

ACUTE TOXICITY TO FISH (BLUEGILL)

TEST SUBSTANCE

Identity: A mixture containing perfluorooctanesulfonate, which may also be referred to as PFOS, FC-95, or as a component of FC-600. (1-Octanesulfonic acid, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptafluoro-, potassium salt, CAS # 2795-39-3)

Remarks: The 3M production lot number was not noted. The test sample is FC-600. Current information indicates it is a mixture of 1.0% PFOS, 81.20% water, 12.00% diethylene glycol butyl ether, 1.00% sodium octyl sulfate, 2.00% propane Sultone foamer, 1.00% sodium decyl sulfate, 0.85% xanthan gum, 0.1% N-(3-chloroallyl) hexaminium chloride, 0.80% starch, and 0.05 % benzotriazole.

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

METHOD:

Method: Not noted.

Test type: Static acute

GLP: No

Year Completed: 1975

Species: *Lepomis macrochirus*

Supplier: Not noted.

Analytical monitoring: Temperature, pH, DO

Exposure period: 96-hours

Statistical methods: Probit analysis.

Test fish age: Juveniles

Average Length and weight: Length = 1 inch
Weight = 0.5 grams

Loading: Not noted.

Pretreatment: Not noted.

Test conditions:

Dilution water: Carbon-filtered water, City of St. Paul, MN

Dilution water chemistry: Not noted.

Lighting: Not noted

Stock and test solution preparation: Test solutions were created by direct weights additions.

Concentrations dosing rate: Once

Stability of the test chemical solution: Not noted

Exposure vessels: Not noted.

Number of replicates: One

Number of fish per replicate: 20

Number of concentrations: 5 plus a blank control

Water chemistry during the study:

pH range (0 – 96 hours):

7.1 – 7.2 (control exposures)

7.2 – 7.3 (2,000 mg/L exposure)*

Dissolved Oxygen range (0 – 96 hours):

5.6 – 7.0 mg/L (control exposures)

4.5 – 6.0 mg/L (2,000 mg/L exposure)*

Temperature (0 – 96 hours):

72°F

* Values for the 2,000 mg/L exposure (third highest concentration) were used because total mortality occurred in the highest concentrations tested.

RESULTS

Nominal concentrations: Blank control, 1,000, 1,500, 2,000, 3,000, and 4,000 mg/L

Element value: 96-hour LC₅₀ = 1,500 (1,282 – 1,755) mg/L

Element value based on nominal concentrations.

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

CONCLUSIONS

The FC-600 96-hour LC₅₀ for *Lepomis macrochirus* was determined to be 1,500 mg/L with a 95% confidence interval of 1,282 to 1,755 mg/L.

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

DATA QUALITY

Reliability: Klimisch ranking 3. The study lacks documentation on methodology. The sample purity was not properly characterized and the study lacks analytical confirmation of the amount of fluorochemical proportion in the solutions.

REFERENCES

This study was conducted by 3M Company, Environmental Laboratory, St. Paul, MN, 1975.

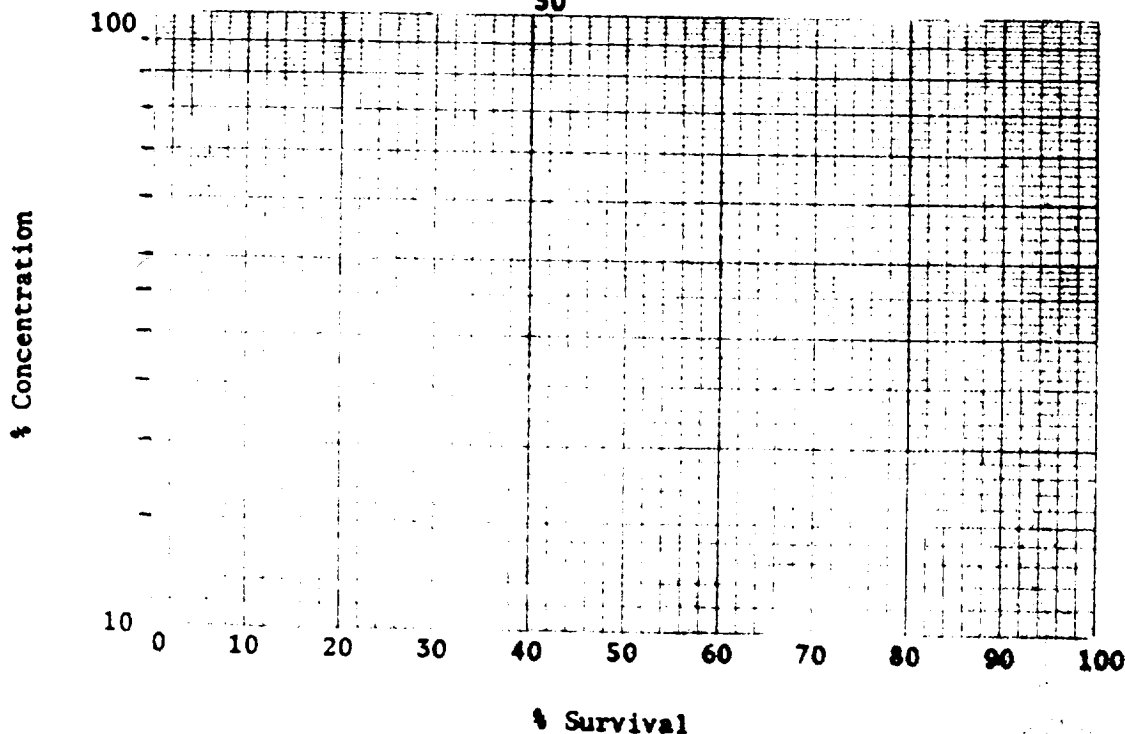
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ENVIRONMENTAL ENGINEERING LABORATORY
 AQUATIC TOXICITY WORK SHEET
Type Test 96-Hour staticMaterial Tested FC-600Test Organism BluegillAvg. Weight 0.5g Avg. Size 1 InchDate Started 8-25-75Date Completed 8-29-75Time Started 2:00 PMPlotted LC₅₀ _____Dilution Water Carbon Filtered-city waterLepomis Macrochirus

