Fact Sheet Date: March 12, 1998

NEW YORK STATE
- HUMAN HEALTH FACT SHEET -

Ambient Water Quality Value for
Protection of Sources of Potable Water

SUBSTANCE: cis-1,2-Dichloroethene **CAS REGISTRY NUMBER:** 156-59-2

AMBIENT WATER QUALITY VALUE: 5 ug/L

BASIS: Surface Water: Principal Organic Contaminant Classes

Groundwater: Former Reference to 10 NYCRR Subpart 5-1 Principal Organic Contaminant (POC) General Maximum Contaminant Level (MCL)

I INTRODUCTION

The Ambient Water Quality Value applies to the water column and is designed to protect humans from the effects of contaminants in sources of drinking water; it is referred to as a Health (Water Source) or H(WS) value. Regulations (6 NYCRR 702.2) require that the water quality value be based on the procedures in sections 702.3 through 702.7. Available information on cis-1,2-dichloroethene was examined as described in "Scope of Review," below. Potential water quality values are derived below, and the value of 5 ug/L selected as described under "Selection of Value."

II PRINCIPAL ORGANIC CONTAMINANT CLASSES AND SPECIFIC MCL (702.3)

A. Discussion

cis-1,2-Dichloroethene does not have a Specific Maximum Contaminant Level as defined in 700.1. It is, however, in a principal organic contaminant class (class i) as defined in 700.1.

Under the State Sanitary Code (10 NYCRR Part 5, Public Water Supplies),

the New York State Department of Health has established a general maximum contaminant level of 5 ug/L for principal organic contaminants such as cis-1,2-dichloroethene in drinking water.

The U.S. Environmental Protection Agency has established a maximum contaminant level goal (MCLG) of 70 ug/L and a MCL of 70 ug/L for drinking water for cis-1,2-dichloroethene.

B. Derivation of Water Quality Value

Because cis-1,2-dichloroethene is in a principal organic contaminant class and has no Specific MCL, a water quality value of 5 ug/L can be derived based on 702.3(b).

III ONCOGENIC EFFECTS (702.4)

A. Data

U.S. EPA (1994) classifies cis-1,2-dichloroethene as "D: not classifiable as to human carcinogenicity because of inadequate information." Significant uncertainties exist because of the lack of oncogenicity data. No lifetime animal bioassay has been conducted. The potent oncogenicity of the metabolite dichloroacetic acid (Herren-Freund et al., 1987) indicates the need for a comprehensive evaluation in an appropriate bioassay.

Herren-Freund et al. (1987) used an initiation-promotion protocol to evaluate the carcinogenicity of dichloroacetic acid in mice. Ingestion of drinking water containing 5 g/L dichloroacetic acid by mice for 61 weeks caused a statistically significant increase in the number of animals that developed hepatic adenomas or carcinomas compared to controls.

IV NON-ONCOGENIC EFFECTS (702.5)

A. Data

There are no reports of adverse effects of cis-1,2-dichloroethene on humans.

Most of the animal studies used single doses or the effects in a study were observed in all the treatment groups. (Jenkins et al., 1972; McMillan, 1986; Freundt and Macholz, 1978; Costa and Ivanetich, 1982; Plaa and Larson, 1965).

McCauley et al. (1990) administered cis-1,2-dichloroethene by gavage in corn oil to male and female Sprague-Dawley rats (20/sex/dose) for 3

months at doses of 0, 32, 97, 291 or 872 mg/kg/d. cis-1,2-Dichloroethene caused dose-dependent decreases in the hematocrit of male rats at all doses above 32 mg/kg/d. A no-observed-adverse-effect level (NOAEL) of 32 mg/kg/d was identified in male rats based on the absence of hematological effects.

B. Derivation of Water Quality Value

1. Selection of Data

The study by McCauley et al. (1990) was judged the one appropriate for deriving a water quality value based on non-oncogenic effects because it is the only chronic or subchronic multi-dose study with a NOAEL.

2. Calculation of Acceptable Daily Intake (ADI)

An ADI is calculated from the study of McCauley (1990) by dividing the NOAEL of 32 mg/kg/day by a total uncertainty factor of 1000 as follows:

$$\text{ADI} = \frac{32 \text{ mg/kg/day}}{1000} = 0.03 \text{ mg/kg/d}$$

This uncertainty factor was selected to account for inter- and intra-species variation and a less-than-lifetime study. An RfD developed by USEPA differs by a factor of 3 for the use of a NOAEL from an animal study with less than an adequate database. The Department believes this condition to be accounted for in the total factor of 1,000.

3. Calculation of Water Quality Value

A water quality value can be calculated from the ADI based on a 70 kg adult consuming 2 liters of water per day and allocating 20% of the ADI to come from drinking water, as follows:

$$\text{Water Quality Value} = \frac{(0.03 \text{ mg/kg/day})(1000 \text{ ug/mg})(70 \text{ kg})(0.2)}{2 \text{ L/day}} = 210 \text{ ug/L}$$

V CHEMICAL CORRELATION (702.7)

Because values can be derived using 702.4 and 702.5, deriving a water quality value for cis-1,2-dichloroethene using chemical correlation was not considered.

