

# Diethanolamine

111-42-2

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## Hazard Summary

Diethanolamine is used in a number of consumer products, such as shampoos, cosmetics, and pharmaceuticals. Limited information is available on the health effects of diethanolamine. Acute (short-term) inhalation exposure to diethanolamine in humans may result in irritation of the nose and throat, and dermal exposure may irritate the skin. No information is available on the chronic (long-term), reproductive, developmental, or carcinogenic effects of diethanolamine in humans. Animal studies have reported effects on the liver, kidney, blood, and central nervous system (CNS) from chronic oral exposure to diethanolamine. The National Toxicology Program (NTP) reported an increased incidence of liver and kidney tumors in mice from dermal exposure to diethanolamine. EPA has not classified diethanolamine for carcinogenicity.

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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literature, and the Registry of Toxic Effects of Chemical Substances (RTECS), a database of toxic effects that are not peer reviewed. (3)

## Uses

- Diethanolamine is used in cutting oils, soaps, shampoos, cleaners, polishers, cosmetics, and pharmaceuticals. (1,7)
- It is also used as an intermediate in the rubber chemicals industry, as a humectant and softening agent, and as an emulsifier and dispersing agent in various agricultural chemicals. (1,7)

## Sources and Potential Exposure

- The most probable route of exposure to diethanolamine is dermal exposure to products such as soaps, shampoos, cosmetics, and detergents that contain this chemical. (1)
- Occupational exposure to diethanolamine may occur by inhalation during the use of lubricating liquids in various processes in machine building and metallurgy. (1)

## Assessing Personal Exposure

- No information is available on assessing personal exposure to diethanolamine.

## Health Hazard Information

### Acute Effects:

- Acute inhalation exposure to diethanolamine in humans may result in irritation of the nose and throat, and dermal exposure may result in irritation of the skin. (2)
- Animal studies indicate that exposure to diethanolamine by intravenous injections can cause increased blood pressure, pupillary dilatation, and salivation. At very high doses in animals, sedation, and coma may result. (1)
- Acute animal studies have shown that dermal exposure to diethanolamine may burn skin, and eye contact with the chemical may impair vision. (1)
- Acute animal tests in rats have shown diethanolamine to have **moderate** acute toxicity from oral exposure.

(3)

#### Chronic Effects (Noncancer):

- No information is available on the chronic effects of diethanolamine in humans.
- Animal studies have reported effects on the liver, kidney, blood, and CNS from chronic oral exposure to diethanolamine. (4,7)
- Skin lesions were observed in mice following daily topical administration of diethanolamine. (7)
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for diethanolamine.
- The California Environmental Protection Agency (CalEPA) has established a chronic reference exposure level of 0.02 milligrams per cubic meter (mg/m<sup>3</sup>) for diethanolamine based on effects on the blood in rats. The CalEPA reference exposure level is a concentration at or below which adverse health effects are not likely to occur. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At lifetime exposures increasingly greater than the reference exposure level, the potential for adverse health effects increases. (7)

#### Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of diethanolamine in humans.
- Animal studies have reported testicular degeneration and reduced sperm motility and count from oral exposure to diethanolamine. (10)

#### Cancer Risk:

- No information is available on the carcinogenic effects of diethanolamine in humans.
- The NTP reported an increased incidence of liver and kidney tumors in mice and no increased incidence in rats from dermal exposure to diethanolamine. (4)
- EPA has not classified diethanolamine for carcinogenicity.

