VALUE(S) ADDED 7-24-85

FACT SHEET REVISED _____

VALUE(S) REMOVED _____

AMBIENT SURFACE WATER QUALITY STANDARDS DOCUMENTATION

CHEMICAL: Acrylonitrile

CAS NO.(s): 107-13-1

BASIS (Human/Aquatic): Human

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

STANDARD: 0.07 ug/l Note A

REMARKS:

SUMMARY INFORMATION:

The toxicologic data base for this compound has been reviewed.[1-3] Acrylonitrile is embryotoxic and teratogenic in laboratory animals[2-4] and is a suspected occupational carcinogen.[5,6] It is an animal oncogen as defined in Part 701.1(p). Chronic exposure of laboratory animals to this compound via inhalation, drinking water, or gavage has resulted in a significant increase in the incidence of tumors at numerous sites in male and female rats, including tumors of the stomach, brain, mammary gland, zymbal gland and tongue.[7,8]

STANDARD DERIVATION:

Dose-response data from the Quast et al.[7] carcinogenesis bioassay were used for extrapolation. Using the protocol in Part 701.4 and a linearized multistage extrapolation procedure (GLOBAL82)[9], an acrylonitrile concentration of 0.07 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 acrylonitrile is 0.07 ug/l.

Calculations:

1. Quast et al. Bioassay Data

The incidence of brain tumors in female rats given acrylonitrile in the drinking water at levels of 0, 35, 85 and 210 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)*

Average Daily Intake During Lifetime
0 mg/kg/day
4.4 mg/kg/day
10.8 mg/kg/day
25 mg/kg/day

*Specific information on average daily dose was provided by Quast et al.[7]

3. Data Input for GLOBAL82 Computer Program

Dose (mg/kg/day)	Number of animals with tumors	Number of experimental animals
0	1	80
4.4	17	48
10.8	22	48
25*	24*	48*

*Since the dose-response data indicate that the number of responders reached a plateau at an average daily dose of 10.8 mg/kg/day, 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 acrylonitrile dose corresponding to an increased lifetime cancer risk of 1×10^{-6} for the experimental animals was 0.011 ug/kg/day.

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

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

$$0.011 \text{ ug/kg/day} \times \left(\frac{0.37 \text{ kg}}{70 \text{ kg}}\right)^{0.33} = 0.002 \text{ ug/kg/day}$$

6. Calculation of the acrylonitrile 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.

$$\frac{0.002 \text{ ug/kg/day} \times 70 \text{ kg}}{2 \text{ l/day}} = 0.07 \text{ ug/l}$$

REFERENCES:

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

(2) International Agency for Research on Cancer. 1979. IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. 19: 73-113.

(3) U.S. Environmental Protection Agency. 1980. Ambient water quality criteria for acrylonitrile. NTIS No. PB81-117285.

(4) Willhite, C.C. et al. 1981. Morphogenesis of axial skeletal (dysraphic) disorders induced by aliphatic nitriles. Teratology. 23: 325-333.

(5) Werner, J.B. and J.T. Carter. 1981. Mortality of United Kingdom acrylonitrile polymerisation workers. Br. J. Ind. Med. 38: 247-253.

(6) O'Berg, M.T. 1980. Epidemiologic study of workers exposed to acrylonitrile. J. Occup. Med. 22: 245-252.

(7) Quast, J.F. et al. 1980. A two-year toxicity and oncogenicity study with acrylonitrile incorporated in the drinking water of rats. Toxicology Research Lab. Dow Chemical, U.S.A.

(8) Maltoni, C. et al. 1977. Carcinogenicity bioassays on rats of acrylonitrile administered by inhalation and by ingestion. Med. Lav. 68: 401-411.

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

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