N,N-Dimethylaniline

121-69-7

Hazard Summary

N,N-Dimethylaniline is used as an intermediate in the manufacture of dyes and other substances. Acute (short-term) inhalation exposure to N,N-dimethylaniline has resulted in effects on the central nervous system (CNS) and circulatory system, with headache, cyanosis, and dizziness in humans. Effects on the blood have been reported in exposed workers. Chronic (long-term) inhalation exposure of animals resulted in effects on the CNS, blood, and liver. No information is available on the reproductive, developmental, or carcinogenic effects of N,N-dimethylaniline in humans. In a National Toxicology Program (NTP) study of rats and mice exposed via gavage, increased incidences of tumors of the spleen and forestomach were observed. EPA has not classified N,N-dimethylaniline for potential carcinogenicity.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS) (6), which contains information on oral chronic toxicity and the RfD, and EPA's Health and Environmental Effects Profile for N,N-Dimethylaniline. (5)

Uses

• N,N-Dimethylaniline is used as an intermediate in the manufacture of vanillin, Michler's ketone, methyl violet, and other dyes and also as a solvent, an alkylating agent, and a stabilizer. (1-3,5,8)

Sources and Potential Exposure

- Humans may be occupationally exposed to N,N-dimethylaniline in the workplace. (1,2)
- N,N-Dimethylaniline is present in certain antibiotics (penicillin and cephalosporin) as an impurity, and potential exposure of the public exists through their use. (1)

Assessing Personal Exposure

• No information was located regarding the measurement of personal exposure to N,N-dimethylaniline.

Health Hazard Information

Acute Effects:

- Acute inhalation exposure to N,N-dimethylaniline has resulted in effects on the CNS and circulatory system, with headache, cyanosis, dizziness, labored breathing, paralysis, and convulsions in humans. (1,3)
- Acute oral exposure resulted in weakness, tremors, tonic and clonic convulsions, and slowing of breathing in guinea pigs. (1)
- Acute animal tests in rats and rabbits have demonstrated N,N-dimethylaniline to have moderate acute toxicity from oral exposure and high acute toxicity from dermal exposure. (4)

Chronic Effects (Noncancer):

- Effects on the blood (including increased blood methemoglobin levels and decreased hemoglobin concentration) have been reported in exposed workers. (1,3)
- Chronic inhalation exposure of rats resulted in effects on the CNS, blood, and liver. (1,3,5,6)

- Effects on the spleen and blood have been observed in rats and mice chronically exposed via gavage. At higher doses, effects on the liver and kidney were observed. Changes in motor activity, cyanosis, and blanching were reported in rats. (3,5,6)
- EPA has not established a Reference Concentration (RfC) for N,N-dimethylaniline. (6)
- The Reference Dose (RfD) for N,N-dimethylaniline is 0.002 milligrams per kilogram body weight per day (mg/kg/d) based on effects on the spleen in mice. The RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily ingestion exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfD, the potential for adverse health effects increases. Lifetime exposure above the RfD does not imply that an adverse health effect would necessarily occur. (6)
- EPA has low to medium confidence in the study on which the RfD was based because, although both sexes of two species were studied at several dose levels by a relevant route, the study did not define a no-observed-adverse-effect level (NOAEL); low confidence in the database because supporting oral chronic studies were lacking; and, consequently, low confidence in the RfD. (6)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of N,N-dimethylaniline in humans.
- In a study of mice exposed to N,N-dimethylaniline via gavage, no effects on survival or weight gain of dams, or birth weight, weight gain, or viability of the offspring were observed. (3,5,6)

Cancer Risk:

- No information is available on the carcinogenic effects of N,N-dimethylaniline in humans.
- In an NTP study of rats and mice exposed via gavage, increased incidences of tumors of the spleen, and tumors of the forestomach were observed in male rats and female mice, respectively. (1)
- EPA has not classified N,N-dimethylaniline for potential carcinogenicity. (6)

Physical Properties

- The chemical formula for N,N-dimethylaniline is $C_8H_{11}N$, and its molecular weight is 121.18 g/mol. (5,7)
- N,N-Dimethylaniline occurs as a yellow oily liquid that is insoluble in water. (1,3,5,7)
- The odor threshold for N,N-dimethylaniline is 0.013 parts per million (ppm). (8)
- The vapor pressure for N,N-dimethylaniline is 0.52 mm Hg at 25 °C, and its log octanol/water partition coefficient (log K) is 2.31. (3,5)

Conversion Factors:

To convert concentrations in air (at 25 °C) from ppm to mg/m^3 : $mg/m^3 = (ppm) \times (molecular weight of the compound)/(24.45)$. For N,N-dimethylaniline: 1 ppm = 4.96 mg/m³.

Health Data from Inhalation Exposure



N,N-Dimethylaniline

ACGIH TLV--American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

ACGIH STEL--ACGIH's threshold limit value short-term exposure limit; a 15-minute TWA exposure which should not be exceeded at any time during a workday.

NIOSH IDLH--National Institute of Occupational Safety and Health's immediately dangerous to life or health limit; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment. NIOSH REL--NIOSH's recommended exposure limit; NIOSH-recommended exposure limit for an 8- or 10-h timeweighted-average exposure and/or ceiling.

NIOSH STEL--NIOSH's recommended short-term exposure limit; a 15-minute TWA exposure which should not be exceeded at any time during a workday.

OSHA PEL--Occupational Safety and Health Administration's permissible exposure limit expressed as a timeweighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.

The health and regulatory values cited in this factsheet were obtained in December 1999.

, Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

² Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.

References

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