## Physical Properties

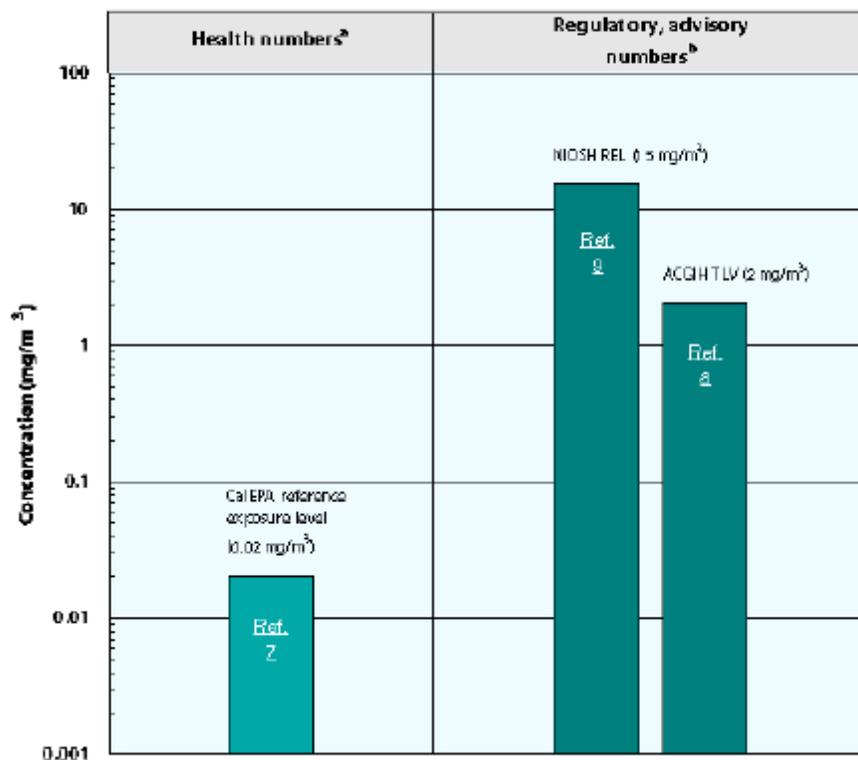
- Diethanolamine is a colorless powder or liquid with a slight ammonia-like odor. (4)
  - The odor threshold for diethanolamine is 0.27 parts per million (ppm). (5)
  - The chemical formula for diethanolamine is C<sub>4</sub>H<sub>11</sub>NO<sub>2</sub>, and the molecular weight is 105.1 g/mol. (6)
  - The vapor pressure for diethanolamine is 0.577 mm Hg at 25 °C, and it has a log octanol/water partition coefficient (log K<sub>ow</sub>) of -1.46. (6)
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#### Conversion Factors:

To convert concentrations in air (at 25 °C) from ppm to mg/m<sup>3</sup>:  $\text{mg/m}^3 = (\text{ppm}) \times (\text{molecular weight of the compound}) / (24.45)$ . For diethanolamine: 1 ppm = 4.3 mg/m<sup>3</sup>.

### Health Data from Inhalation Exposure

## Diethanolamine



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 effect.

NIOSH REL--National Institute of Occupational Safety and Health's recommended exposure limit; NIOSH--recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.

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

<sup>a</sup> Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

<sup>b</sup> 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. NIOSH and ACGIH numbers are advisory.

Summary created in April 1992, updated January 2000

### 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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3. 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.
4. National Toxicology Program. Toxicology and Carcinogenesis Studies of Diethanolamine (CAS No. 111-42-2) in F344/N Rats and B6C3F<sub>1</sub> Mice (Dermal Studies). TR No. 478. U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Bethesda, MD. 1999.
5. J.E. Amore and E. Hautala. Odor as an aid to chemical safety: Odor thresholds compared with threshold limit values and volatilities for 214 industrial chemicals in air and water dilution. *Journal of Applied Toxicology*, 3(6):272-290. 1983.
6. U.S. Environmental Protection Agency. Assessment Tools for the Evaluation of Risk (ASTER, online

database). Environmental Research Laboratory, Duluth, MN. 1993.

7. California Environmental Protection Agency (CalEPA). Air Toxics Hot Spots Program Risk Assessment Guidelines: Part III. Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels. SRP Draft. Office of Environmental Health Hazard Assessment, Berkeley, CA. 1999.
8. American Conference of Governmental Industrial Hygienists (ACGIH). 1999 TLVs and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents. Biological Exposure Indices. Cincinnati, OH. 1999.
9. National Institute for Occupational Safety and Health (NIOSH). Pocket Guide to Chemical Hazards. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention. Cincinnati, OH. 1997.
10. National Toxicology Program. Toxicity Studies of Diethanolamine (CAS No. 111-42-2) Administered Topically and in Drinking Water to F344/N Rats and B6C3F<sub>1</sub> Mice. TR No. 342. U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Bethesda, MD. 1989.