

ACUTE TOXICITY TO AQUATIC INVERTEBRATES (DAPHNIA MAGNA)

TEST SUBSTANCE

Identity: Mixture containing perfluorooctanesulfonate which may also be referred to as PFOS, FC-95, or as a component of FC-203FC. (1-Octanesulfonic acid) (CAS # 2795-39-3).

Remarks: The 3M production lot number was not noted. The test sample is FC-203FC, identified by the laboratory as R1335. Current information indicates it is a mixture of 0.85% PFOS, 17% diethylene glycol butyl ether, 74.46% water, 2.34% acrylic foamer, 1.7% alkyl ether sulfate, 2.55% sodium octyl sulfate, 0.12% sodium nitrite, 0.09% sodium molybdate, 0.85% triethanolamine, and 0.04% tolyltriazole.

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

METHOD:

Method: OECD Guideline 202

Type: Acute static

GLP: No

Year completed: 1997

Species: *Daphnia magna*

Supplier: In-house cultures, maintained at ASCL-DETD, Duluth, MN.

Analytical monitoring: Temperature, pH, conductivity, and dissolved oxygen.

Exposure period: 48-hours

Test organism age: <24 hours old

Statistical methods: EC₅₀ values calculated using the Trimmed Spearman-Kärber method. The NOEC was calculated using Steel's Many-One Rank test using Toxstat statistical software, Version 3.1.

Test conditions:

Dilution water: Dechlorinated City of Duluth, MN tap water, post-carbon filtered, aerated for 24 hours prior to use.

Dilution water chemistry:

Hardness: 44 mg/L as CaCO₃

Alkalinity: 42 mg/L as CaCO₃

Conductivity: 145 µmhos/cm

pH: 8.05

Lighting: Cool-white fluorescent lights. A daily photoperiod of 16 hours light and 8 hours dark was maintained throughout the testing period.

Stock and test solution preparation: A 1000 mg/L primary stock solution was prepared by dissolving 2.5 g test solution in 2.5 L dilution water.

Exposure concentrations were prepared by serial dilutions.

Exposure vessels: 250 mL beakers with 200 mL exposure solution.

Number of replicates: 4

Number of daphnids per replicate: 5

Number of concentrations: five plus a blank control

Water chemistry during the study:

pH range (0-48 hours):

7.93 – 8.05 (control exposure)

7.87 – 7.92 (1000 mg/L exposure)

Temperature range (0-48 hours): 20.4 – 20.5 °C

Conductivity range (0-48 hours):

145 – 161 µmhos/cm (control exposure)

159 – 159 µmhos/cm (1000 mg/L exposure)

Dissolved oxygen range (0-48 hours):

8.6 – 8.9 mg/L (control exposure)

8.7 – 9.0 mg/L (1000 mg/L exposure)

RESULTS

Nominal concentrations: Blank control, 130, 216, 360, 600, and 1000 mg/L.

Element values: 48-hour EC₅₀ = 653 (396-1077) mg/L

48-hour NOEC = 360 mg/L

Element values based on nominal concentrations.

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

CONCLUSIONS

The FC-203FC 48-hour EC₅₀ was determined to be 653 mg/L with a 95% confidence interval of 396 to 1077 mg/L. The test substance 48-hour No Observed Effect Concentration (NOEC) was 360 mg/L.

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

DATA QUALITY

Reliability: Klimisch ranking = 2. This study meets the criteria for quality testing. However, sample purity was not properly characterized and the study lacks analytical confirmation of the amount of fluorochemical proportion in solution.

REFERENCES

This test was conducted by AScl Corporation, Duluth Environmental Testing Division, Duluth, MN at the request of the 3M Company, Lab Request number R1335, 1997.

OTHER

Last changed: 6/26/00.

STUDY TITLE

ACUTE TOXICITY OF R1335 TO *DAPHNIA MAGNA*

DATA STANDARD

OECD GUIDELINE 202

STUDY COMPLETED

April 1, 1997

TESTING FACILITY

ASCI Corporation/ASCI-Duluth
Environmental Testing Division
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STUDY IDENTIFICATION NUMBERS

ASCI Study ID# 5010-068

3M Company Lab Request# R1335

1.0 GENERAL INFORMATION

Study Title	Acute Toxicity of R1335 to <i>Daphnia magna</i> .	
Data Standard	OECD Guideline 202.	
Sponsor	3M Environmental Technology and Safety Services, Building 2-3E-09, 935 Bush Avenue, St. Paul, MN 55133.	
Sponsor's Representative	Susan A. Beach, 3M Environmental Technology and Safety Services, Building 2-3E-09, 935 Bush Avenue, St. Paul, MN 55133. Tel No. (612) 778-7452.	
Sponsor's Lab Request#	R1335.	
Testing Facility	ASCI Corporation/ASCI-Duluth Environmental Testing Division, 4444 Airpark Boulevard, Duluth, MN 55811; Tel. No. (218) 722-4040.	
Principal Investigator	Tina Galloway.	
Project Director	Joe Amato.	
Testing Facility Director	Donald Mount.	
Definitive Test Dates	March 25-27, 1997.	
Data Validation and Report Review	Alan Mozol.	Report Signature: 
Retention of Raw Data and Final Report	Two years from the date study is completed.	
Location of Raw Data and Final Report	ASCI Corporation/ASCI-Duluth Environmental Testing Division, 4444 Airpark Boulevard, Duluth, MN 55811; Tel. No. (218) 722-4040.	

