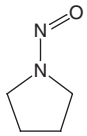
N-Nitrosopyrrolidine
CAS No. 930-55-2

Reasonably anticipated to be a human carcinogen
First Listed in the *Second Annual Report on Carcinogens* (1981)



Carcinogenicity

N-Nitrosopyrrolidine is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (IARC 1978, 1982, 1987). When administered in the drinking water, *N*-nitrosopyrrolidine induced lung adenomas in mice of both sexes, hepatocellular carcinomas, leukemia, cholangiocarcinomas, and olfactory carcinomas in rats of both sexes, and papillary mesotheliomas of the tunica vaginalis, interstitial cell tumors, and a cavernous hemangioma of the testis in male rats (IARC 1978).

No adequate human studies of the relationship between exposure to *N*-nitrosopyrrolidine and human cancer have been reported (IARC 1978).

Properties

N-Nitrosopyrrolidine is a yellow liquid. It is miscible with water and is soluble in organic solvents. It decomposes when exposed to light and is especially sensitive to ultraviolet light. When heated to decomposition, it emits toxic fumes of nitrogen oxides. It is oxidized by strong oxidants to corresponding nitroamine and can be reduced to the corresponding hydrazine and/or amine. It is relatively resistant to hydrolysis, but can be reduced by hydrogen bromide in acetic acid (IARC 1978, HSDB 2001).

Use

N-Nitrosopyrrolidine is used primarily as a research chemical and is not produced commercially (IARC 1978, HSDB 2001).

Production

N-Nitrosopyrrolidine was first prepared in 1888 by the reaction of pyrrolidine with potassium nitrate in a weak hydrochloric acid solution. Chem Sources (2001) identified nine U.S. suppliers for *N*-nitrosopyrrolidine. The 1979 TSCA Inventory identified one company producing 500 lb of *N*-nitrosopyrrolidine in 1977 (TSCA 1979). No other production, import, or export data were found.

Exposure

N-Nitrosopyrrolidine is produced when nitrite-preserved or -contaminated foods, especially fatty foods, are heat-prepared. Exposure occurs through inhalation of vapors released during cooking or ingestion of food. In recent years, lower concentrations of sodium nitrite in food have resulted in lower concentrations of *N*-nitrosopyrrolidine in food. For example, the *N*-nitrosopyrrolidine content of bacon decreased from approximately 67 µg/kg in 1971 through 1974 to only 17 µg/kg in 1975 and 1976; when bacon is fried, an average of 50% of the *N*-nitrosopyrrolidine normally present in that meat is detected in the vapor. Dry premixed cures containing spices and sodium nitrite originally contained *N*-nitrosopyrrolidine at concentrations of 40 µg/kg; these levels increased to 520 µg/kg after six months of storage. Investigators have also found *N*-nitrosopyrrolidine in tobacco smoke at concentrations up to 0.113 µg/cigarette, and in pipe bowl scrapings at concentrations up to 1.6 mg of *N*-nitrosopyrrolidine/kg of residue (IARC 1978). Wastewater from chemical factories was reported to contain *N*-nitrosopyrrolidine at concentrations of 0.09 to 0.20 µg/L (IARC 1978).

Regulations

EPA

Clean Water Act
- Effluent Guidelines: Listed as a Toxic Pollutant (nitrosamines)
- Water Quality Criteria: Based on fish/shellfish and water consumption = 0.016 µg/L; based on fish/shellfish consumption only = 34 µg/L

Comprehensive Environmental Response, Compensation, and Liability Act
- Reportable Quantity (RQ) = 1 lb

Resource Conservation and Recovery Act
- Listed Hazardous Waste: Waste codes in which listing is based wholly or partly on substance - U180
- Listed as a Hazardous Constituent of Waste

FDA

Action level for *N*-nitrosamines in rubber baby bottle nipples is 10 ppb

REFERENCES

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HSDB. 2001. Hazardous Substances Data Base. National Library of Medicine. http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB.

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