VALUE(S) ADDED 7-24-85

FACT SHEET REVISED _____

VALUE(S) REMOVED _____

AMBIENT SURFACE WATER QUALITY STANDARDS DOCUMENTATION

CHEMICAL: Carbon tetrachloride

CAS NO.(s): 56-23-5

BASIS (Human/Aquatic): Human

WATER CLASSIFICATION: AA; AA-s; A; A-s

STANDARD: 0.4 ug/l Note A

REMARKS:

SUMMARY INFORMATION:

The toxicologic data base for this compound has been reviewed.[1-6] It is an animal oncogen as defined in Part 701.1(p). Chronic exposure of laboratory animals to gavage doses of this compound has resulted in a significant increase in the incidence of liver tumors in mice, rats and hamsters.[1,7]

STANDARD DERIVATION:

Dose-response data from a National Cancer Institute[7] carcinogenesis bioassay were used for extrapolation. Using the protocol in Part 701.4 and a linearized multistage extrapolation procedure (GLOBAL82)[8], a carbon tetrachloride concentration of 0.4 ug/l in water was calculated to correspond to an increased human cancer risk of 1×10^{-6} over a lifetime (see calculations below). The recommended ambient water quality standard for carbon tetrachloride is 0.4 ug/l.

Calculations:

1. National Cancer Institute Bioassay Data

The incidence of liver tumors in male mice given time-weighted average doses of 0, 1,250, and 2,500 mg/kg of carbon tetrachloride via gavage on 5 days each week during the exposure period is the dose-response data for the most sensitive tumor type in the most sensitive species and sex, occurring at a statistically significant level.

2. Average Daily Intake (for animals)*

Average Daily Intake During Lifetime
0 mg/kg/day
777 mg/kg/day
1,554 mg/kg/day

*Exposure was only for 5 days a week, therefore, time-weighted average doses on treatment days were multiplied by 5/7 to calculate average daily doses during exposure. In addition, mice lived an additional 12 weeks without exposure after being exposed for 78 weeks; therefore, average daily doses during exposure were multiplied by 0.87 to calculate average daily doses during lifetime.

3. Data Input for GLOBAL82 Computer Program

Dose (mg/kg/day)	Number of animals with tumors	Number of experimental animals
0	0	18
777	49	49
1,554*	47*	48*

*Since the dose-response data indicate that the number of responders reached a plateau at an average daily dose of 777 mg/kg, the data from the highest dose level were omitted from input into the GLOBAL82 program.

4. GLOBAL82 Result (for animals)

The lower 95% confidence limit value of the carbon tetrachloride dose corresponding to an increased lifetime cancer risk of 1×10^{-6} for the experimental animals was 0.13 ug/kg/day.

5. Conversion of the animal dose (ug/kg/day) to a human dose using surface area conversion rule

$$\text{rodent dose (ug/kg/day)} \times \left(\frac{\text{animal body wt. (kg)}}{\text{human body wt. (kg)}}\right)^{0.33} = \text{human dose (ug/kg/day)}$$

$$0.13 \text{ ug/kg/day} \times \left(\frac{0.03 \text{ kg}}{70 \text{ kg}}\right)^{0.33} = 1.0 \times 10^{-2} \text{ ug/kg/day}$$

6. Calculation of the carbon tetrachloride level in water corresponding to an increased cancer risk of 1×10^{-6} for a 70 kg human ingesting 2 liters of contaminated water per day over a lifetime.

$$\frac{0.01 \text{ ug/kg/day} \times 70 \text{ kg}}{2 \text{ l/day}} = 0.35 \text{ ug/l}$$

REFERENCES:

(1) National Academy of Sciences. 1977. Drinking Water and Health, Vol. 1. National Academy of Sciences. Washington, D.C.

(2) National Academy of Sciences. 1980. Drinking Water and Health, Vol. 3. National Academy Press. Washington, D.C.

(3) National Academy of Sciences. 1983. Drinking Water and Health, Vol. 5, National Academy Press, Washington, D.C.

(4) International Agency for Research on Cancer. 1972. IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. 1: 53-60.

(5) International Agency for Research on Cancer. 1979. IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. 20: 371-399.

(6) U.S. Environmental Protection Agency. 1980. Ambient water quality criteria for carbon tetrachloride. NTIS No. PB81-117376.

(7) National Cancer Institute. 1976. Bioassay of trichloroethylene for possible carcinogenicity. Carcinogenesis Tech. Rep. Ser. No. 2.

(8) Howe, R.B. and K.S. Crump. 1982. GLOBAL82 Computer Program. Science Research Systems, Inc., Ruston, LA.

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