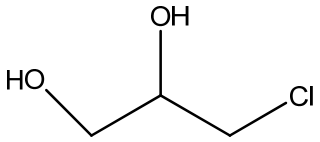
3-Monochloropropane-1,2-diol (3-MCPD)



3-Monochloropropane-1,2-diol (3-MCPD) is a member of a group of chemicals known as chloropropanols. 3-MCPD is found in a wide range of foods and food ingredients. It is formed when fat-containing and salt-containing foods are processed at high temperatures, in the presence of chlorine. For example, it is present in foods prepared by hydrochloric acid hydrolysis, such as acid-hydrolyzed vegetable proteins. Other foods in which 3-MCPD has been detected include liquid seasonings, soy sauces, roasted cereals, fermented sausages, and toasted breads.

3-MCPD 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

No cancer epidemiology studies were identified

Animal carcinogenicity data

- Subcutaneous injection study in mice
  - 19-Month study in female CHR/Ha Swiss mice: Van Duuren *et al.* (1974); as reviewed in WHO (2002), Section 2.2.3

- Dermal application study in mice
  - 19-Month study in female CHR/Ha Swiss mice: Van Duuren *et al.* (1974); as reviewed in WHO (2002), Section 2.2.3

- Drinking water studies in rats
  - Two-year bioassays of 3-MCPD in Sprague-Dawley rats: Cho *et al.* (2008)
  - Two-year bioassays of 3-MCPD in Fisher 344 rats: Sunahara *et al.* (1993); as reviewed by WHO (2002), Section 2.2.3

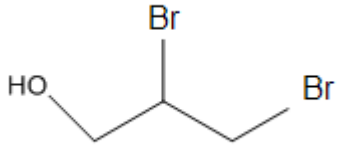
- Oral gavage studies in rats
  - Two-year bioassays (72-week treatment) of 3-MCPD in CD rats: Weisburger *et al.* (1981); as reviewed by WHO (2002), Section 2.2.3

Other relevant data

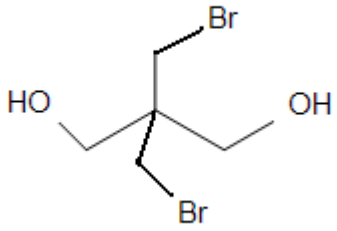
- *In vitro* genotoxicity tests: Multiple tests, including mutation assays in *S. typhimurium*, *E. coli*, *S. pombe*, mouse lymphoma cells, HeLa cells, mouse fibroblasts, Chinese hamster V79 cells (as reviewed in WHO (2002), Section 2.2.4); Malignant transformation of mouse fibroblasts: Piasecki *et al.* (1990); Comet assay of 3-MCPD and its metabolites in Chinese Hamster Ovary (CHO) cells: El Ramy *et al*. (2007)

- *In vivo* genotoxicity tests: Multiple tests, including (1) dominant lethal mutation assays in ICR/Ha Swiss mice, *Drosophila*, and Wistar rats, (2) micronucleus assays in mice and rats, (3) unscheduled DNA synthesis assay in rats (as reviewed in WHO (2002), Section 2.2.4)

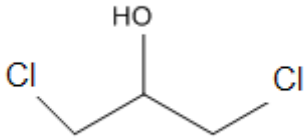
- Structure activity comparisons



2,3-dibromopropanol
(Proposition 65 carcinogen)



2,2-bis(bromomethyl)1,3-propanediol
(Proposition 65 carcinogen)



1,3-dichloro-2-propanol
(Chemical[1] with positive evidence of carcinogenicity)

Review

- WHO (2002)

[1] See material prepared for this chemical, also in this CIC consultation package

References[2]

Cho W-S, Han BS, Nam KT, Park K, Choi M, Kim SH, Jeong J, Jang DD (2008). Carcinogenicity study of 3-monochlorpropane-1,2-diol in Sprague-Dawley Rats. *Food Chem Toxicol (accepted for publication July 11, 2008*).

El Ramy R, Ould Elhkim M, Lezmi S, Poul JM (2007). Evaluation of the genotoxic potential of 3-monochloropropane-1,2-diol (3-MCPD) and its metabolites, glycidol and beta-chloroactic acid, using the single cell gel/comet assay. *Food Chem Toxicol* **45(1)**: 41-48.

Piasecki A, Ruge A, Marquardt H (1990). Malignant transformation of mouse M2-fibroblasts by glycerol chlorohydrines contained in protein hydrolysates and commercial food. *Arzneim-Forsch/Drug Res* **40**, 1054-1055.

Sunahara G, Perrin I, Marchesini M. (1993). Carcinogenicity study on 3-monochloropropane-1,2-diol (3-MCPD) administered in drinking water to Fischer 344 rats. Unpublished report No. RE-SR93003 submitted to WHO by Nestec Ltd, Research & Development, Switzerland (*as cited by WHO, 2002*).

World Health Organization (WHO) (2002). Safety Evaluation of Certain Food Additives and Contaminants. WHO Food Additives Series No. 48. 3-chloro-1,2-propanediol. Fifty-seventh meeting of the Joint FAO/WHO Expert Committee on Food Additives (JEFCA).

[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.