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NEW YORK STATE
- HUMAN HEALTH FACT SHEET -

Ambient Water Quality Value for Protection of Sources of Potable Water

SUBSTANCE: 1,3-Dichlorobenzene **CAS REGISTRY NUMBER:** 541-73-1

AMBIENT WATER QUALITY VALUE: 3 micrograms/liter (3 ug/L)

BASIS: Chemical Correlation

INTRODUCTION

1,3-Dichlorobenzene is one of three structurally-similar isomers of dichlorobenzene. The other two isomers are 1,2-dichlorobenzene and 1,4-dichlorobenzene. The physical, chemical, and toxicological properties of 1,3-dichlorobenzene (meta-dichlorobenzene) have been reviewed (US EPA, 1980, 1985, 1987a,b). The following ambient water quality values were derived using these and other references and the procedures outlined in 6 NYCRR 702.2 through 702.7. Water quality values for 1,4-dichlorobenzene and 1,2-dichlorobenzene are derived in separate fact sheets (NYS, 1997a,b)

SPECIFIC MCL AND PRINCIPAL ORGANIC CONTAMINANT CLASS (702.3)

1,3-Dichlorobenzene does not have a Specific MCL (maximum contaminant level) as defined in 6 NYCRR 700.1 and is in principal organic contaminant class iii as defined in 6 NYCRR 700.1. Therefore, a water quality value of 5 ug/L can be derived based on 6 NYCRR 702.3(b).

ONCOGENIC EFFECTS (702.4)

Studies on the oncogenic effects of 1,3-dichlorobenzene were not found. The U.S. EPA classifies 1,3-dichlorobenzene as a Group D substance (not classifiable as to its human carcinogenicity) based on the lack of human or animal oncogenicity data (US EPA, 1996a).

1,4-Dichlorobenzene induces liver tumors in mice and kidney tumors in male rats

(NTP,1987) and is an oncogen under 6 NYCRR 700.1 (NYS, 1997a). Both the NTP (1994) and the IARC (1987) consider the evidence on the carcinogenicity of 1,4-dichlorobenzene in animals to be "sufficient" (the strongest ranking). The U.S. EPA Office of Drinking Water (US EPA, 1987c) classifies 1,4-dichlorobenzene as a Group C (possible human) carcinogen. The water concentration of 1,4-dichlorobenzene corresponding to the lower bound estimate on the dose associated with an excess lifetime human cancer risk of one-in-one million is 3 ug/L (NYS, 1997a). The U.S. EPA classifies 1,2-dichlorobenzene as a Group D substance (not classifiable as to its human carcinogenicity) based on the lack of data in humans and inadequate data in animals (US EPA, 1996b). 1,2-Dichlorobenzene is not an oncogen under 6 NYCRR 700.1, however, the doses used in negative NTP (1985) bioassays may have been below the maximum tolerated doses and may have reduced the sensitivity of the assays to detect oncogenic effects (NYS, 1997b; US EPA, 1996b).

NON-ONCOGENIC EFFECTS (702.5)

1,3-Dichlorobenzene damages the liver, kidney, thyroid and pituitary glands of laboratory animals (McCauley et al., 1995; Stine et al., 1991; Valentovic et al., 1993). A 90-day study among rats given gavage doses of 0, 9, 37, 147, or 588 milligrams per kilogram per day (mg/kg/day) did not find a clear-cut no-observed-effect level. Serum cholesterol levels were significantly ($p \leq 0.05$) elevated above control values in males at $\geq$ 9 mg/kg/day and in females at $\geq$ 37 mg/kg/day. Other serum indicators of liver dysfunction (aspartate aminotransferase and lactate dehydrogenase levels) were significantly ($p \leq 0.05$) difference from control values in males at $\geq$ 9 mg/kg/day. Other effects ($p \leq 0.05$) included reduced body weights (588 mg/kg/day) and increased relative liver weights (147 mg/kg/day) and kidney weights (588 mg/kg/day). Selected histopathological observations suggested compound-related thryoid-gland lesions at 37 mg/kg/day, liver lesions at 588 mg/kg/day and pituitary-gland lesions at 147 mg/kg/day. Chronic studies on the non-oncogenic effects of ingested or inhaled 1,3-dichlorobenzene were not found.

The results of a 90-day gavage study of 1,3-dichlorobenzene in rats (a lowest-observed-effect level of 9 mg/kg/day for biochemical indicators of liver dysfunction in male rats) provide data for use in deriving a reference dose (equivalent to an acceptable daily intake) for 1,3-dichlorobenzene. If an uncertainty factor of 1,000 is applied to this dose, an oral reference dose of 9 micrograms per kilogram per day (ug/kg/day) for 1,3-dichlorobenzene can be derived using procedures consistent with those outlined in paragraphs (a) and (b) of 6 NYCRR 702.5. The uncertainty factor of 1,000 was used to account for variability among humans, differences between animals and humans, the use of a subchronic study, the nature of the effects, and the use of a lowest-observed-effect level. A less than 10-fold uncertainty factor for the use of a subchronic study was used because there is evidence that liver lesions induced in rats during subchronic exposure to 1,4-dichlorobenzene do not progress to more severe lesions during chronic exposure (US EPA, 1996c). A value of 63 ug/L is derived using the procedure outlined in paragraph (e) of 6 NYCRR 702.5 and allowing 20% of the acceptable daily intake to come from drinking water (6 NYCRR 702.5(c)).

CHEMICAL CORRELATION (702.7)

The chemical structures, metabolic pathways, and target organs of the three dichlorobenzene isomers are similar; thus, the oncogenic potential of the three isomers may be similar. Although an ambient water quality value of 3 ug/L has been established for 1,4-dichlorobenzene based on its oncogenic effects (NYS, 1997a), the data are inadequate to evalute the oncogenic potential of 1,3-dichlorobenzene (US EPA, 1996a) or 1,2-dichlorobenzene (NYS, 1997b). Moreover, the absence of a mechanistic data on the carcinogenicity of 1,4-dichlorobenzene precludes dismissing the concerns that 1,3-dichlorobenzene would be oncogenic when tested or that 1,2-dichlorobenzene would be oncogenic when tested at doses higher than those used in the negative NTP (1985) bioassays. Given the similarities of the three isomers and the uncertainties regarding the oncogenic potential of 1,2-dichlorobenzene and 1,3-dichlorobenzene, an ambient water quality value of 3 ug/L is derived for 1,3-dichlorobenzene based on its chemical correlation to 1,4-dichlorobenzene.

OTHER STANDARDS AND GUIDELINES

Under New York State Department of Health regulations for drinking-water standards (10 NYCRR Part 5), 1,3-dichlorobenzene is a principal organic contaminant (POC) and has a MCL of 5 ug/L. The U.S. EPA (1989) decided not to promulgate a drinking water standard for 1,3-dichlorobenzene because of the lack of data on its toxicity.

SELECTION OF VALUE

According to 6 NYCRR 702.2(b), the selected ambient water quality value shall be the most stringent of the values derived using the procedures found in 6 NYCRR 702.3 through 702.7. A value of 3 ug/L based on chemical correlation (6 NYCRR 702.7) to 1,4-dichlorobenzene is the most stringent value for 1,3-dichlorobenzene and is the value selected as the water quality value for 1,3-dichlorobenzene.

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SEARCH STRATEGY: ON-LINE TOXICOLOGIC DATABASE

Toxline (1981 to March 14, 1996) was searched linking the CAS Registry Number of 1,3-dichlorobenzene with the keyword "toxicity."

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