

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-201F.
(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 1. The test sample is FC-201F (F-11129). Current information indicates that FC-201F is a mixture of 3.0% PFOS, 36.0% diethylene glycol butyl ether, 36.6% water, 8.25% acrylic foamer, 7.0% sodium octyl sulfate, 6.0% sulfonated alkyl ether sodium salts, 3.0% triethanolamine, and 0.15% tolyl triazole.

The following summary applies to a mixture with incompletely characterized concentration 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: 1992

Species: *Daphnia magna*

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

Analytical monitoring: Temperature, pH, conductivity and DO

Exposure period: 48-hours

Test organism age: <24 hours old neonates

Statistical method: EC₅₀ calculated by Trimmed Spearman-Kärber method. NOEC calculated using Dunnett's procedure.

Test conditions:

Dilution water: Shallow well water from Two Harbors, MN.

Dilution water chemistry:

Hardness: 170 mg/L (as CaCO₃)

Alkalinity: 147 mg/L (as CaCO₃)

pH: 8.61

Lighting: Cool-white fluorescent lights providing a daily photoperiod of 16 hours light and 8 hours dark.

Stock and test solution preparation: A 1000 mg/L primary stock solution was prepared by dissolving 1000 mg FC-201F in one L of dilution water. Remaining concentrations prepared by serial dilutions of the stock solution.

Exposure vessels: 250-mL borosilicate glass beakers containing 200 mL test solution.

Number of replicates: four

Number of daphnids per replicate: 5

Number of concentrations: five plus a blank control

Water chemistry during the study:

Conductivity range: (0-48 hours)

330 – 349 μ mhos/cm (controls)

371 – 376 μ mhos/cm (1,000 mg/L exposure)

pH range (0-48 hours):

8.51 – 8.61 (controls)

8.47 – 8.48 (1,000 mg/L exposure)

Temperature range (0-48 hours):

20.4 – 20.6 °C (all exposures)

Dissolved oxygen range (0-48 hours):

7.5 – 8.0 mg/L (controls)

7.1 – 8.0 mg/L (1,000 mg/L exposure)

RESULTS

Nominal concentrations: Blank control, 62.5, 125, 250, 500, and 1000 mg/L

Element values: 24-hour EC_{50} = >1,000 mg/L
48-hour EC_{50} = 308 (272 - 348) mg/L
48-hour NOEC = 125 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-201F 48-hour EC_{50} was determined to be 308 mg/L with a 95% confidence Interval of 272 to 348 mg/L. The 48-hour No Observed Effect Concentration (NOEC) was 125 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, the sample purity was not properly characterized and

the study lacks analytical confirmation of the amount of fluorochemical proportion in solution.

REFERENCES

This study was conducted by AScl Corporation, Duluth Environmental Testing Division, Duluth, MN at the request of the 3M Company, Lab Request number K1792, 1992.

OTHER

Last changed: 6/26/00

STUDY TITLE

ACUTE TOXICITY OF FC-201F TO *DAPHNIA MAGNA*

DATA STANDARD

OECD GUIDELINE 202

STUDY COMPLETED

August 21, 1992

TESTING FACILITY

ASCI Corporation
ASCI-Duluth Environmental Testing Division
112 East Second Street
Duluth, MN 55805

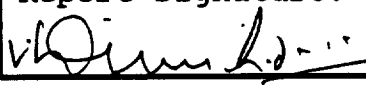
Tel. No. (218) 722-4040

STUDY IDENTIFICATION NUMBERS

ASCI Study ID# 5030-015-01

3M Company Lab Request# K1792

1.0 GENERAL INFORMATION

Study Title	Acute Toxicity of FC-201F to <i>Daphnia magna</i>	
Data Standard	OECD Guideline 202.	
Sponsor	3M Environmental Laboratory, Building 2-3E-09, 935 Bush Avenue, St. Paul, MN 55106.	
Sponsor's Representative	Susan A. Beach, 3M Environmental Laboratory, Building 2-3E-09, 935 Bush Avenue, St. Paul, MN 55106; Tel No. (612) 778-7452.	
Sponsor's Lab Request#	K1792.	
Testing Facility	ASCI Corporation/ASCI-Duluth Environmental Testing Division, 112 East Second Street, Duluth, MN 55805; Tel. No. (218) 722-4040.	
Principal Investigator	Dave Nessa	
Project Director	Dinesh Vaishnav	
Testing Facility Director	Donald Mount	
Definitive Test Dates	August 17-19, 1992.	
Data Validation and Report Review	Dinesh Vaishnav 8/21/92	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, 112 East Second Street, Duluth, MN 55805; Tel. No. (218) 722-4040.	