Conc.	24 hrs			48 hrs			72 hrs			96 hrs		
	% Survival	pH	D.O ppm	% Survival	pH	D.O ppm	% Survival	pH	D.O ppm	% Survival	pH	D.O ppm
Control	100	7.2	7.0	100	7.2	6.5	100	7.2	6.0	100	7.1	5.6
1,000 mg/l	100	7.2	6.5	100	7.2	6.2	90	7.0	5.8	80	7.2	5.0
1500	100	7.3	6.3	100	7.2	5.9	70	7.2	5.4	50	7.3	4.9
2,000	100	7.3	6.0	50	7.3	5.5	40	7.2	5.0	30	7.3	4.5
3,000	40	7.4	5.7	20	7.3	4.8	0	7.3	4.0	0	—	—
4,000	10	7.6	5.4	0	—	—	0	—	—	0	—	—
Average Temperature	72			72			72			72		

Average Temperature

Comments: 8/16 liter20 Bluegills per test containerLC₅₀ Calculation

ENVIRONMENTAL ENGINEERING LABORATORY
AQUATIC TOXICITY - PROBIT ANALYSIS WORK SHEET

Date Started: 8-25-75 Material Tested: FC-600
Time Started: 2:00 (AM) (PM) Test Organism (Fathead minnow) Bluegills
Type Test: (Continuous Flow) (Static) Avg. Wt. .5 (gram) Avg. Size 1 (inch)
Exposure Period: 96-Hour Date Completed: 8-29-75
Diluent: (carbon-filt.-St.P. City Wtr.) Analysis by: M.T. Elnohary

(1)		(2)		(3)		(4)	
No. of Doses Plotted	K	Conc.	Observed % Mortality	Expected % Mortality	Corrected Values	O - E Observed-Expected	Contribution to chi (from Nomograph #1)
1		10000	20	13		7	.043
2		1500	50	50		—	—
3		2000	70	78		8	.037
4		3000	100	90	96.8	6.8	0.150
5							
6							
7							

K = 4 Animals/Dose = 20 Total contribution to chi = 0.230
Total Animals = 80 (chi²) = contrib. to chi x Tot. Animals = 4.60
chi² (P-.05) for (K-2) 2 degree of freedom (from Table 2) = 5.99
4.60 is less than 5.99; therefore, the data are not significantly heterogenous.

95% Confidence Limits for LC₅₀*

LC₈₄ = 2150 mg/l LC₅₀ = 1500 mg/l LC₁₆ = 1050 mg/l
Slope function (S) = $\frac{LC_{84}/LC_{50} + LC_{50}/LC_{16}}{2} = \frac{2150/1500 + 1500/1050}{2} = \frac{1.43 + 1.43}{2} = 1.43$

Total number of animals used between 16% and 84% expected effects (N') = 40
fLC₅₀ = (S)^{2.77/√N'} = (1.43)^{.44} = (from Nomograph #2) 1.17
LC₅₀/fLC₅₀ = lower limit = 1500/1.17 = 1282 mg/l
LC₅₀ x fLC₅₀ = upper limit = 1500 x 1.17 = 1755 mg/l
LC₅₀ = 1500 (95% confidence limits 1282 to 1755)

- (1) Do not list more than two consecutive 0% effects or more than two consecutive 100% effects.
 - (2) Expected value for any dose should be greater than 0.01% or less than 99.99%.
 - (3) Corrected value for each 0% or 100% effect (from Table 1).
- * There is a 95% chance that the true value of LC₅₀ lies within these limits.

