

ACUTE TOXICITY TO FISH (FATHEAD MINNOW)

TEST SUBSTANCE

Identity: A mixture containing perfluorooctanesulfonate, which may also be referred to as PFOS, FC-95, or as a component of L-4647. (1-Octanesulfonic acid) (CAS # 2795-39-3).

Remarks: The 3M production lot number is given as both NB# 52393-334, and cc803-17. The test sample is 1.356% solution of L-4647. Current information indicates it is a mixture of 6.6% PFOS, 20% polyethylene glycol, 20% hexahydric alcohol, 39% sodium decyl sulfate, 13.2% Hydroxy foamer, 1% sodium ethylhexyl sulfate, 0.1% methylhydroquinone, and 0.1% biphenylol, sodium salt, tetrahydrate.

The following summary applies to a mixture with incompletely characterized concentrations of impurities. Data may not accurately reflect the toxicity of the fluorochemical component of the test sample.

METHOD:

Method: Not given.

Type: Acute static definitive and range-finding

GLP: No

Year completed: 1980

Species: *Pimephales promelas*

Supplier: Commerical supplier, Brady, NE.

Analytical monitoring: Temperature, pH, and dissolved oxygen.

Exposure period: 96-hours

Statistical methods: The LC₅₀ values were determined by the moving average angle method.

Test fish age: Juveniles

Length and weight: Average length = 32 - 36 mm
Average weight = 0.37 - 0.40 g (wet)

Loading: 0.46 - 0.75 g/L

Pretreatment: None

Test conditions:

Dilution water: Carbon-filtered well water

Dilution water chemistry: Not given.

Lighting: Not given.

Stock and test solution preparation: The test material was added directly to the dilution water on a weight/volume basis for the range-finding and the first definitive test. The test material was added from a stock solution, based on the active ingredient (Cartridge Agent), wherein each mL added was equivalent to 10.356 mg Cartridge Agent for the second definitive test.

Concentrations dosing rate: Once.

Stability of the test chemical solutions: Not noted.

Exposure vessels: Wide-mouth 1 gallon glass jars containing 3 L test solution for the range-finding test. All-glass tanks (35x20x25) containing 16 L test solution for the definitive tests.

Number of replicates: 1 – 2, depending on the test

Number of fish per replicate: 5 – 30, depending on the test

Number of concentrations: five plus a blank control for the range-finding and the second definitive test. One plus a blank control for the first definitive test.

Water chemistry during the first definitive study (5/6-10/80):

pH range (0-96 hours):

7.5 – 7.8 (control exposure)

7.4 – 7.8 (1550 mg/L exposure)

Temperature range (0-96 hours): 17 - 18 °C

Dissolved oxygen range (0-96 hours):

3.8 – 10.8 mg/L (control exposure)

1.4 – 10.8 mg/L (1550 mg/L exposure)

Water chemistry during the second definitive study (6/24-28/80):

pH range (0-96 hours):

7.9 – 8.0 (control exposure)

7.5 – 8.0 (103 mg/L exposure)*

Temperature range (0-96 hours): 17 - 19 °C

Dissolved oxygen range (0-96 hours):

4.8 – 9.1 mg/L (control exposure)

1.4 – 9.1 mg/L (103 mg/L exposure)*

* 103 mg/L (intermediate concentration) exposure values used because the highest two concentrations used resulted in total mortality by 24 hours.

RESULTS

Nominal concentrations: Blank control and 1550 mg/L for the first definitive study (conducted 5/6-10/80). Blank control, 10.4, 58, 103, 248, and 580 mg/L for the second definitive study (conducted 6/24-28/80).

Element values: 96-hour LC_{50} = >1550 mg/L (first definitive study)
96-hour LC_{50} = 154 (126 – 188) mg/L (second definitive study)

Element values based on nominal concentrations

Remarks: Testing was conducted on a mixture as described in the Test Substance Remarks field. The values reported apply to that mixture and not the fluorochemical proportion alone.

CONCLUSIONS

Inconsistent LC₅₀ results were obtained between the first and second definitive studies. In the first definitive study, which evaluated one exposure concentration (1550 mg/L), no mortality was observed during the study. This study result is consistent with the results of the range-finding study, in which no mortality was observed in any exposure concentration (highest conc. 1500 mg/L). In the second definitive study, which evaluated a series of exposure concentrations from 10.4 to 580 mg/L, total mortality was seen at the highest two concentrations (248 and 480 mg/L), and an LC₅₀ of 154 mg/L was obtained. Based on the results from the range-finding study and the first definitive study, the results obtained during the second definitive study are questionable. The first study was based on the total solution, while the second was based on the cartridge agent.

