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: Hexachlorobenzene **CAS REGISTRY NUMBER:** 118-74-1

AMBIENT WATER QUALITY VALUE: 0.04 micrograms/liter (0.04 ug/L)

BASIS: Oncogenic Effects

INTRODUCTION

The physical, chemical and toxicological properties of hexachlorobenzene have been reviewed (ATSDR, 1994; US EPA, 1985a,b, 1987, 1995). 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.

SPECIFIC MCL AND PRINCIPAL ORGANIC CONTAMINANT CLASS (702.3)

Hexachlorobenzene 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)

Hexachlorobenzene induces liver tumors in three rodent species (rats, mice, and hamsters), kidney tumors in rats, and thyroid-gland tumors in hamsters (ATSDR, 1994; IARC, 1987; US EPA, 1985a,b; 1995) and is oncogen under 6 NYCRR 700.1. In 1985, the U.S. EPA

evaluated the dose-response data for hexachlorobenzene and calculated cancer potency factors that range from 0.083 per milligram per kilogram per day (0.083 $(mg/kg/day)^{-1}$) to 1.7 $(mg/kg/day)^{-1}$ (US EPA, 1985b, 1995), using procedures consistent with those outlined in paragraphs (a) to (e) of 6 NYCRR 702.4, including the linearized multistage model (702.4(a)). These cancer potency factors were calculated by the U.S. EPA using a cross-species scaling factor for carcinogen risk assessment based on the assumption that lifetime cancer risks are equal when daily administered doses are in proportion to body weights raised to the 2/3 power (the surface area scaling factor). Proposed New York State regulations state that the scaling factor should be based on the assumption that lifetime cancer risks are equal when daily administered doses are in proportion to body weights raised to the 3/4 power. This change requires application of an adjustment factor to cancer potency factors calculated using a cross-species scaling factor based on surface area.

The water concentration corresponding to the lower bound estimate on the dose associated with an excess lifetime human cancer risk of one-in-one million is 0.04 ug/L. This value was derived using the adjusted cancer potency factor (1.0 $(mg/kg/day)^{-1}$) based on the most sensitive responses among the sexes and species tested (Exhibit 1, taken from US EPA, 1995), and the procedure in paragraph (f) of 6 NYCRR 702.4. The adjusted cancer potency factor was calculated by multiplying the U.S. EPA cancer potency factor of 1.7 $(mg/kg/day)^{-1}$ by 0.60 (the average adjustment factor for a rat body weight of 0.265 kg and a hamster body weight of 0.10 kg), and is based on the incidence of hepatocellular carcinomas in female rats (Erturk et al., 1986, Exhibit 1) and the incidence of hepatomas in male hamsters (Cabral et al., 1977).

NON-ONCOGENIC EFFECTS (702.5)

Long-term dietary exposure of humans to high levels of hexachlorobenzene causes porphyria of the blood (an indicator of disturbed liver metabolism), thyroid enlargement, skin lesions, effects on the nervous system, and hyperpigmentation (ATSDR, 1994, US EPA, 1985b, 1987). Hexachlorobenzene also damages the liver, kidneys, and skin of laboratory animals (ATSDR, 1994; US EPA, 1985b). In 1988, the U.S. EPA established an oral reference dose (equivalent to an acceptable daily intake) of 0.8 micrograms per kilogram per day (0.8 ug/kg/day) for hexachlorobenzene (Exhibit 2, taken from US EPA, 1995), using procedures consistent with those outlined in paragraphs (a) and (b) of 6 NYCRR 702.5. The reference dose was derived by application of a 100-fold uncertainty factor to a no-observed-effect-level of 0.08 mg/kg/day for histological lesions in the livers of rats exposed to hexachlorobenzene in utero, through nursing, and for 130 weeks in the diet (Arnold et al., 1985). A value of 5.6 ug/L is derived using the procedure outlined in paragraph (e) of 6 NYCRR and allowing 20% of the acceptable daily intake to come from drinking water (6 NYCRR 702.5(c)).

CHEMICAL CORRELATION (702.7)

A value based on chemical correlation was not derived because there were sufficient data to derive values based on oncogenic effects (6 NYCRR 702.4) and non-oncogenic effects (6 NYCRR 702.5).

OTHER STANDARDS AND GUIDELINES

Under the Safe Drinking Water Act, the federal maximum contaminant level goal (MCLG) for hexachlorobenzene is zero and the maximum contaminant level (MCL) is 1 ug/L, based on analytical considerations (US EPA, 1990, 1992). Under New York State Department of Health regulations for drinking-water standards (10 NYCRR Part 5), hexachlorobenzene is a principal organic contaminant (POC) and has an MCL of 5 ug/L. The federal MCL will be adopted under 10 NYCRR Part 5 during the next rulemaking process. The World Health Organization's recommended guideline for hexachlorobenzene in drinking water is 1 ug/L, based on a lifetime excess cancer risk of one-in-one hundred thousand (WHO, 1993).

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 NCYRR 702.3 through 702.7. This value is 0.04 ug/L (based on oncogenic effects) and is the value selected as the water quality value for hexachlorobenzene.

REFERENCES

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US EPA (U.S. Environmental Protection Agency). 1995. Hexachlorobenzene. On-Line as of March 1. Integrated Risk Information System (IRIS). Cincinnati, OH: Office of Research and Development, Environmental Criteria and Assessment Office.

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SEARCH STRATEGY: ON-LINE TOXICOLOGIC DATABASE

Toxline (1981 to August 1994) was searched linking the CAS Registry Number of hexachlorobenzene with the keyword "toxicity."

Bureau of Toxic Substance Assessment/tbj01&kgb02
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