2.0 OBJECTIVE(S)

To determine the 48-h EC50 and 48-h NOEC (no observed effect concentration) of the test substance, FC-201F, for *Daphnia magna*.

This study was conducted according to the AScI study plan retained by the Sponsor and OECD Guideline 202 (OECD 1984).

3.0 TEST METHODS

Test Substance	Properties: FC-201F, orange/red liquid, relative density 1.1 (water = 1), stable, and miscible with water. Test concentrations: 0.0 (dilution water control), 62.5, 125, 250, 500, and 1,000 mg/L, prepared by a serial dilution of 1,000 mg/L stock solution. Throughout the test, all test solutions appeared clear with a persistent foam at the surface.
Test Organisms	Source: Healthy, less than 24-h old <i>Daphnia magna</i> neonates obtained from AScI stock culture. 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: Shallow well water from the Two Harbors, Minnesota area. The most recent chemical analysis is in Raw Data Package. Characteristics: At test time, a hardness of 170 mg/L (as CaCO₃) and a pH of 8.61. 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	Duration: 48 h. Daily photoperiod: 16 h light and 8 h dark, maintained using cool white fluorescent lamps. Temperature: 20.4-20.6°C.
Observations	Biological: 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. Water chemistry: (1) At test initiation- total hardness and alkalinity, (2) daily- temperature, and (3) at test initiation and termination- DO, pH, and specific conductivity. All determinations were made according to APHA methods (1989).
Endpoint Calculations	EC50: Trimmed Spearman-Kärber method (Hamilton et. al. 1977). NOEC: Dunnett's procedure (TOXSTAT statistical software, Version 3.1, University of Wyoming 1989).

3.0 RESULTS

Test Substance Toxicity (Pertinent data are in Table 1)	24-h EC50: >1000 mg/L. 48-h EC50: 308 mg/L. 48-h NOEC: 125 mg/L.
Ranges of Water Chemistry Parameters	Total hardness (as CaCO ₃ , mg/L): 170-186.
	Alkalinity (as CaCO ₃ , mg/L): 147-152.
	Temperature (°C): 20.4-20.6°C
	DO (mg/L): 7.1-8.2.
	pH: 8.47-8.64.
	Specific conductivity (umhos/cm): 330-372.

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 80% of the air saturation value at 20.4°C.
Test duration must be 48 h.	The test duration was 48 h.
Reference substance toxicity test (this test is optional).	Final report for the most recent test with sodium chloride is in Raw Data Package.

5.0 REFERENCES

American Public Health Association (APHA). 1989. 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 concentration in toxicity bioassays. Environ. Sci. Technol. 11:714-719.

Organization for Economic Cooperation and Development (OECD). 1981/1984. OECD Guidelines for Testing of Chemicals. OECD Publication Information Center, Washington, D.C.

University of Wyoming. 1989. Toxstat Version 3.1. Fish Physiology and Toxicology Laboratory, Department of Zoology and Physiology. University of Wyoming, Laramie, WY.

Table 1. Acute toxicity of FC-201F to *D. magna*

Test substance nominal concn (mg/L)	Cumulative number and % of dead and immobilized organisms ^a	
	24 h	48 h
0.0	0 (0)	0 (0)
62.5	0 (0)	0 (0)
125	0 (0)	0 (0)
250	0 (0)	4 (20)
500	0 (0)	20 (100)
1000	4 (20)	20 (100)

^aPercentages are in parenthesis.

Effect and no-effect concentrations with
 corresponding 95% confidence intervals

EC50 and NOEC	Data (mg/L) ^b	95% Confidence interval
24-h EC50	>1000 mg/L	Not reliable
48-h EC50	308 mg/L	271.89-348.42
48-h NOEC	125 mg/L	Not applicable

^bEC50 values were calculated based on the test substance nominal concentration.