AMBIENT SURFACE WATER QUALITY
STANDARDS DOCUMENTATION

CHEMICAL: 1,2-Diphenylhydrazine

CAS NO.(s): 122-66-7

BASIS (Human/Aquatic): Human

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

STANDARD: 0.05 ug/l   Note A

REMARKS:

SUMMARY INFORMATION:

The toxicologic data base for this compound has been
reviewed.[1,2] It is an animal oncogen as defined in Part
701.1(p). Chronic exposure of laboratory animals to this
compound via the diet has resulted in a significant increase
in the incidence of liver tumors (male and female rats and
female mice), zymbal gland tumors (male rats) and mammary
gland tumors (female rats).[3]

STANDARD DERIVATION:

Dose-response data from a National Cancer Institute[3]
carcinogenesis bioassay were used for extrapolation. Using
the protocol in Part 701.4 and a linearized multistage
extrapolation procedure (GLOBAL82)[4], a
1,2-diphenylhydrazine concentration of 0.05 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
1,2-diphenylhydrazine is 0.05 ug/l.

Calculations:

1.   National Cancer Institute Bioassay Data

The incidence of liver tumors in male rats fed
1,2-diphenylhydrazine in the diet at time-weighted average
levels of 0, 80 and 300 ppm 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)*

Concentration in diet	Average Daily Intake During Lifetime
0	0 mg/kg/day
80 ppm	3 mg/kg/day
300 ppm	11 mg/kg/day

*Since specific information on food consumption was not provided, the general formula ppm in diet x 0.05 = daily dose in mg/kg/day was used to calculate the average daily intake for rats at each dose level during exposure. However, rats lived an additional 28 weeks without exposure after being exposed for 78 weeks; therefore, average daily doses during exposure were multiplied by 0.74 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	6	95
3	13	49
11	37	49

4. GLOBAL82 Result (for animals)

The lower 95% confidence limit value of the 1,2-diphenylhydrazine dose corresponding to an increased lifetime cancer risk of 1×10^{-6} for the experimental animals was 7.4×10^{-3} ug/kg/day.

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

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

$$7.4 \times 10^{-3} \text{ ug/kg/day} \times \left(\frac{0.35 \text{ kg}}{70 \text{ kg}}\right)^{0.33} = 1.3 \times 10^{-3} \text{ ug/kg/day}$$

6. Calculation of the 1,2-diphenylhydrazine 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.

$$\frac{0.0013 \text{ ug/kg/day} \times 70 \text{ kg}}{2 \text{ l/day}} = 4.6 \times 10^{-2} \text{ ug/l}$$

REFERENCES:

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

(2) U.S. Environmental Protection Agency. 1980. Ambient water quality criteria for diphenyhydrazine. NTIS No. PB81-117731.

(3) National Cancer Institute. 1978. Bioassay of hydrazobenzene for possible carcinogenicity. Carcinogenesis Tech. Rep. Ser. No. 92.

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

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