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SECONDARY VALUES FOR CYANAZINE (CAS No.21725-46-2)

A search was conducted for information on the chemical properties and toxicity of cyanazine to human health and to fish and aquatic life using the following databases and search engines: ECOTOX (toxicity to fish and aquatic life), IRIS (Integrated Risk Information System; toxicity to human health), CHEMFATE (environmental fate), BIODEG (degradation), HSDB (Hazardous Substances Data Bank), CCRIS (Chemical Carcinogenesis Research Info System), ATSDR ToxFAQs (Agency for Toxic Substances and Disease Registry chemical fact sheets), and EXTOXNET (Extension Toxicology Network's pesticide information project). This search yielded some useful information on cyanazine's properties and toxicity.

Fish and Aquatic Life Secondary Values

To derive an acute toxicity criterion for fish and aquatic life, acute toxicity test results are required for at least one species in each of eight different families. Specific requirements and the data available to meet these requirements are found in Table 1. Following a search for information on the toxicity of cyanazine to fish and other aquatic life, it was determined that data are available to meet five out of the eight requirements. Because data are available for a Daphnid species, it was possible to calculate a secondary acute value for cyanazine.

Cold Water

To calculate a secondary acute value (SAV), the lowest genus mean acute value (GMAV) in the database is divided by the secondary acute factor (SAF; an adjustment factor corresponding to the number of satisfied requirements).

SAF for five out of eight requirements met = 6.1
Lowest GMAV = 2,000 µg/L (*Gammarus fasciatus*)

SAV = GMAV/SAF
= 2,000 µg/L / 6.1
= 327.87 µg/L

No chronic data are currently available for cyanazine which meet acceptability requirements; therefore, a secondary chronic value (SCV) may be calculated using default ratios only.

SACR (secondary acute-chronic ratio) = Geometric mean of three species mean acute-chronic ratios (SMACRs).

SMACR 1 = 18 (default)
SMACR 2 = 18 (default)

SMACR 3 = 18 (default)

SACR = geometric mean of 18, 18, and 18 = 18

SCV = SAV/SACR
= 327.87 µg/L / 18
= 18.21 µg/L

Because the lowest GMAV available is for an invertebrate species (*Gammarus fasciatus*), which will not drop out of the database for any of the water body use designations, the secondary acute and chronic values calculated for cold water designated waters will also apply for warm water sportfish, warm water forage fish, limited forage fish and limited aquatic life designated waters.

Table 1. Requirements for calculation of an acute toxicity criterion for protection of aquatic life for cyanazine, and corresponding acute toxicity data.

Species Name	Common Name	Duration/ Endpoint	Value µg/L	Reference #[a]	Source
1. At least one salmonid fish in the family Salmonidae, in the class Osteichthyes.					
Oncorhynchus mykiss	**rainbow trout**	**96-h/LC50**	**9,000**	**4**	**AQUIRE**
Oncorhynchus mykiss	**rainbow trout**	**96-h/LC50**	**9,000**	**5**	**AQUIRE**
Species Mean Acute Value (SMAV) = 9,000					
2. At least one non-salmonid fish from another family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species.					
Ictalurus punctatus	**channel catfish**	**96-h/LC50**	**17,400**	**4**	**AQUIRE**
Ictalurus punctatus	**channel catfish**	**96-h/LC50**	**11,300**	**4**	**AQUIRE**
Ictalurus punctatus	**channel catfish**	**96-h/LC50**	**10,400**	**4**	**AQUIRE**
SMAV = 12,692.69					
Lepomis macrochirus	**bluegill**	**96-h/LC50**	**22,500**	**4**	**AQUIRE**
Lepomis macrochirus	**bluegill**	**96-h/LC50**	**20,300**	**5**	**AQUIRE**
Lepomis macrochirus	**bluegill**	**96-h/LC50**	**18,000**	**5**	**AQUIRE**
SMAV = 20,182.91					
3. At least one planktonic crustacean (e.g., cladoceran, copepod).					
Daphnia magna	**water flea**	**48-h/EC50**	**106,000**	**1**	**AQUIRE**
Daphnia magna	**water flea**	**48-h/EC50**	**84,000**	**1**	**AQUIRE**
Daphnia magna	**water flea**	**48-h/EC50**	**53,000**	**1**	**AQUIRE**
Daphnia magna	**water flea**	**48-h/EC50**	**95,000**	**1**	**AQUIRE**
Daphnia magna	**water flea**	**48-h/EC50**	**93,000**	**1**	**AQUIRE**
Daphnia magna	**water flea**	**48-h/EC50**	**86,000**	**1**	**AQUIRE**
Daphnia magna	**water flea**	**48-h/EC50**	**35,500**	**2**	**AQUIRE**
Daphnia magna	**water flea**	**48-h/EC50**	**49,000**	**3**	**AQUIRE**