2.0 OBJECTIVE(S)

To determine the 48-h EC_{50} and 48-h NOEC (no observed effect concentration) of the test substance, R1335, for *Daphnia magna*.

This study was conducted according to the ASCI study plan retained by the Sponsor and OECD Guideline 202 (OECD 1993).

3.0 TEST METHODS

Test Substance	Properties: R1335, amber liquid, specific gravity 1.0 (water = 1), stable, and miscible with water. Test concentrations: 0 (dilution water control), 130, 216, 360, 600, and 1000 mg/L. High test concentration solution prepared by diluting 2.5 g of test substance in 2.5 L of dilution water. Lesser concentrations were prepared by direct addition of high concentration into dilution water. A 0.6 dilution series was utilized.
Test Organisms	Source: Healthy, less than 24-h old <i>Daphnia magna</i> neonates obtained from ASCI stock cultures maintained in water of test dilution water quality. Use in test: Gravid adults isolated in dilution water 24 h before the test initiation. Used 5 organisms/replicate and 4 replicates/test concentration. Handled with a smooth bore pipet with an inside diameter of 6 mm. Did not feed during the test.
Dilution Water	Source: Dechlorinated City of Duluth, MN, tap water. The most recent chemical analysis is in Raw Data Package. Characteristics: At test time, the water had a hardness of 44 mg/L (as $CaCO_3$) and a pH of 8.05. Aerated for 24 h prior to using in the test.
Exposure Chambers	Type: 250-ml borosilicate glass beakers. Use in test: 200 ml of dilution water or test solution/chamber. During the test, kept covered, except when experimental observations were made.

Incubation	<i>Duration:</i> 48 h. <i>Daily photoperiod:</i> 16 h light and 8 h dark, maintained using cool-white fluorescent bulbs. <i>Temperature:</i> 21°C.
Observations	<i>Biological:</i> Daily- gently agitated the exposure chambers and then counted immobilized and dead test organisms (immobilized organisms were those that did not swim within 15 seconds after exposure chambers were gently agitated). Did not remove any daphnids from the exposure chambers at 24 h. <i>Water chemistry:</i> (1) At test initiation- total hardness and alkalinity, (2) daily- temperature, pH, DO, and conductivity. All determinations were made according to APHA methods (1995).
Endpoint Calculations	<i>EC₅₀:</i> Trimmed Spearman-Kärber method. <i>NOEC:</i> Steel's Many-One Rank Test (TOXSTAT statistical software, Version 3.1, University of Wyoming).

3.0 RESULTS

Test Substance Toxicity (Pertinent data are in Table 1)	24-h EC_{50}: > 1000 mg/L (not calculable). 48-h EC_{50}: 653 mg/L (396-1077). 48-h NOEC: 360 mg/L.
Ranges of Water Chemistry Parameters	Total hardness (as $CaCO_3$ mg/L): 44-46. Alkalinity (as $CaCO_3$ mg/L): 42-46. Temperature ($^{\circ}C$): 20.4-20.5$^{\circ}C$. DO (mg/L): 8.6-9.0. pH: 7.76-8.05. Specific conductivity ($\mu mhos/cm$): 142-161.

4.0 TEST QA/QC

QA/QC Criteria	Data
Test organism dead, immobilized or trapped in control exposure must not be more than 10%.	0% dead, immobilized or trapped.
The lowest DO concentration at test termination must be at least 60% of the air saturation value at test temperature.	The lowest DO concentration measured was 97% of the air saturation value at 21.0 $^{\circ}C$.
Test duration must be 48 h.	The test duration was 48 h.
Reference substance toxicity test (this test is optional).	Current control chart for <i>D. magna</i> acute testing is included in the raw data package.

5.0 REFERENCES

- American Public Health Association (APHA). 1995. Standard Methods for the Examination of Water and Wastewater. APHA, Washington, D.C.
- Hamilton, M.A., R.C. Russo, and R.V. Thurston. 1977. Trimmed Spearman-Kärber Method for Estimating Median Lethal Concentrations in Toxicity Bioassays. Environ. Sci. Technol. 11(7):714-719; Correction 12(4):417 (1978).
- Organization for Economic Cooperation and Development (OECD). 1993. OECD Guidelines for Testing of Chemicals. OECD Publication Information Center, Washington, D.C.
- University of Wyoming. TOXSTAT Package Version 3.1.

TABLE 1. ACUTE TOXICITY OF R1335 TO *DAPHNIA MAGNA*

Test Substance Concentration (mg/L)	Cumulative Number and Percent of Dead and Immobilized Organisms*	
	24 h	48 h
0	0 (0)	0 (0)
130	0 (0)	0 (0)
216	0 (0)	0 (0)
360	0 (0)	1 (5)
600	2 (10)	10 (50)
1000	4 (20)	13 (65)

* Percentages are in parenthesis.

**EFFECT AND NO-EFFECT CONCENTRATIONS WITH
CORRESPONDING 95% CONFIDENCE INTERVALS**

EC ₅₀ and NOEC	Data (mg/L)	95% Confidence Interval
24-h EC ₅₀	> 1000	Not Calculable
48-h EC ₅₀	653	396-1077
48-h NOEC	360	Not Applicable