Fact Sheet Date: March 12, 1998

NEW YORK STATE
- HUMAN HEALTH FACT SHEET -

Ambient Water Quality Value
Based on Human Consumption of Fish

SUBSTANCE: Cyanide **CAS REGISTRY NUMBER:** Not Applicable

AMBIENT WATER QUALITY VALUE: 9000 ug/L

BASIS: Bioaccumulation

INTRODUCTION

This value applies to the water column and is designed to protect humans from the effects of waterborne contaminants that may bioaccumulate in fish; it is referred to as a Health (Fish Consumption) or H(FC) value. The H(FC) value is based on three components, the toxicity of the substance to humans, the extent to which it bioaccumulates in fish, and the rate of fish consumption.

SUMMARY OF INFORMATION

A. Toxicity

The toxicity of cyanide relevant to human health is described in a separate fact sheet (NYS, 1997). That fact sheet, which supports an ambient water quality value for protection of sources of potable water, derives an acceptable daily intake (ADI) of 21.6 ug cyanide/(kg · day) for non-oncogenic effects.

B. Bioaccumulation

A measurement of bioaccumulation is necessary to derive a value to protect human consumers of fish. Bioaccumulation is the process by which a substance becomes concentrated in an organism through the organism's exposure to the

contaminant in food and water. Bioaccumulation is represented numerically by a bioaccumulation factor, or BAF, which is the ratio of the concentration of a substance in the organism to that in the water column.

The term bioconcentration also describes the concentration of a substance in an organism relative to the concentration in the water column. A bioconcentration factor (BCF), however, is measured with exposure to the contaminant by water only. A BCF may be equal to the BAF for many substances, but can substantially underestimate it for others.

U.S. EPA (1995a) has promulgated, as final Federal regulations, procedures for deriving bioaccumulation factors applicable to the Great Lakes System. These procedures are believed appropriate for deriving statewide values.

For cyanide, however, U.S. EPA (1995b) states that neither an appropriate BAF nor BCF exists, and lists baseline and final BAFs of 1 L/kg. In their criteria document for cyanide for the Great Lakes Initiative, U.S. EPA (1995c) uses a "default" BAF of 1 L/kg. This value has been reviewed and will be used in this fact sheet.

DERIVATION OF WATER QUALITY VALUE

As required by 6 NYCRR 702.8(a) the water quality value must equal the acceptable daily intake from fish consumption divided by a bioaccumulation factor and by a fish consumption rate of 0.033 kg/day.

A. Acceptable Daily Intake From Fish Consumption

As required by 6 NYCRR 702.8(b), the most stringent acceptable daily intake from fish consumption is 20% of the ADI for non-oncogenic effects, as determined from 6 NYCRR 702.5. This value is 21.6 ug cyanide/(kg · day) from NYS (1997) as described above. The acceptable daily intake from fish consumption is:

0.2 x 21.6 ug cyanide/(kg · day) = 4.32 ug cyanide/(kg · day)

B. Final BAF

A fish lipid content of 3% had previously been used when calculating BAFs for deriving criteria for New York State. U.S. EPA (1995a) apportions daily fish consumption between fish of trophic levels 3 and 4. Specifically, 24% is assigned to trophic level 3 fish, with a standardized lipid fraction of 0.0182 (1.82%), and 76% to trophic level 4 fish, with a standardized lipid fraction of 0.0310 (3.1%). The weighted average lipid fraction of trophic level 3 and 4 fish is thus 0.028 (2.8%), which is very close to the value of 3% that had been used

in New York State. U.S. EPA's apportionment approach is believed to be protective of human consumers of fish statewide, and will be used in the derivation of the water quality value in this fact sheet to achieve consistency with requirements for the Great Lakes System.

The default BAF of 1 L/kg is used as the final BAF for both trophic levels 3 and 4.

C. Human Exposure (Fish Consumption)

6 NYCRR 702.8 requires that H(FC) values be based on a fish consumption rate of 0.033 kg/day.

D. Calculation of Water Quality Value

The water quality value (WQV) is derived using a human body weight of 70 kg and a daily fish consumption rate of 0.033 kg as shown below. The fish consumption is apportioned as 24% trophic level 3 and 76% trophic level 4.

$$WQV = \frac{\text{Acceptable Daily Intake from Fish Consumption} \times 70\ kg}{[(BAF_{TL3})(0.24) + (BAF_{TL4})(0.76)] \times 0.033\ kg/day}$$

$$WQV = \frac{4.32\ ug\ cyanide/(kg \cdot day) \times 70\ kg}{[(1\ L/kg)(0.24) + (1\ L/kg)(0.76)] \times 0.033\ kg/day}$$

$$= 9164\ ug/L, \text{ rounded to } 9000\ ug/L$$

REFERENCES

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: Department of Environmental Conservation.

NYS (New York State). 1997. Human Health Fact Sheet. Ambient Water Quality Value for Protection of Sources of Potable Water. Cyanide. Albany, NY: Department of Environmental Conservation.

U.S. EPA (Environmental Protection Agency). 1995a. Final Water Quality Guidance for the Great Lakes System. 60 Federal Register: 15366-15425. March 23, 1995.

U.S. EPA (Environmental Protection Agency). 1995b. Great Lakes Water Quality Initiative Technical Support Document for the Procedure to Determine Bioaccumulation Factors. Office of Water. EPA-820-B95-005.

U.S. EPA (Environmental Protection Agency). 1995c. Great Lakes Water Quality Initiative Criteria Documents for the Protection of Human Health. Office of Water. EPA-820-B-95-006.

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