

Triethylamine

121-44-8

Hazard Summary

Acute (short-term) exposure of humans to triethylamine vapor causes eye irritation, corneal swelling, and halo vision. People have complained of seeing "blue haze" or having "smoky vision." These effects have been reversible upon cessation of exposure. Acute exposure can irritate the skin and mucous membranes in humans. Chronic (long-term) exposure of workers to triethylamine vapor has been observed to cause reversible corneal edema. Chronic inhalation exposure has resulted in respiratory and hematological effects and eye lesions in rats and rabbits. No information is available on the reproductive, developmental, or carcinogenic effects of triethylamine in humans. EPA has not classified triethylamine with respect to potential carcinogenicity.

Please Note: The main source of information for this fact sheet is EPA's Integrated Risk Information System (IRIS) (2), which contains information on inhalation chronic toxicity of triethylamine and the [RfC](#).

Uses

- Triethylamine is used as a catalytic solvent in chemical syntheses; as an accelerator activator for rubber; as a corrosion inhibitor; as a curing and hardening agent for polymers; as a propellant; in the manufacture of wetting, penetrating, and waterproofing agents of quaternary ammonium compounds; and for the desalination of seawater. (1,3)

Sources and Potential Exposure

- Occupational exposure may occur primarily via inhalation and dermal contact during its manufacture and use. (1)
- The general population may be exposed to triethylamine from ingesting contaminated food; triethylamine has been identified in broiled beef. (1)

Assessing Personal Exposure

- No information was located regarding the measurement of personal exposure to triethylamine.

Health Hazard Information

Acute Effects:

- Acute exposure of humans to triethylamine vapor causes eye irritation, corneal swelling, and halo vision. People have complained of seeing "blue haze" or having "smoky vision." These effects have been reversible upon cessation of exposure. (1,2)
- Acute exposure can irritate the skin and mucous membranes in humans. (1,3)
- Acute animal tests in rats, mice, and rabbits, have demonstrated triethylamine to have **moderate** acute toxicity from inhalation, **moderate** to **high** acute toxicity from oral exposure, and **high** acute toxicity from dermal exposure. (4)

Chronic Effects (Noncancer):

- Chronic exposure of workers to triethylamine vapor has been observed to cause reversible corneal edema. (1,2)
- Chronic inhalation exposure has resulted in inflammation of the nasal passage in rats. Thickening of the interalveolar walls of the lungs, mucous accumulation in the alveolar spaces of the lungs, and hematological effects have also been reported in rats chronically exposed by inhalation. (2)
- Chronic inhalation exposure of rabbits has been reported to cause irritation of the lungs, edema, moderate peribronchitis, vascular thickening, eye lesions, and, at higher levels, liver, kidney, and heart effects. (2)
- The Reference Concentration (RfC) for triethylamine is 0.007 milligrams per cubic meter (mg/m^3) based on inflammation of the nasal passages in rats. The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation 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 RfC, the potential for adverse health effects increases. Lifetime exposure above the RfC does not imply that an adverse health effect would necessarily occur. (2)
- EPA has medium confidence in the studies on which the RfC was based because a concentration–response was evident, although a lowest–observed–adverse–effect level (LOAEL) could not be identified and a second species was not used; low confidence in the database as only a single reproductive/developmental study exists, which is by the oral route and is therefore not useful for inhalation risk assessment, and no chronic studies exist; and, consequently, low confidence in the RfC. (2)
- EPA has not established a Reference Dose (RfD) for triethylamine. (2)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of triethylamine in humans.
- No reproductive or developmental effects were reported in a 3–generation study in rats exposed to triethylamine in drinking water; however, this study had limitations. (2)

Cancer Risk:

- No information is available on the carcinogenic effects of triethylamine in humans or animals.
- EPA has not classified triethylamine with respect to potential carcinogenicity. (2)

