

ACUTE TOXICITY TO FISH (FATHEAD MINNOW)

TEST SUBSTANCE

Identity: A mixture containing perfluorooctanesulfonate, which may also be referred to as PFOS, FC-95 or as a component of FC-201AF. (1-Octanesulfonic acid) (CAS # 2795-39-3).

Remarks: The 3M production lot number was not noted. The test sample is FC-201AF. Current information indicates it is a mixture of 3% PFOS, 18.59% diethylene glycol butyl ether, 37.81% water, 14% ethylene glycol, 8.25% Acrylic foamer, 9% sodium octyl sulfate, 0.3% sodium lauryl sulfate, 3% triethanolamine, 6% sulfonated alkyl ether salts, and 0.05% tolyltriazole.

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

METHOD:

Method: OECD Guideline 203

Type: Acute static-renewal

GLP: No

Year completed: 1995

Species: *Pimephales promelas*

Supplier: Aquatic Biosystems, Inc., Fort Collins, CO.

Analytical monitoring: Temperature, pH, and dissolved oxygen.

Exposure period: 96-hours

Statistical methods: LC₅₀ values were calculated by the Trimmed Spearman Karber method using the EPA Probit Analysis Program, Version 1.5.

Test fish age: Juveniles (~89-90 days)

Length and weight: Average length = 25 mm
Average weight = 0.109 g (wet)

Loading: 0.607 g/L

Pretreatment: None.

Test conditions:

Dilution water: Carbon-filtered well water (3M #2, St. Paul, MN)

Dilution water chemistry: Not given.

Lighting: Not given.

Stock and test solution preparation: The test material was added directly to the dilution water on a weight/volume basis.

Concentrations dosing rate: Daily solution renewal during the study.

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: five plus a blank control

Water chemistry during the study:

pH range (0-96 hours):

8.0 – 8.4 (control exposure)

7.9 – 8.3 (320 mg/L exposure)*

Temperature range (0-96 hours): 17.6 – 19.8 °C

Dissolved oxygen range (0-96 hours):

6.1 – 8.5 mg/L (control exposure)

2.1 – 8.5 mg/L (320 mg/L exposure)*

* 320 mg/L (intermediate concentration) exposure values used because the highest two concentrations resulted in total mortality by 24 hours.

RESULTS

Nominal concentrations: Blank control, 100, 180, 320, 560, and 1000 mg/L

Element values: 96-hour LC₅₀ = 310 (270 – 370) mg/L

Element values based on nominal concentrations

Remarks: Testing was conducted on a mixture 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 LC₅₀ for fathead minnow was determined to be 310 mg/L with a 95% confidence interval of 270 to 370 mg/L.

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

This study was conducted by the 3M Company, Environmental Laboratory, St. Paul, MN, Lab Request number N2964, 1995.

OTHER

Last changed: 6/2600

Lab Request No. 02904Page 1 of 5Date: 10/18/95Analyst: CW

Environmental Lab — Work Sheet

Sample Description

96-Hour Acute Toxicity to Fathead Minnow, *Pimephales notatus*

Test Type: Static Renewal

Test Substance: FC-201AF

Test Preparation Procedure [Monday 10/16/95] Added the following concentrations to individual beakers filled to the 1.8L mark with preconditioned carbon filtered well water mixed well with glass rod

A) Conc. mL/L	Conc. mg/L	1.8L	Atb. All conc. were made independently
100	180		
180	320		
320	560		
560	1000		
1000	1800		

Fathead minnows were then placed in each beaker. Beakers were then put into an environmental chamber.

[Tuesday 10/17/95] D.O. in all beakers were $< 60\%$ of the air-saturation value. Fresh preconditioned carbon filtered well water was added to fresh beakers to the mark of 1.8L before adding sample. Sample concentrations were the same as listed in Table A above. Note: only sample concentration of 100, 180, 320 mg/L were renewed due to the fact that all the fish died in the 560 and 1000 mg/L concentrations.

Dilution H₂O: Temp 20.5°C, pH 8.3, D.O. 8.6 mg/L.

