ACUTE TOXICITY TO FISH (FATHEAD MINNOW)

TEST SUBSTANCE

Identity: A mixture containing perfluorooctanesulfonate, may also be referred to as PFOS, FC-95, or as a component of FC-3072. (1-Octanesulfonic acid) (CAS # 2795-39-3).

Remarks: The 3M production lot number was not noted. The test sample is FC-3072. Current information indicates it is a mixture of 1.67% test substance, 33.33% diethylene glycol butyl ether, 29.23% water, 20.83% urea, 5% sodium octyl sulfate, 3.33% sulfonated alkyl ether sulfate salts, 4.60% acrylic foamer, 1.67% triethanolamine, and 0.33% tolyl triazole.

The following summary applies to the test sample as a mixture of the test substance in water solution with incompletely characterized concentrations of impurities. Data may not accurately relate toxicity of the test sample with that of the fluorochemical component.

METHOD:

Method: OECD Guideline 203
Type: Acute static
GLP: No
Year completed: 1995
Species: *Pimephales promelas*
Supplier: Environmental Consulting & Testing, Superior, WI.
Analytical monitoring: Temperature, pH, conductivity, and dissolved oxygen.
Exposure period: 96-hours
Statistical methods: LC_{50} values were calculated using the Trimmed Spearman-Karber Method and the U.S. EPA Computer Program for the Probit Method, Version 1.4.
Test fish age: Juveniles
Length and weight: Average length = 25.6 mm
Average weight = 0.139 g (wet)
Loading: 0.77 g/L
Pretreatment: None.
Test conditions:
Dilution water: Dechlorinated City of Duluth, MN tap water, post-carbon filter.
Dilution water chemistry:
Hardness: 47 mg/L as $CaCO_3$
Alkalinity: 45 mg/L as $CaCO_3$
pH: 7.96

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: The test material was added directly to the dilution water on a weight/volume basis.
Concentrations dosing rate: Once.
Stability of the test chemical solutions: Not noted.
Exposure vessels: 2 L glass beakers containing 1.8 L test solution.
Number of replicates: 2
Number of fish per replicate: 10
Number of concentrations: one plus a blank control
Water chemistry during the study:

pH range (0-96 hours):

7.61 – 7.96 (control exposure)
7.25 – 7.81 (1000 mg/L exposure)

Temperature range (0-96 hours): 20.0 – 20.4 °C

Conductivity range (0-96 hours):

116 – 123 µmhos/cm (control exposure)
125 – 175 µmhos/cm (1000 mg/L exposure)

Dissolved oxygen range (0-96 hours):

6.2 – 8.8 mg/L (control exposure)
4.7 – 8.8 mg/L (1000 mg/L exposure)

RESULTS

Nominal concentrations: Blank control and 1000 mg/L

Element values: 96-hour LC_{50} = >1000 mg/L
96-hour NOEC = 1000 mg/L

Element values based on nominal concentrations

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

CONCLUSIONS

The test sample 96-hour LC_{50} for fathead minnow was determined to be >1000 mg/L, the highest concentration tested. No mortality was observed.

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

DATA QUALITY

Reliability: Klimisch ranking 2. Testing 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 the solution.

REFERENCES

Test was conducted by AScI Corporation, AScI-Duluth Environmental Testing Division, of Duluth, MN at the request of the 3M Company, Lab Request number M3597, 1995.

OTHER

Last changed: 6/25/00

STUDY TITLE

ACUTE TOXICITY OF FC-3072 TO
FATHEAD MINNOW (*PIMEPHALES PROMELAS*)

DATA STANDARD

OECD GUIDELINE 203

STUDY COMPLETED

March 20, 1995

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# 5010-068

3M Company Lab Request# M3597

1.0 GENERAL INFORMATION

Study Title	Acute Toxicity of FC-3072 to Fathead Minnow (*Pimephales promelas*)	
Data Standard	OECD Guideline 203.	
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#	M3597.	
Testing Facility	AScI Corporation/AScI-Duluth Environmental Testing Division, 112 East Second Street, Duluth, MN 55805; Tel. No. (218) 722-4040.	
Principal Investigator	Joseph Dierkes	
Project Director	Joe Amato	
Testing Facility Director	Donald Mount	
Definitive Test Dates	March 13-17, 1995.	
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, 112 East Second Street, Duluth, MN 55805; Tel. No. (218) 722-4040.	