Physical Properties

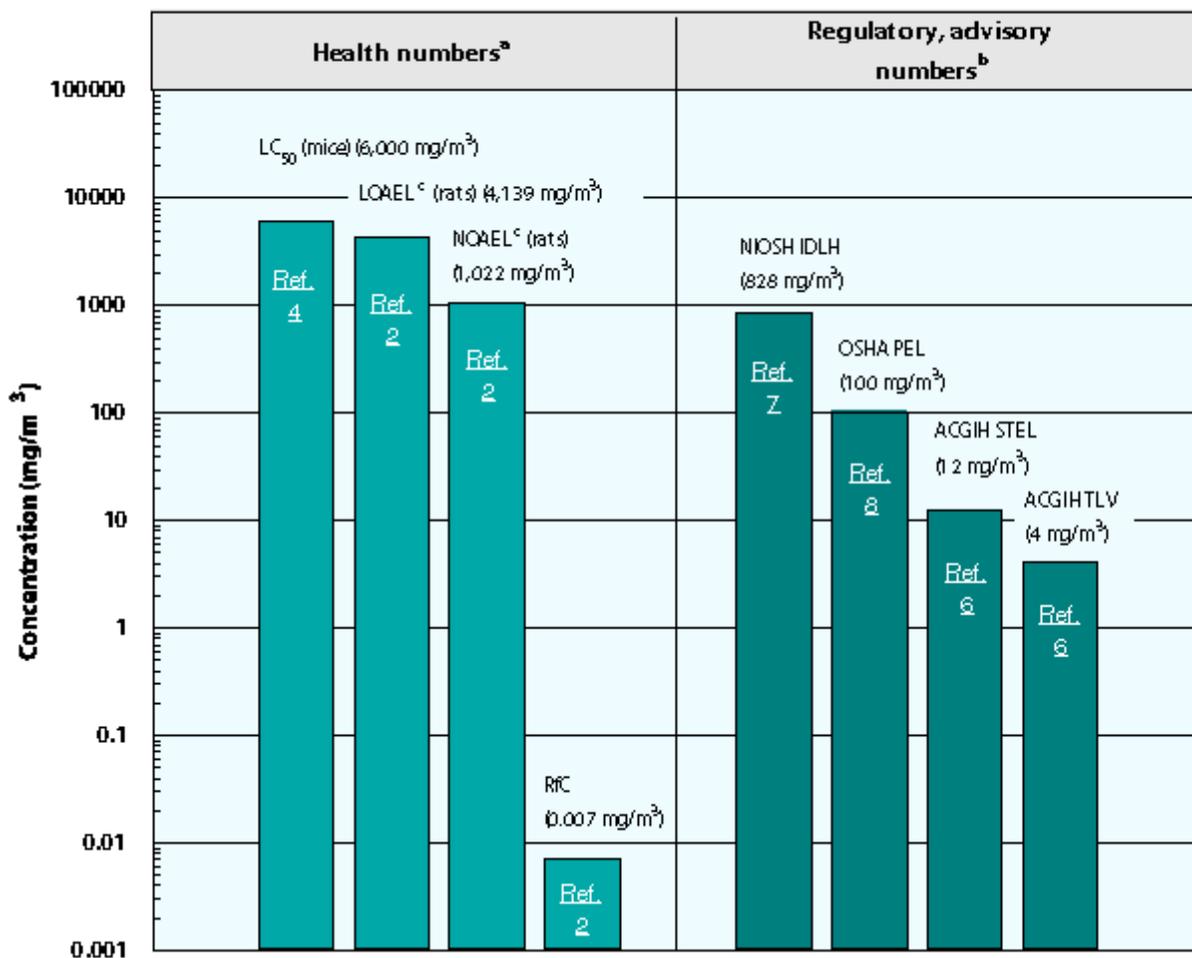
- The chemical formula for triethylamine is $\text{C}_6\text{H}_{15}\text{N}$, and its molecular weight is 101.19 g/mol. (3)
- Triethylamine occurs as a colorless flammable liquid that is slightly soluble in water. (1,3,5)
- Triethylamine has a strong fishy ammonia–like odor, with an odor threshold of 0.48 parts per million (ppm). (1,3,5)
- The vapor pressure for triethylamine is 400 mm Hg at 31.5 °C, and its log octanol/water partition coefficient ($\log K_{ow}$) is 1.45. (1)

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 triethylamine: 1 ppm = 4.14 mg/m^3 .

Health Data from Inhalation

Triethylamine



ACGIH STEL--American Conference of Governmental and Industrial Hygienists' threshold limit value short-term exposure limit; a 15-minute TWA exposure which should not be exceeded at any time during a workday.
 ACGIH TLV--ACGIH's threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

LC₅₀ (Lethal Concentration₅₀)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.

LOAEL--Lowest-observed-adverse-effect level.

NIOSH IDLH -- National Institute of Occupational Safety and Health's immediately dangerous to life or health concentration; 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.

NOAEL--No-observed-adverse-effect level.

OSHA PEL--Occupational Safety and Health Administration's permissible exposure limit expressed as a time-weighted 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.

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

^b 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.

^c The LOAEL and NOAEL are from the critical study used as the basis for the EPA RfC.

References

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.
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4. 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.
5. M. Sittig. *Handbook of Toxic and Hazardous Chemicals and Carcinogens*. 2nd ed. Noyes Publications, Park Ridge, NJ. 1985.
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8. Occupational Safety and Health Administration (OSHA). *Occupational Safety and Health Standards, Toxic and Hazardous Substances*. Code of Federal Regulations 29 CFR 1910.1000. 1998.