Triethanolamine (TEA)

Triethanolamine (TEA) is used in a number of industrial processes, and in the manufacture of a wide variety of consumer products. TEA is a chemical intermediate in the manufacture of anionic and nonionic surfactants. It is used to manufacture emulsifiers and dispersing agents for household detergents and polishes; lubricants, dyes and antistatic agents for textiles; agricultural herbicides; mineral and vegetable oils; paraffin and waxes; pharmaceutical ointments, and petroleum demulsifiers. It is a solvent for casein, shellac, and dyes. It is used as a vulcanization accelerator in the rubber industry, as a humectant and softening agent in hide tanning, and in the manufacture of synthetic resins, plasticizers, adhesives, and sealants. Based on its metal chelation properties, TEA is used as a corrosion inhibitor, in electroplating, metal cleaning and rust removal, and in lubricating and metalworking fluids. TEA is also used in a number of personal care products, such as creams, lotions, skin cleansers, shampoos, hair care and coloring agents, permanent wave lotions, deodorants, fragrances, makeup, nail polish and polish remover, and cuticle softeners and removers.

TEA 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 (2000a, p. 386); IARC (2000b, pp. 354-360)

Animal carcinogenicity data

- Long-term dermal studies
  - Two-year studies in male and female $B6C3F_1$ mice (dermal application five days per week): NTP (1999)
  - Two-year studies in male and female $B6C3F_1$ mice (dermal application five days per week): NTP (2004)[1]
  - Two-year studies in male and female F344/N rats (dermal application five days per week): NTP (1999)

- Long-term diet studies
  - Lifetime studies in male and female ICR-JCL mice: Hoshino and Tanooka (1978)

[1] NTP conducted a second set of studies in mice, because of concerns regarding *Helicobacter hepaticus* infection in the 1999 NTP mouse studies.

- Long-term drinking water studies
    - Eighty-two week studies in male and female B6C3F$_1$ mice: Konishi *et al.* (1992)
    - Two-year studies in male and female F344/DuCrj rats: Maekawa *et al.* (1986)

- Transgenic *Tg.AC* mouse study
    - Fourteen-week old female *Tg.AC* mice (dermal application five times per week for 20 weeks + six weeks observation): Spalding *et al.* (2000) as reviewed in IARC (2000a, p. 388).

Other relevant data

- Genotoxicity
    - *Bacilius subtilis* mutagenicity assay: Hoshino and Tanooka (1978)
    - *Salmonella typhimurium* mutagenicity assays: NTP (1999)
    - Chinese hamster ovary cell assays for chromosomal aberrations and sister chromatid exchanges: NTP (1999)
    - Sex-linked recessive lethal mutation assays in germ cells of *Drosophila melanogaster*: NTP (1999)
    - *In vivo* mouse peripheral blood micronucleated erythrocyte assay: NTP (1999)
    - Reviews: IARC (2000a, pp. 393-396)

- Effects of *Helicobacter hepaticus* infection in B6C3F$_1$ mice used in the 1999 NTP studies: Stout *et al.* (2008)

- Potential of TEA to convert to the carcinogen N-nitrosodiethanolamine: Hoshino and Tanooka (1978); IARC (2000a, pp. 396-397)

- Mechanistic studies: Stott *et al.* (2004), Fischer *et al*. (2007); Zeisel (2008)

- Structural activity considerations
    - Structurally similar to diethanolamine

Reviews

- IARC (2000a)

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[2] 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.

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