2.0 OBJECTIVE(S)

To determine the 96-h LC50 and 96-h NOEC (no observed effect concentration) of the test substance, FC-3072, for fathead minnow (*Pimephales promelas*) under static test conditions.

This study was conducted according to the ASci study plan retained by the Sponsor and OECD Guideline 203 (OECD 1984).

3.0 TEST METHODS

Test Substance	*Properties*: FC-3072, amber colored liquid, specific gravity = 1.1 (water = 1), stable, and soluble in water. *Test concentrations*: 0.0 (dilution water control) and 1,000 mg/L. Test solutions prepared by direct addition to each replicate test chamber.
Test Organisms	*Source*: Healthy, juvenile fathead minnows (*Pimephales promelas*) obtained from a commercial supplier. *Holding/acclimation:* Held and acclimated for 12 days in the test dilution water. 0% mortality occurred during holding/acclimation period. At test termination, they were 2.2-3.0 cm in length and 0.108-0.193 g in weight with a mean of 0.139 g. *Use in test*: Did not feed 24 h before test initiation. Used 10 organisms/replicate and 2 replicates/test concentration.

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 47 mg/L (as $CaCO_3$) and a pH of 7.96. Aerated for more than 24 h prior to using in the test.
Exposure Chambers	*Type*: Pyrex® 2-L glass beakers. *Use in test*: 1.8 L of dilution water or test solution/chamber. During the test, kept covered, except when experimental observations were made. Solutions were not aerated during the exposures.
Incubation	*Duration*: 96 h. *Daily photoperiod*: 16 h light and 8 h dark, maintained using cool white fluorescent lamps. *Temperature*: 20.0°C.
Observations	*Biological*: Daily- Test organisms with abnormal behavior and signs of stress, and dead test organisms. *Water chemistry*: (1) At test initiation- total hardness and alkalinity, (2) daily- temperature, DO, and pH, and specific conductivity. All determinations were made according to APHA methods (1989).
Endpoint Calculations	24-, 48-, 72-, and 96-h median lethal concentrations (LC50's), and 96-h no observable effect concentration (NOEC)

3.0 RESULTS

Test Substance Toxicity (Pertinent data are in Table 1)	*24-h LC50*: >1000 mg/L. *48-h LC50*: >1000 mg/L. *72-h LC50*: >1000 mg/L. *96-h LC50*: >1000 mg/L. *96-h NOEC*: 1000 mg/L.
Ranges of Water Chemistry Parameters	*Total hardness (as $CaCO_3$ mg/L)*: 47.
	Alkalinity (as $CaCO_3$ mg/L): 45.
	Temperature (°C): 20.0-20.4.
	DO (mg/L): 4.7-8.8.
	pH: 7.25-7.96.
	Specific conductivity (µmhos/cm): 116-175.

4.0 TEST QA/QC

QA/QC Criteria	Data
Mortality in control exposure must not be more than 10%.	0% mortality.
The lowest DO concentration at test termination must be at least 60% of the air saturation value at test temperature.	The lowest DO concentration was 52% of the air saturation value at 20.0°C. Although the DO concentration was below 60% saturation in the 1000 mg/L test concentration, the test appears valid due to the lack of effect.
Test duration must be 96 h.	The test duration was 96 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.

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

Hamilton, M.A., R.C. Russo, and R.V. Thurston, 1977. Trimmed Spearman-Karber Method for Estimating Median Lethal Concentrations in Toxicity Bioassays. Environ. Sci. Technol. 11(7): 714-719; Correction 12 (4): 417 (1978).

US EPA EMSL Cincinnati, Ohio. Computer Program for the Probit Method, LC50 Estimate and 95% Confidence Interval. Version 1.4.

Table 1. Acute toxicity of FC-3072 to fathead minnow (*P. promelas*)

Test substance nominal concn (mg/L)	Cumulative number of dead organisms and % mortality[a]			
	24 h	48 h	72 h	96 h
0.0 (control)	0 (0)	0 (0)	0 (0)	0 (0)
1000	0 (0)	0 (0)	0 (0)	0 (0)

[a]Percentages are in parenthesis.

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

LC50 and NOEC	Data (mg/L)	95% Confidence interval
24-h LC50	>1000	Not calculable
48-h LC50	>1000	Not calculable
72-h LC50	>1000	Not calculable
96-h LC50	>1000	Not calculable
96-h NOEC	1000	Not applicable