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-heptadecafluoro-, 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

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.

OTHER

Last changed: 6/28/00
**Type Test:** 96-Hour Static  
**Material Tested:** FC-600  
**Test Organism:** Bluegill  
**Avg. Weight:** 0.5g  
**Size:** 1 Inch  
**Date Started:** 8-25-75  
**Date Completed:** 8-29-75  
**Time Started:** 2:00 PM  
**Dilution Water:** Carbon-filtered-city water  
**Plot LC<sub>50</sub>**  

**Leptomis Macroleucus**

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<table>
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<tr>
<th>Conc.</th>
<th>Survival</th>
<th>pH</th>
<th>D.O</th>
<th>%</th>
<th>Survival</th>
<th>pH</th>
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**Average Temperature:** 72°F  
**Comments:** 50 Bluegills per test container  

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**LC<sub>50</sub> Calculation**

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**% Survival**

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3M_MN01658213
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. Enoloharry

<table>
<thead>
<tr>
<th>K</th>
<th>No. of Doses Plotted</th>
<th>Conc.</th>
<th>Observed % Mortality</th>
<th>Expected % Mortality</th>
<th>Corrected Values</th>
<th>O - E</th>
<th>Contribution to chi (from Nomograph #1)</th>
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</table>

K = 4 Animals/Dose = 80 Total contribution to chi = 0.230

Total Animals = 80 (chi^2) = contrib. to chi x Tot. Animals = 4.60

chi^2 (P-.05) for (K-2) 5 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 LC_{50}^*

LC_{54} = \frac{2150 \text{ mg/l}}{LC_{50} = \frac{1500 \text{ mg/l}}{LC_{16} = \frac{1050 \text{ mg/l}}{LC_{84} = \frac{1500 \text{ mg/l}}{LC_{50}}}}

Slope function (S) = \frac{LC_{84}/LC_{50} + LC_{50}/LC_{16}}{2} = \frac{1500 \times 0.5}{1500 \times 0.5} = 0.03 + 0.03 = 0.03

Total number of animals used between 16% and 84% expected effects (N') = 40

fLC_{50} = (S)^2.77/\sqrt{N'} = (0.03)^2 = \frac{0.03}{\sqrt{40}} (from Nomograph #2) \frac{1.17}{1.17}

LC_{50}/fLC_{50} = lower limit = \frac{1500}{1.17} = 1282.8 \text{ mg/l}

LC_{50} \times fLC_{50} = upper limit = \frac{1500 \times 1.17}{1.17} = 1755 \text{ mg/l}

LC_{50} = \frac{1500}{1.17} (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 LC_{50} lies within these limits.
Fit the straight line with the obtained new set of expected effects and corrected values.