Submitter: 3M Company, Environmental Laboratory, P.O. Box 33331, St. Paul, Minnesota, 55133

DATA QUALITY

Reliability: Klimisch ranking = 3. Inconsistent study results were obtained in the two definitive studies conducted with this test substance. The studies also lack information on purity of the test substance and actual measurements of the amount of fluorochemical proportion in solution.

REFERENCES

These studies were conducted by the 3M Company, Environmental Laboratory, St. Paul, MN, Lab Request number 5623S, 1980.

OTHER

Last changed: 6/26/00

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ENVIRONMENTAL LABORATORY
AQUATIC TOXICITY DATA SHEET
EXPLORATORY (RANGE-FINDING TEST)

Type Test 96HR. ACUTE STATIC Material Tested 1.356% L-4047 L.W. AF3 EXTINGUISHING AGENT Lot CC 803-17
Test Organism FATHEAD MINNOWS Source BRADY, N.E.B. Date Rec'd 3/17/80 Batch No. 4-E
Avg. Wt. 0.408 grams Avg. Size 3.6 CM No. Organisms per dose 5
Test Solution Volume 3 Liters/All-Glass Tank Tank Dimensions: WIDE-MOUTH 1 GALLON GLASS JA
Time Started 2:00PM Date Started 4/22/80 Date Completed 4/26/80
Dilution Water Carbon-filtered well water (Temp. 15 °C.; D.O. 9.7 ppm, pH 7.9)
Investigator [Signature] (Full Signature) 50 (95% Confidence Limits) n=2

Tank No.	Init. Conc. mg/l	Total Amount Added	24 Hours			48 Hours			72 Hours			96 Hours		
			Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm
CI	Control	* <u>mg</u>	0/5	7.7	3.7	0/5	7.7	2.4	0/5	7.7	2.4	0/5	7.8	2.4
CII	CONTROL	—	0/5	7.7	3.1	0/5	7.7	2.2	0/5	7.7	2.2	0/5	7.8	2.2
1	10	30	0/5	7.7	4.7	0/5	7.7	3.2	0/5	7.8	2.6	0/5	7.8	2.6
2	100	300	0/5	7.7	2.1	0/5	7.7	1.9	0/5	7.7	1.5	0/5	7.7	1.5
3	500	1500	0/5	7.7	2.5	0/5	7.7	1.9	0/5	7.7	2.0	0/5	7.8	2.0
4	1000	3000	0/5	7.7	2.0	0/5	7.7	1.9	0/5	7.7	1.7	0/5	7.8	1.7
X	1500	4500	0/5	7.7	1.5	0/5	7.7	2.0	SUNDAY			0/5	7.8	2.0
X WAS STARTED ON 4/24/80														
Test Temp. °C.			18°C			19°C			19°C			20°C		
Initials & Date			3 4/23/80			3 4/24/80			3 4/25/80			3 4/26/80		

Comments: * INDIVIDUAL WEIGHTS. CLEAR, LIGHT YELLOW, FOAMY LIQUID. SOLUBLE IN WATER AT AMBIENT ROOM TEMPERATURE.

Effects other than Mortality

EC₅₀

Tank No.	Symptoms or Reactions	Total No. Affected			
		24-Hr.	48 Hr.	72-Hr.	96-Hr.
Control					

Comments: TEST DURATION EXTENDED PAST 96HR. (ENDED APRIL 29, 1980) MORTALITY RATES REMAINED UNCHANGING

003039

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ENVIRONMENTAL LABORATORY
AQUATIC TOXICITY DATA SHEET
DEFINITIVE (FULL-SCALE TEST)

file L 4647

LR 56235

Type Test 96 HR. ACUTE STATIC Material Tested 1.350% L-4647 L.W. AF3 EXTINGUISHER
98.644% H₂O Lot WB# 52393334 Conc. CC 803-17

Test Organism FATHHEAD MINNOWS Source BRADY, NEG. Date Rec'd 3/17/80 Batch No. 5-80

Avg. Wt. 0.4 grams Avg. Size 3.6 cm No. Organisms per dose 30 Loading Factor 0.75 mg/l

