicated seven producers and importers of hydrazobenzene, with domestic production of 373,000 lb annually and imports of 135,000 lb. Dye manufacturing facilities produce additional unknown quantities during reduction of nitrobenzene to hydrazobenzene; this reduction occurs prior to the rearrangement of hydrazobenzene to benzidine.

EXPOSURE

The primary routes of potential human exposure to hydrazobenzene are inhalation, ingestion, and dermal contact. The greatest potential for exposure to hydrazobenzene occurs in the benzidine-based dye industry and when the compound is used as an intermediate in the manufacture of certain pharmaceuticals. NIOSH (1984) conducted an occupational exposure survey in 1981 to 1983 and estimated that 977 U.S. workers, including 154 females, were potentially exposed to hydrazobenzene. The lack of hydrazobenzene use in consumer products results in little, if any, appreciable exposure of consumers to this compound; however, the general population could be exposed from ingesting contaminated fish or drinking water (HSDB 2000).

In a national survey, hydrazobenzene was detected in 1.2% of 1,205 effluent samples collected from wastewater treatment plants at a median concentration of 10 µg/L (HSDB 2000). Hydrazobenzene has been found in drinking water at levels of 1 µg/L (1 ppb). Hydrazobenzene will rapidly degrade in the atmosphere by a combination of air oxidation and photolysis (Spectrum 2001). It was determined that the half-life for the decomposition of 100 µg hydrazobenzene/L in a municipal sewage effluent was 60 minutes if oxygen was removed from the sewage, but only 15 minutes if the oxygen was not removed (CHIP 1981). Based on the EPA's Toxic Release Inventory (TRI) only 12 lb were released to the environment from two U.S. facilities in 1999 (TRI99 2001).

REGULATIONS

EPA regulates hydrazobenzene under the Clean Water Act (CWA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), Superfund Amendments and Reauthorization Act (SARA), and Toxic Substances Control Act (TSCA). Hydrazobenzene is included on lists of chemicals for which water quality criteria have been established under CWA. A statutory reportable quantity (RQ) of 10 lb has been established under CERCLA. Under RCRA, SARA, and TSCA, hydrazobenzene is subject to reporting and record-keeping requirements. SARA sets threshold amounts for hydrazobenzene used, manufactured, or processed at a facility. Manufacturers, importers, and processors of hydrazobenzene are required to submit to EPA copies and lists of unpublished health and safety studies under TSCA.

OSHA regulates hydrazobenzene under the Hazard Communication Standard and as a chemical hazard in laboratories. Regulations are summarized in Volume II, Table 97.

REFERENCES

Chem Sources USA. 27th Edition. Ormond Beach, FL: Directories Publishing Company, Inc., 1986.

Chem Sources. Chemical Sources International, Inc. <http://www.chemsources.com>, 2001.

CHIP. Chemical Hazard Information Profile. Hydrazobenzene. Office of Pesticide Programs and Toxic Substances, U.S. EPA, Washington, DC, 1981.

Griesemer, R.A. and C. Cueto. Toward a Classification Scheme for Degrees of Experimental Evidence for the Carcinogenicity of Chemicals in Animals. In: Molecular and Cellular Aspects of Carcinogen Screening Tests. IARC Scientific Publications, No. 27. 370 pp. Lyon, France: IARC, 1980, pp. 259-281.

HSDB. Hazardous Substances Data Bank. Online database produced by the National Library of Medicine. 1,2-Diphenylhydrazine. Profile last updated March 30, 2000. Last review date, January 23, 1997.

Maronpot, R.R., M.B. Shimkin, H.P. Witschi, L.H. Smith, and J.M. Cline. Strain A Mouse Pulmonary Tumor Test Results for Chemicals Previously Tested in the National Cancer Institute Carcinogenicity Tests. J. Natl. Cancer Inst. Vol. 76, No. 6, 1986, pp. 1101-1112.

NCI. National Cancer Institute. Carcinogenesis, Technical Report Series No. 92. Bioassay of Hydrazobenzene for Possible Carcinogenicity (CAS No. 530-50-7*). DHEW (NIH) Publication No. 78-1342. 58 pp. National Institutes of Health, Bethesda, MD, 1978.

NIOSH. National Institute for Occupational Safety and Health. National Occupational Exposure Survey (1981-83). Cincinnati, OH: Department of Health and Human Services, 1984.

NTP. National Toxicology Program. NTP Chemical Repository. Hydrazobenzene. Last updated August 13, 2001. (<http://ntp-server.niehs.nih.gov/> and search 122-66-7).

OTA. Office of Technology Assessment, Congress of the United States. Assessment of Technologies for Determining Cancer Risks from the Environment. Washington, DC: U.S. Government Printing Office, 1981, pp. 211-214.

Pliss, G.B. Carcinogenic Properties of Hydrazobenzene. Vopr. Onkol. Vol. 20, No. 4, 1974, p. 53.

Spectrum. Chemical Fact Sheet. <http://www.speclab.com/compound/c122667.htm>, 2001.

* The CAS Registry Number 530-50-7 applies to hydrazobenzene (1,1-diphenylhydrazine). CAS Registry Number 122-66-7 applies to hydrazobenzene (1,2-diphenylhydrazine), the actual substance tested by NCI.

Hydrazobenzene (Continued)

TRI99. Toxic Chemical Release Inventory 1999. Data contained in the Toxic Chemical Release Inventory (TRI). Available from the U.S. Environmental Protection Agency Office of Environmental Information, <http://www.epa.gov/triexplorer/reports.htm>, 2001.

TSCA. Toxic Substances Control Act, Chemical Substance Inventory, 1979: public record.

USITC. U.S. International Trade Commission. Imports of Benzenoid Chemicals and Products, 1983. USITC Publication No. 1548. Washington, DC: U.S. Government Printing Office, 1984.