OHIO EPA SURFACE WATER QUALITY CRITERION FACT SHEET

Chemical Name: Acenaphthene Developed by: Chris J. Skalski
CAS # 83-32-9 Data Retrieval Date: 4-17-01
Internal Code # 1 Fact Sheet Preparation Date: 3-01-06

ACUTE DATA

SPECIES	EC_{50}/LC_{50} (µg/l)	TEST TYPE[a]	DURATION (HOURS)	SMAV[b] (µg/l)	GMAV[b] (µg/l)	REFERENCE NUMBER
Cladoceran	3,450	S,U	48	2,097	2,097	1
Daphnia magna	1,275	S,U	48			2
	41,000[c]	S,U	48			3
Channel Catfish *Ictalurus punctatus*	1,720	F,M	96	1,720	1,720	4
Rainbow Trout *Oncorhynchus mykiss*	670	F,M	96	670	670	4
Brown Trout *Salmo trutta*	580	F,M	96	580	580	4
Snail *Aplexa hypnorum*	>2,040	F,M	96	> 2,040	> 2,040	4
Amphipod *Gammarus minus*	460	S,U	96	460	460	9
Stonefly *Tallaperla maria*	240	S,U	96	240	240	9
Bluegill *Lepomis macrochirus*	1,700[d]	S,U	96			5
Fathead Minnow	1,600	F,M	96	1,189	1,189	4
Pimephales promelas	1,730	F,M	96			6
	608	F,M	96			7
Sheepshead Minnow[e] *Cyprinodon variegatus*	2,230	S,U	96			8

[a] S = static; F= flow through; U = unmeasured; M = measured.
[b] SMAV = Species Mean Acute Value; GMAV = Genus Mean Acute Value
[c] Data not used because it varies by over a factor of 10 from the other data for this species.
[d] Data not used because precipitate was present during the test.
[e] Saltwater species; data not used in the calculation of acute criteria.

Chemical Name: Acenaphthene Developed by: Chris J. Skalski
CAS # 83-32-9 Data Retrieval Date: 4-17-01
Internal Code # 1 Fact Sheet Preparation Date: 3-01-06

ACUTE DATA

SPECIES	EC_{50}/LC_{50} (µg/l)	TEST TYPE[a]	DURATION (HOURS)	SMAV[b] (µg/l)	GMAV[b] (µg/l)	REFERENCE NUMBER
Midge	60	S,U	96	64.8	64.8	10
Paratanytarsus sp.	70	S,U	96			10
	140[d]	S,U	96			10
	470[d]	S,U	96			10
	1,620[c]	S,U	96			10
	1,650[c]	S,U	96			10
	2,000[c]	S,U	96			10
	2,090[c]	S,U	96			10

[a] S = static; F= flow through; U = unmeasured; M = measured.
[b] SMAV = Species Mean Acute Value; GMAV = Genus Mean Acute Value
[c] Data not used to calculate the SMAV because the report indicated that volatilization of the chemical occurred and probably accounted for the variation in the test results among various laboratories. Volatilization would result in reduced exposure and, therefore, higher EC50s. Since the range of EC50s is greater than an order of magnitude, and since data for other species indicate that other invertebrates are among the most sensitive species to this chemical, these data were not used to calculate the SMAV.
[d] Data not used to calculate the SMAV because the report indicated that the laboratory employed 4th instar larva in their test. This affected the acute test results by more closely simulating a life-cycle related effect since the paper reported that molting occurred during the 96-hour exposure period.

Chemical Name: Acenaphthene Developed by: Chris J. Skalski
CAS # 83-32-9 Data Retrieval Date: 4-17-01
Internal Code # 1 Fact Sheet Preparation Date: 3-01-06