Test Solution Volume 16 Liters/All-Glass Tank Tank Dimensions: 35x20 cm and 25 cm deep

Time Started 11:00 AM Date Started 5/6/80 Date Completed 5/10/80

Dilution Water Carbon-filtered well water (Temp. 17 °C., D.O. 10.8 ppm, pH 7.8)

Investigator [Signature] LC₅₀ (95% Confidence Limits) >1550 mg/l
(Full Signature) Not reported

Tank No.	Init. Conc. mg/l	Total Amount Added	24 Hours			48 Hours			72 Hours			96 Hours		
			Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm
CI	Control	*mg	0/30	7.6	6.9	0/30	7.6	4.5	0/30	7.5	3.8	0/30	7.6	3.8
CII	Control	—	0/30	7.6	6.9	0/30	7.6	4.5	0/30	7.5	3.8	0/30	7.6	3.8
I	1550	24800	0/30	7.7	6.8	0/30	7.6	1.4	0/30	7.4	2.5	0/30	7.6	3.8
IA	1550	24800	0/30	7.7	6.8	0/30	7.6	1.4	0/30	7.4	2.5	0/30	7.6	3.8

Test Temp. °C.

17°C 18°C 18°C 18°C

Initials & Date

3/5/7/80 3/5/8/80 3/5/9/80 3/5/10/80

Comments: * INDIVIDUAL WEIGHTS. CLEAR, LIGHT YELLOW, FOAMY
LIQUID. SOLUBLE IN WATER AT AMBIENT ROOM TEMPERATURE.

Effects other than Mortality

EC₅₀

Tank No.	Symptoms or Reactions	Total No. Affected			
		24-Hr.	48 Hr.	72-Hr.	96-Hr.
CI	Control	NONE	ALL	NONE	NONE
CII	Control				
I	SURFACING	NONE	ALL	NONE	NONE
IA	SURFACING				

Comments:

003040

LR 5623 STest 96-Hr. Acute Static Material Tested 1.356% L-4647Lot AF³ ExtinguishTest Organism Fathead Minnow Source Brady, Neb. Date Rec'd 5-5-80 Batch # 6-80Avg. Wt. .37 grams Avg. Size 3.2 cm No. Organisms per dose 20 Loading Factor .46 mg/Fish Disease Treatment: NoneTest Solution Volume 16 Liters/All-Glass Tank Tank Dimensions: 35x20 cm and 25 cm deepTime Started 9³⁰ am Date Started 6-24-80 Date Completed 6-28-80Dilution Water Carbon-filtered well water (Temp. 17 °C., D.O. 9.1 ppm, pH 8.0)Investigator W. E. Mabury IC₅₀ (95% Confidence Limits) Greater than 103 mg/L
(Full Signature) Moving angle method 96 Hr LC50 = 154.2
95% Confidence Limits 125.6 - 188.7 less than 248 mg/L

Tank No.	Initial Conc. mg/L	Total Amount Added	24 Hours			48 Hours			72 Hours			96 Hours		
			Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.C. ppm
d	Control I	—	0	7.9	7.0	0	7.9	6.5	0	7.9	4.8	0	7.9	4.
	Control II	—	0	8.0	6.7	0	7.9	6.3	0	7.9	5.2	0	7.9	4
	10.4	16	0	7.9	6.5	0	7.9	6.1	0	8.0	4.2	0	7.9	4.
2	58	89.6	0	7.8	5.9	0	7.7	5.5	0	7.7	2.9	0	7.7	2
3	103	160	0	7.6	5.3	0	7.5	5.0	0	7.5	1.4	0	7.5	1.
4	248	384	20	7.5	.5	20	—	—	20	—	—	20	—	—
5	580	896	20	7.5	.5	20	—	—	20	—	—	20	—	—
Test Temp. °C			19°C			19°C			19°C			19°C		
Initials & Date			WMO 6-25-80			WMO 6-26-80			WMO 6-27-80			WMO 6-28-80		

Comments: * Based on active ingredient (Cartridge Agent)Each ml = 10.356 mg Cartridge Agent

Secondary Effects (other than Mortality):

EC₅₀

Tank No.	Symptoms or Reactions	Total Number Affected			
		24-Hr.	48-Hr.	72-Hr.	96-Hr.
Control		None	None	None	None
1		N	N	None	None
2		N	N	None	all Surfacing
3		N	N	all Surfacing	all Surfacing
4		N	N	—	—
5		N	N	N	002041
		N	N	N	N