Daphnia magna	**water flea**	**48-h/EC50**	**42,000**	**3**	**AQUIRE**
SMAV = 66,718.90					

4. At least one benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish).

Gammarus fasciatus	**scud**	**96-h/LC50**	**2,000**	**4**	**AQUIRE**
Gammarus fasciatus	**scud**	**96-h/LC50**	**2,000**	**5**	**AQUIRE**
SMAV = 2,000					

5. At least one insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge).

6. At least one fish or amphibian from a family in the phylum Chordata not already represented in one of the other subdivisions.

Pimephales promelas	**fathead minnow**	**96-h/LC50**	**16,300**	**4**	**AQUIRE**
Pimephales promelas	**fathead minnow**	**96-h/LC50**	**17,500**	**4**	**AQUIRE**
Pimephales promelas	**fathead minnow**	**96-h/LC50**	**21,300**	**4**	**AQUIRE**
Pimephales promelas	**fathead minnow**	**96-h/LC50**	**19,400**	**5**	**AQUIRE**
SMAV = 18,528.99					

7. At least one organism from a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca).

8. At least one organism from a family in any order of insect or any other phylum not already represented in subdivisions 1 through 7.

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[1]Nebeker, A.V., M.A. Cairns, S.T. Onjukka, and R.H. Titus. 1986. Effect of age on sensitivity of *Daphnia magna* to cadmium, copper and cyanazine. Environmental Toxicology and Chemistry 5(6):527-530.

[2]Marchini, S., L. Passerini, D. Cesareao, and M.L. Tosato. 1988. Herbicidal triazines: Acute toxicity on *Daphnia*, fish, and plants and analysis of its relationships with structural factors. Ecotoxicology and Environmental Safety 16(2):148-157.

[3]Office of Pesticide Programs. 2000. Environmental Effects Database. Environmental Fate and Effects Division, U.S. EPA, Washington, D.C.

[4]Johnson, W.W. and M.T. Finley. 1980. Handbook of acute toxicity of chemicals to fish and aquatic invertebrates. Resource Publication 137, U.S. Fish and Wildlife Service, U.S. Department of Interior, Washington, D.C. 98 pp.

[5]Mayer, F.L.J., and M.R. Ellersieck. 1986. Manual of acute toxicity: Interpretation and data base for 410 chemicals and 66 species of freshwater animals. Resource Publication 160, U.S. Fish and Wildlife Service, U.S. Department of Interior, Washington, D.C. 505 pp.

HUMAN HEALTH

To calculate a criteria or secondary value for the protection of human health, it is first necessary to determine if the substance has been shown to be carcinogenic (which will result in the calculation of a human cancer criteria or secondary value) or not (which will result in the calculation of a human threshold criteria or secondary value). U.S. EPA has determined that cyanazine is not likely to be carcinogenic. However, the U.S. EPA withdrew the oral reference dose (RfD) for cyanazine in 1992 for review, and has not yet made a new one available. Therefore, a human threshold secondary value can not be calculated for cyanazine at this time.

Chemical	CAS #	Category	Type of Secondary Value	Water Body Classification	Value (µg/L)
Cyanazine	21725-46-2	Fish and Aquatic	Acute	Cold, WWSF, WWFF, LFF, LAL	328
Cyanazine	21725-46-2	Fish and Aquatic	Chronic	Cold, WWSF, WWFF, LFF, LAL	18

Cold = cold water designated water bodies
WWSF = warm water sportfish designated water bodies
WWFF = warm water forage fish designated water bodies
LFF = limited forage fish designated water bodies
LAL = limited aquatic life designated water bodies (includes wetlands)