

N-Nitrosomorpholine

59-89-2

Hazard Summary

N-Nitrosomorpholine is not used commercially in the United States. Limited information is available on the health effects of N-nitrosomorpholine. No information is available on the acute (short-term), chronic (long-term), reproductive, developmental, or carcinogenic effects of N-nitrosomorpholine in humans. Animal studies have reported effects on the liver from chronic exposure as well as tumors of the liver, nasal cavity, lung, and kidneys from oral exposure to N-nitrosomorpholine. EPA has not classified N-nitrosomorpholine for carcinogenicity. The International Agency for Research on Cancer (IARC) has classified N-nitrosomorpholine as a Group 2B, possible human carcinogen.

Please Note: The main sources of information for this fact sheet are the Hazardous Substances Data Bank (HSDB) (1), a database of summaries of peer-reviewed literature, and the IARC monographs on chemicals carcinogenic to humans. (3)

Uses

- N-Nitrosomorpholine is not used commercially in the United States. (3)

Sources and Potential Exposure

- N-Nitrosomorpholine was detected as an airborne contaminant inside some cars; levels ranging from trace to 2.5 grams per cubic meter (g/m^3) were detected. (1)
- N-Nitrosomorpholine has been found in rubber-stoppered blood collection tubes. (1)

Assessing Personal Exposure

- No information is available on the assessment of personal exposure to N-nitrosomorpholine.

Health Hazard Information

Acute Effects:

- No information is available on the acute effects of N-nitrosomorpholine in humans.
- Tests involving acute exposure of rats have shown N-nitrosomorpholine to have moderate to high acute toxicity from oral exposure. (2)

Chronic Effects (Noncancer):

- No information is available on the chronic effects of N-nitrosomorpholine in humans.
- Animal studies have reported effects on the liver from chronic exposure to N-nitrosomorpholine. (1,3)
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for N-nitrosomorpholine.

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of N-nitrosomorpholine in humans or animals.

Cancer Risk:

- No information is available on the carcinogenic effects of N-nitrosomorpholine in humans.
- Animal studies have reported tumors of the liver, lung, nasal cavity, and kidneys from oral exposure to N-nitrosomorpholine. (1,3-5)
- EPA has not classified N-nitrosomorpholine for carcinogenicity.
- The IARC has classified N-nitrosomorpholine as a Group 2B, possible human carcinogen. (3)
- The California Environmental Protection Agency (CalEPA) has calculated an inhalation unit risk factor of $0.0019 (\mu\text{g}/\text{m}^3)^{-1}$ and an oral cancer slope factor of $6.7 (\text{mg}/\text{kg}/\text{d})^{-1}$. (4)

Physical Properties

- N-Nitrosomorpholine exists as yellow crystals. (1,3)
- The chemical formula for N-nitrosomorpholine is $\text{C}_4\text{H}_8\text{N}_2\text{O}_2$, and the molecular weight is 116.1 g/mol. (3)

Note: There are very few health numbers or regulatory/advisory numbers for N-nitrosomorpholine; thus, a graph has not been prepared for this compound. The health information cited in this fact sheet was obtained in December 1999.

Conversion Factors:

To convert concentrations in air (at 25°C) from ppm to mg/m^3 : $\text{mg}/\text{m}^3 = (\text{ppm}) \times (\text{molecular weight of the compound}) / (24.45)$. For N-nitrosomorpholine: $1 \text{ ppm} = 4.7 \text{ mg}/\text{m}^3$. To convert concentrations in air from $\mu\text{g}/\text{m}^3$ to mg/m^3 : $\text{mg}/\text{m}^3 = (\mu\text{g}/\text{m}^3) \times (1 \text{ mg}/1,000 \mu\text{g})$.

References

Summary created in April 1992, updated in January 2000

1. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, [online database](#)). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
2. U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS, [online database](#)). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
3. International Agency for Research on Cancer (IARC). IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Volume 17. World Health Organization, Lyon. 1978.
4. California Environmental Protection Agency. Air Toxics Hot Spots Program Risk Assessment Guidelines: Part II. Technical Support Document for Describing Available Cancer Potency Factors. Office of Environmental Health Hazard Assessment, Berkeley, CA. 1999.
5. U.S. Department of Health and Human Services (DHHS). [The 8th Report on Carcinogens](#). 1998 Summary. Public Health Service, National Toxicology Program. 1998.