VI SELECTION OF VALUE

The H(WS) value is designed to protect humans from oncogenic and non-oncogenic effects from contaminants in sources of drinking water. To protect from these effects, regulations [6 NYCRR 702.2(b)] require that the value be the most stringent of the values derived using the procedures found in sections 702.3 through 702.7. The principal organic contaminant class value of 5 ug/L 6 NYCRR 702.3(b) is the most stringent value derived by these procedures and is the ambient water quality value for cis-1,2-dichloroethene.

It should be noted that the principal organic contaminant (POC) value of 5 ug/L became a groundwater standard effective on January 9, 1989 by reference to 10 NYCRR Subpart 5-1 standards. The basis and derivation of the POC standard are described in a separate fact sheet.

VII REFERENCES

Cerna, M. and H. Kypova. 1977. Mutagenic activity of chloroethylenes analyzed by screening system tests. Mutat. Res. 46:214-215 abst.

Costa, A.K. and Ivanetich. 1982. The 1,2-dichloroethylenes: their metabolism by hepatic cytochrome P-450 in vitro. Biochem. Biopharm. 31:2093-2102.

Freundt, K.J. and J. Macholz. 1978. Inhibition of mixed function oxidases in rat/liver by trans- and cis-1,2-dichloroethylene. Toxicology 10:131-139.

Herren-Freund, S.L., M.A. Pereira, M.D. Khoury, G. Olson. 1987. The carcinogenicity of trichloroethylene and its metabolites, trichloroacetic acid and dichloroacetic acid in mouse liver. Toxicol. Appl. Pharmacol. 90:183-189.

Jenkins, L.G., Jr., M.J. Trabulus and S.D. Murphy. 1972. Biochemical effects of 1,1-dichloroethylene in rats: Comparison with carbon tetrachloride and 1,2-dichloroethylane. Toxicol. Appl. Pharmacol. 23:501-510.

McCauley, P.T., M. Robinson, L.W. Condia and M. Purnell. 1990. The effects of subacute and subchronic oral exposure to cis-1,2-dichloroethylene. (Unpublished data, Health Effects Research Laboratory (HERL), Cincinnati, OH) as discussed in: F.P. Guengerich et al. 1990. Drinking Water Criteria Document for dichloroethylenes (1,1-dichloroethylene), (cis-1,2-dichloroethylene), and (trans-1,2-dichloroethylene). Cleveland, OH: Life Systems, Inc.

McMillan, D.A. 1986. Toxicity of cis- and trans-isomers of 1,2-dichloroethylene. Ph.D. dissertation, Omaha, NE: Univ. of Nebraska.

6 NYCRR (New York State Codes, Rules and Regulations). Water Quality Regulations, Surface Water and Groundwater Classifications and Standards: Title 6 NYCRR, Chapter X, Parts 700-705. Albany, NY: New York State Department of Environmental Conservation.

10 NYCRR (New York State Codes, Rules and Regulations). Public Water Systems: Title 10 NYCRR, Chapter 1, State Sanitary Code, Subpart 5-1. Albany, NY: New York State Department of Health, Bureau of Water Supply Protection.

Plaa, G.L. and R.E. Larson. 1965. Relative nephrotoxic properties of chlorinated methane, ethane and ethylene derivatives in mice. Toxicol. Appl. Pharmacol. 7:37-44.

U. S. EPA (U.S. Environmental Protection Agency). 1990. Drinking Water Criteria Document for dichloroethylenes (1,1-dichloroethylene, cis-1,2-dichloroethylene and trans-1,2-dichloroethylenes. F.P. Guegerich. Cleveland, OH: Life Systems, Inc.

U.S. EPA (U.S. Environmental Protection Agency). 1994. cis-1,2-Dichloroethylene on-line. Integrated Risk Information System (IRIS). Cincinnati OH: Office of Research and Development, Environmental Criteria and Assessment office.

VIII SCOPE OF REVIEW

The widely-recognized sources listed below can often provide a comprehensive review of the toxicity of a substance and, in some cases, the derivation of a value. These sources were searched for their availability and, if found, examined. Where they were not found, it is so noted.

- IRIS (U.S. EPA's Integrated Risk Information System) (on-line).
- RTECS (Registry of Toxic Effects of Chemical Substances) (on-line).
- CCRIS (Chemical Carcinogenesis Research Information System) (on-line).
- ATSDR (Agency for Toxic Substances and Disease Registry) toxicological

profile (not found).

- U.S. EPA ambient water quality criteria document.
- U.S. EPA health advisory.
- U.S. EPA drinking water criteria document.
- U.S. EPA Drinking Water Regulations and Health Advisories, Office of Water, May 1994.
- IARC (International Agency for Research on Cancer) Monographs Supplement 7 (not found).

The sources above are deemed adequate to assess the literature through 1990. Coverage of recent literature through 1994 was provided by a New York State Library on-line search of the databases listed below.

- NTIS (National Technical Information Service
- TOXLINE
- BIOSIS

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