CHRONIC DATA

SPECIES	CHRONIC VALUE (µg/l)	METHOD	SMCV[a] (µg/l)	GMCV[a] (µg/l)	REFERENCE NUMBER
Fathead Minnow *Pimephales promelas*	332-495 405	Early Life Stage			7
Fathead Minnow *Pimephales promelas*	345-509 419	Early Life Stage			7
Fathead Minnow *Pimephales promelas*	133-263 187	Early Life Stage			11
Fathead Minnow *Pimephales promelas*	146-285 204	Early Life Stage			11
Fathead Minnow *Pimephales promelas*	75-180 116	Early Life Stage			12
Fathead Minnow *Pimephales promelas*	180-370 258	Early Life Stage			12
Fathead Minnow *Pimephales promelas*	64-98 79	Early Life Stage			12
Fathead Minnow *Pimephales promelas*	91-139 112	Early Life Stage			12
Fathead Minnow *Pimephales promelas*	34-71 49	Early Life Stage			12
Fathead Minnow *Pimephales promelas*	33-88 54	Early Life Stage			12
Fathead Minnow *Pimephales promelas*	110-240 162	Early Life Stage			12
Fathead Minnow *Pimephales promelas*	120-270 180	Early Life Stage			12
Fathead Minnow *Pimephales promelas*	330-500 406	Early Life Stage			12
Fathead Minnow *Pimephales promelas*	350-510 422	Early Life Stage			12

[a] SMCV = Species Mean Chronic Value; GMCV = Genus Mean Chronic Value.

Chemical Name: Acenaphthene Developed by: Chris J. Skalski
CAS # 83-32-9 Data Retrieval Date: 4-17-01
Internal Code # 1 Fact Sheet Preparation Date: 3-01-06

CHRONIC DATA

SPECIES	CHRONIC VALUE (µg/l)	METHOD	SMCV[a] (µg/l)	GMCV[a] (µg/l)	REFERENCE NUMBER
Midge *Paratanytarsus sp.*	10-20 14.14[b]	Life Cycle		10	
Midge *Paratanytarsus sp.*	20-30 24.49[b]	Life Cycle		10	
Midge *Paratanytarsus sp.*	300-800 490	Life Cycle			10
Midge *Paratanytarsus sp.*	180-300 230	Life Cycle		10	
Midge *Paratanytarsus sp.*	27-44 35	Life Cycle		10	
Midge *Paratanytarsus sp.*	60-150 95	Life Cycle		10	
Midge *Paratanytarsus sp.*	30-110 57	Life Cycle		10	
Midge *Paratanytarsus sp.*	640-1,300 910	Life Cycle		10	
Midge *Paratanytarsus sp.*	270-580 400	Life Cycle		10	
Midge *Paratanytarsus sp.*	>800	Life Cycle		10	
Sheepshead Minnow *Cyprinodon variegatus*	520-970 710	Early Life Stage	710	710	8

[a] SMCV = Species Mean Chronic Value; GMCV = Genus Mean Chronic Value.
[b] Only these chronic values were used to calculate acute-chronic ratios because they were determined in the same laboratory as the acceptable acute values.

REFERENCES

1. Randall, T.L. and P.V. Knopp. 1980. Detoxification of Specific Organic Substances by Wet Oxidation. J. Water Pollut. Control Fed. 52(8):2117-2130.

2. Munoz, M.J. and J.V. Tarazona. 1993. Synergistic Effect of Two- and Four-Component Combinations of the Polycyclic Aromatic Hydrocarbons: Phenanthrene, Anthracene, Naphthalene and Acenaphthene on *Daphnia magna*. Bull. Environ. Contam. Toxicol. 50(3):363-368.

3. LeBlanc, G.A. 1980. Acute Toxicity of Priority Pollutants to Water Flea (*Daphnia magna*). Bull. Environ. Contam. Toxicol. 24(5):684-691.

4. Holcombe, G.W., G.L. Phipps and J.T. Fiandt. 1983. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf. 7(4):400-409.

5. Buccafusco, R.J., S.J. Ells and G.A. LeBlanc. 1981. Acute toxicity of Priority Pollutants to Bluegill (*Lepomis macrochirus*). Bull. Environ. Contam. Toxicol. 26(4):446-452.

6. Geiger, D.L., C.E. Northcott, D.J. Call and L.T. Brooke. 1985. Acute Toxicities of Organic Chemicals to Fathead Minnows (*Pimephales promelas*), Vol. 2. Center for Lake Superior Environmental Studies, Univ. of Wisconsin, Superior, WI:326 p.

7. Cairns, M.A. and A.V. Nebeker. 1982. Toxicity of Acenaphthene and Isophorone to Early Life Stages of Fathead Minnows. Arch. Environ. Contam. Toxicol. 11(6):703-707.

