

Diethanolamine (DEA)

Diethanolamine (DEA) is used as a surface-active agent in metal-cutting fluids and oils, as a corrosion inhibitor, and as a dispersant in agricultural chemical formulations. It is also an intermediate in the production of other compounds such as fatty acid condensates of diethanolamine, which are extensively used in soaps, laundry and dishwashing detergents, cosmetics, shampoos, and hair conditioners as emulsifiers, thickeners, wetting agents and detergents. The concentration of DEA in cosmetics may range from 1 to 25 percent. DEA is also used in textile processing, in industrial gas purification, and as a solvent for drugs administered intravenously.

DEA passed the animal data screen, underwent a preliminary toxicological evaluation, and is being brought to the Carcinogen Identification Committee for consultation. This is a compilation of the relevant studies identified during the preliminary toxicological evaluation.

Epidemiological data

- Worker studies
 - Review of studies of cancer risks among workers exposed to metal working fluids: Calvert *et al.* (1998); IARC (2000, pp. 354-360)

Animal carcinogenicity data

- Long-term dermal studies
 - Two-year studies in male and female F344/N rats (dermal application five days per week): NTP (1999)
 - Two-year studies in male and female B6C3F₁ mice (dermal application five days per week): NTP (1999)
- Transgenic *Tg.AC* mouse study
 - Fourteen-week old female *Tg.AC* mice (dermal application five times per week for 20 weeks + six weeks observation): NTP (1999); reviewed in IARC (2000, p. 362)

Other relevant data

- Genotoxicity
 - *Salmonella typhimurium* mutagenicity assays: NTP (1999)
 - Chinese hamster ovary cell assays for chromosomal aberrations and sister chromatid exchanges: NTP (1999)
 - Mouse lymphoma cell mutagenicity assay: NTP (1999)
 - *In vivo* mouse peripheral blood micronucleated erythrocyte assay: NTP (1999)
 - Reviews: IARC (2000, pp. 369-372)

- Formation of the carcinogen N-nitrosodiethanolamine: NTP (1999); IARC (2000, p. 366)
- Mechanistic studies: Leung *et al.* (2005); Fischer *et al.* (2007); Zeisel (2008)
- Structural activity considerations
 - Structurally similar to triethanolamine

Reviews

- IARC (2000)

References¹

Calvert GM, Ward E, Schnorr T, Fine LJ (1998). Cancer risks among workers exposed to metalworking fluids: a systematic review. *Am J Indust Med* **33**, 282-292.

Fischer LM, daCosta KA, Kwock L, Stewart PW, Lu T-S, Stabler SP, Allen RH, Zeisel SH (2007). Sex and menopausal status influence human dietary requirements for the nutrient choline. *Am J Clin Nutr* **85**:1275-1285.

International Agency for Research on Cancer (IARC, 2000b). *IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Some Industrial Chemicals*. Volume 77. *Diethanolamine* pp. 349-379, IARC, Lyon, France.

Leung H-W, Kamendulis LM, Stott WT (2005). Review of the carcinogenic activity of diethanolamine and evidence of choline deficiency as a plausible mode of action. *Regul Toxicol Pharmacol* **43**:260-271.

National Toxicology Program (NTP, 1999). *Toxicology and carcinogenesis studies of diethanolamine (CAS No. 111-42-2) in F344/N rats and B6C3F₁ mice (dermal studies)*. Technical Report No. 478, Research Triangle Park, NC.

Zeisel SH (2008). Genetic polymorphisms in methyl-group metabolism and epigenetics: Lessons from humans and mouse models. *Brain Res* **1237**:5-11.

¹ Copies of these listed references, as either the abstract, the relevant sections of the publication, or the complete publication, have been provided to members of the Carcinogen Identification Committee. These references have been provided in the order in which they are discussed in this document.