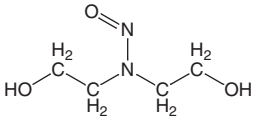
N-Nitrosodiethanolamine
CAS No. 1116-54-7

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



Carcinogenicity

N-Nitrosodiethanolamine is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (IARC 1978, 1982). When administered in the drinking water, *N*-nitrosodiethanolamine induced hepatocellular carcinomas and renal adenomas in rats. When administered subcutaneously, the compound caused nasal cavity adenocarcinomas, papillary tumors of the trachea, hepatocellular adenomas, and injection site fibrosarcomas in hamsters of both sexes (IARC 1978, 1982).

No adequate human studies of the relationship between exposure to *N*-nitrosodiethanolamine and human cancer have been reported (IARC 1987, 2000).

Properties

N-Nitrosodiethanolamine is a yellow, viscous oil that is miscible with water in all proportions. It is soluble in polar solvents and insoluble in nonpolar organic solvents. *N*-Nitrosodiethanolamine is sensitive to light, especially ultraviolet light, and undergoes relatively rapid photolytic degradation (IARC 2000).

Use

The presence of *N*-nitrosodiethanolamine is widespread in the environment. There is presently no known commercial use for this compound. It is used primarily as a research chemical (IARC 2000).

Production

N-Nitrosodiethanolamine is not currently commercially produced in the United States (HSDB 2001). The 1979 TSCA Inventory reported production of 5,000 lb of *N*-nitrosodiethanolamine by one U.S. manufacturer in 1977 (TSCA 1979). Chem Sources (2001) listed seven U.S. suppliers of this compound. No U.S. import or export data were available.

Exposure

The primary routes of potential human exposure to *N*-nitrosodiethanolamine are dermal contact, ingestion, and inhalation. *N*-Nitrosodiethanolamine is a known contaminant of cosmetics, lotions, shampoos, cutting fluids, certain pesticides, antifreeze, and tobacco at concentrations ranging from 1 to 130,000 ppb. As of 1980, FDA analyzed 335 cosmetic products and found that 42% were contaminated with *N*-nitrosodiethanolamine. This compound has been detected in facial cosmetics at concentrations ranging from 42 to 49,000 µg/kg, in lotions from <10 to 140 µg/kg, and in shampoos from <10 to 260 mg/kg (IARC 1978). *N*-Nitrosodiethanolamine is present in most cutting fluids containing triethanolamine and sodium nitrite at concentrations varying from 0.02% to 3% (IARC 1978). An atrazine pesticide formulation emulsified with triethanolamine was reported to contain 0.5 mg/kg *N*-nitrosodiethanolamine. *N*-Nitrosodiethanolamine is also present in tobacco and tobacco smoke. It has been detected in cigarette smoke at concentrations of 24 to 36 ng/cigarette and in smokeless tobacco products at 0.2 to 6.8 µg/g (Brunnemann and Hoffmann 1981, Brunnemann *et al.* 1982). The presence of *N*-nitrosodiethanolamine in tobacco is attributed to the use of a herbicide, maleic hydrazide-diethanolamine, commonly applied to tobacco. Occupational exposure to *N*-nitrosodiethanolamine could possibly occur during the use of synthetic cutting fluids to reduce the temperature of the metal-tool interface during metal cutting or grinding. Various synthetic cutting fluids are produced by over 1,000 companies in the United States, and NIOSH estimates that 780,000 persons are potentially exposed to cutting fluids during their manufacture and use (Sittig 1985). *N*-Nitrosodiethanolamine was not included in the National Occupational Hazard Survey or the National Occupational Exposure Survey conducted by NIOSH.

Regulations

EPA

Clean Water Act
- Effluent Guidelines: Listed as a Toxic Pollutant (nitrosamines)
- Water Quality Criteria: Based on fish/shellfish and water consumption = 0.0008 µg/L (nitrosamines); based on fish/shellfish consumption only = 1.24 µg/L (nitrosamines)

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 - U173
- Listed as a Hazardous Constituent of Waste

FDA

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

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