8. USEPA. 1980. Ambient Water Quality Criteria for Acenaphthene. EPA 440/5-80-015.

9. Horne, J.D., M.A. Swirsky, T.A. Hollister, B.R. Oblad and J.H. Kennedy. 1983. Aquatic Toxicity Studies of Five Priority Pollutants. Rep. No. 4398, Final Report, EPA Contract No. 68-01-6201, NUS Corp., Houston, TX:196.

10. Lemke, A.E. and R.L. Anderson. 1984. Insect Interlaboratory Toxicity Test Comparison Study for the Chironomid (*Paratanytarsus sp.*) Procedure. EPA-600/3-84-054, U.S. EPA, Duluth, MN:15p.

11. Lemke, A.E., E. Durhan and T. Felhaber. 1983. Evaluation of a Fathead Minnow *Pimephales promelas* Embryo-Larval Guideline Using Acenaphthene and Isophorone. EPA-600/3-83-062, U.S. EPA, Duluth, MN:26 p.

12. Lemke, A.E. 1983. Interlaboratory Comparison of Continuous Flow, Early Life Stage Testing with Fathead Minnows. EPA-600/3-84-005, U.S. EPA, Duluth, MN:26p.

Chemical Name: Acenaphthene Developed by: Chris J. Skalski
CAS # 83-32-9 Data Retrieval Date: 4-17-01
Internal Code # 1 Fact Sheet Preparation Date: 3-01-06

CALCULATION OF ACUTE AQUATIC CRITERION (AAC)[a]

Species	SMAV (µg/l)	Genus	GMAV (µg/l)	Data Set Requirement
Cladoceran	2,097	*Daphnia*	2,097	d
Snail	>2,040	*Aplexa*	>2,040	g
Channel Catfish	1,720	*Ictalurus*	1,720	b
Fathead Minnow	1,189	*Pimephales*	1,189	c
Rainbow Trout	670	*Oncorhynchus*	670	
Brown Trout	580	*Salmo*	580	a
Amphipod	460	*Gammarus*	460	e
Stonefly	240	*Tallaperia*	240	f
Midge	64.8	*Paratanytarsus*	65	h

Genus	GMAV	ln(GMAV)	$\ln(GMAV)^2$	RANK	P=R/(N+1)	$\sqrt{P}$
Paratanytarsus	64.8	4.1714	17.4007	1	0.1000	0.3162
Tallaperia	240	5.4806	30.0374	2	0.2000	0.4472
Gammarus	460	6.1312	37.5919	3	0.3000	0.5477
Salmo	580	6.3630	40.4881	4	0.4000	0.6325
TOTALS		22.1463	125.5182		1.0000	1.9436

$$S^2 = \frac{125.5182 - (22.1463)^2/4}{1.0000 - (1.9436)^2/4} = \frac{2.9034}{0.0556} = 52.2329 \quad S = 7.2272$$

$$L = [22.1463 - ((7.2272)(1.9436)]/4 = 2.0248$$

$$A = 7.2272(\sqrt{0.05}) + (2.0248) = 3.6409$$

Final Acute Value (FAV) = $e^{3.6409}$ = 38 µg/l

AAC = FAV ÷ 2 = 38 µg/l ÷ 2 = 19 µg/l

[a]See Ohio Administrative Code 3745-1-36 effective February 22, 2002.

Experimentally determined Acute-Chronic Ratios (ACRs):

SPECIES	ACUTE VALUE ACUTE-CHRONIC (µg/l)		CHRONIC VALUE SPECIES MEAN RATIO	ACR
Fathead Minnow *Pimephales promelas*	608	405	1.50	1.48
Fathead Minnow *Pimephales promelas*	608	419	1.45	
Midge *Paratanytarsus sp.*	60	14.14	4.24	3.48
Midge *Paratanytarsus sp.*	70	24.49	2.86	
Sheepshead Minnow *Cyprinodon variegatus*	2,230	710	3.14	3.14

CALCULATION OF AQUATIC VALUE (CAV)[a]

CHRONIC

$\sqrt[3]{(1.48)(3.48)(3.14)} = 2.53$

Secondary Acute-Chronic Ratio (SACR) =

Chronic Aquatic Value (CAV) = FAV ÷ SACR
= 38 ÷ 2.53
= 15 µg/l

[a]See Ohio Administrative Code 3745-1-36 effective February 22, 2002.