[Wednesday 10/18/95] Repeated same procedure of renewal as was done on Tuesday 10/17/95.

Dilution H₂O: Temp 18.1°C, pH 8.4, D.O. 8.4 mg/L.

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LR N2964/NaCl Ref. Test
Date 10/20/95

Environmental Laboratory

96-Hour Acute Toxicity To Fathead Minnow, *Pimephales Promelas*

Loading Rate Data Sheet

Test Substance: FC-201AF/NaCl Reference Substance

Minnow #	Weight, (g)	Length, (cm)
1	0.1008	2.7
2	0.1336	2.7
3	0.1281	2.5
4	0.0976	2.6
5	0.1149	2.5
6	0.0849	2.4
7	0.1230	2.5
8	0.0769	2.4
9	0.0904	2.5
10	0.1352	2.6
Mean Avg.	0.1093 ± 0.023	2.5 ± 0.1

Loading Rate Calculation:

Mean Avg. wt., (g) 0.1093 x 10 = 1.093 g.

(n) g/1.0L = $\frac{1.093}{10/20/95 \text{ avg}}$ 0.1093 g/1.8L

(n) g = 0.607

Loading Rate = 0.607 g/L.

Environmental Lab — Work Sheet

Lab Request No N2964Page 2 of 5Date: 10/19/95

Sample Description

96-hr Acute Toxicity to Fathead
Minnow, *Pimephales promelas*.Analyst: GWJ

Thursday 10/19/95 Repeated same renewal procedure as
was done on Tuesday 10/17/95 and Wednesday 10/18/95
Dilution H₂O: Temp 19.4°C, pH 8.5, DO 8.5 mg/L.

GWJ 10/19/95

LR Pg 4 of 5
N2964

TYPE TEST: STATIC X STATIC RENEWAL

DILUTION WATER: CARBON-FILTERED WELL WATER (3M WELL #2, ST. PAUL, MN)
Temp. 19.6 °C, pH 8.3, D.O. 8.5 mg/L

TEST FISH SOURCE: Aquatic BioSystems, Inc. DATE RECEIVED: 9/12/95
Fort Collins, CO

FISH AGE: 59-90 days AVG. WT.: 0.1197 ± 0.023 g AVG. SIZE: 2.5 ± 0.1 cm

NO. OF FISH/TEST CHAMBER: 10 LOADING RATE: 0.6-07g/l

TEST SOLUTION VOLUME: 1.8 L SIZE OF TEST VESSELS: 2.0 L

DATE INITIATED: 10/16/95 (12 00 AM EDT) DATE TERMINATED: 10/26/95

		Read @ 2°C Pm			Read @ 3°C Pm			Read @ 3°C Pm			Read @ 2°C Pm			
TEST VESSEL	INITIAL CONC. g/L	TOTAL AMOUNT ADDED*	MORTALITY											
			24-HR	pH	D.O. mg/L	48-HR	pH	D.O. mg/L	72-HR	pH	D.O. mg/L	96-HR	pH	D.O. mg/L
BK1	CONTROL	-	0	8.1	7.1	0	8.2	6.7	0	8.4	7.0	1	8.1	7.0
BK2	CONTROL	-	0	8.0	6.7	0	8.2	6.1	0	8.3	6.4	1	8.2	6.6
1-A	7.5	13.5	0	8.1	6.4	15'	8.1	6.7	2	8.2	7.0	25'	8.1	6.7
2-A	7.5	13.5	0	8.1	6.7	-	8.1	6.7	-	8.2	7.0	2	8.2	6.0
1-B	8.7	15.66	0	8.1	7.1	0	8.2	6.1	2	8.3	7.3	8	8.2	7.7
2-B	8.7	15.66	1	8.1	6.6	20	8.1	6.0	2	8.2	6.0	5	8.2	7.0
1-C	10	18	2	8.1	6.7	2	8.1	6.3	2	8.2	6.6	5	8.1	7.2
2-C	10	18	6	8.2	7.5	20	8.2	6.0	4	8.2	7.4	10	8.3	8.3
1-D	11.5	20.7	10	8.2	6.7	10	-	-	10	-	-	10	-	-
2-D	11.5	20.7	9	8.1	6.7	10	8.2	6.7	10	-	-	10	-	-
1-E	13.5	24.3	10	8.0	5.3	10	-	-	10	-	-	10	-	-
2-E	13.5	24.3	10	7.8	2.7	10	-	-	10	-	-	10	-	-

LC50 (95% C.I.) g/L

COMMENTS: g: Individual weights. Initial pH of highest concentration tested, 10000 µg/L, pH = 8.3.

SECONDARY EFFECTS: S = Surfacing; E = Loss of Equilibrium; Q = Quiescent; R = Erratic Swimming; H = Hemorrhaging

ANALYSTS: [REDACTED]

ENVIRONMENTAL LABORATORY

LR N2964

96-HR ACUTE TOXICITY TO FATHEAD MINNOW, *PIMEPHALES PROMELAS*TYPE TEST: STATIC ~~X~~ STATIC RENEWAL X

TEST SUBSTANCE: FC-201AF

DILUTION WATER: CARBON-FILTERED WELL WATER (3M WELL #2, ST. PAUL, MN)

Temp. 19.1 °C, pH 8.5, D.O. 8.5 mg/L

TEST FISH SOURCE: AQUATIC BIOSYSTEMS, INC. DATE RECEIVED: 9/16/95
FORT COLLINS, CO.

FISH AGE: 59-90 days AVG. WT: 0.193 ± 0.023 g AVG. SIZE: 2.5 ± 0.1 cm

NO. OF FISH/TEST CHAMBER: 10 LOADING RATE: 0.07 g/L

TEST SOLUTION VOLUME: 1.8 L SIZE OF TEST VESSELS: 20 L BEAKER

DATE INITIATED: 10/16/95 (12:00 noon) DATE TERMINATED: 10/20/95 (4 pm)

TEST VESSEL	INITIAL CONC. mg/L	TOTAL AMOUNT ADDED*	24-HR pH	24-HR D.O. mg/L	48-HR pH	48-HR D.O. mg/L	72-HR pH	72-HR D.O. mg/L	96-HR pH	96-HR D.O. mg/L
BK1	CONTROL	-	8.1	7.1	8.2	6.7	8.4	7.4	8.1	7.6
BK2	CONTROL	-	8.6	8.3	8.2	6.1	8.3	6.4	8.2	6.6
1-A	100	180	8.6	7.7	8.9	5.2	8.4	6.0	8.3	5.3
2-A	100	180	8.6	7.7	8.6	4.6	8.4	5.5	8.3	5.5
1-B	180	320	8.6	7.8	8.6	4.4	8.3	5.0	8.2	5.1
2-B	180	320	8.6	7.1	8.3	7.4	8.2	4.4	8.2	4.6
1-C	320	580	8.6	7.7	8.0	7.1	8.3	4.6	8.2	4.3
2-C	320	580	7.9	7.3	8.6	7.7	8.2	2.9	8.2	2.1
1-D	560	1000	7.9	6.2	-	-	-	-	-	-
2-D	560	1000	7.8	6.3	-	-	-	-	-	-
1-E	1000	1800	7.9	6.2	-	-	-	-	-	-
2-E	1000	1800	7.9	6.2	-	-	-	-	-	-

TEMP. °C: 19.3, 18.7, 17.6, 17.8
DATE: 10/17/95, 10/18/95, 10/19/95, 10/20/95
ANALYST: GWS

LC50 (95% C.I.): 410 (390-435) mg/L, 350 (365-395) mg/L, 345 (300-400) mg/L, 310 (270-370) mg/L

COMMENTS: *INDIVIDUAL WEIGHTS, mg/L. Initial pH of highest concentration tested 1000 mg/L, pH=8.3. After ~4 hr all the fish in the 1000 mg/L and 560 mg/L concs were dead and floating on the surface.

SECONDARY EFFECTS: S = Surfacing; E = Loss of Equilibrium; O = Opaque; R = Erratic Swimming; H = Hemorrhaging

ANALYST: SCS

Trimmed Spearman-Kärber