

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-206A. (1-Octanesulfonic acid) (CAS # 2795-39-3).

Remarks: The 3M production lot number was cc 785-22. The test sample is FC-206A. Current information indicates it is a mixture of 0.92% PFOS, 18.75% diethylene glycol butyl ether, 75.44% water, 1.83% Hydroxy foamer, 1.75% sodium octyl sulfate, 1.2% poloxyethylene monooctylphenyl ether, 0.06% sodium lauryl sulfate, and 0.05% benzotriazole.

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: Not given.

Type: Acute static

GLP: No

Year completed: 1979

Species: *Pimephales promelas*

Supplier: Commercial supplier in Brady, NE

Analytical monitoring: Temperature, pH, and dissolved oxygen.

Exposure period: 96-hours

Statistical methods: LC₅₀ values calculated using probit computer program.

Test fish age: Juveniles

Length and weight: Average length = 41 mm
Average weight = 0.64 g (wet)

Loading: 0.64 g/L

Pretreatment: None.

Test conditions:

Dilution water: Carbon filtered well water

Dilution water chemistry:

Hardness: 236 mg/L as CaCO₃

Alkalinity: 221 mg/L as CaCO₃

Conductivity: 430 µmhos/cm

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: Once

Stability of the test chemical solutions: Not noted.

Exposure vessels: Glass tanks (36x21x24 cm) containing 16 L of test solution.

Number of replicates: 2

Number of fish per replicate: 16

Number of concentrations: five plus a blank control

Water chemistry during the study:

pH range (0-96 hours):

7.9 – 8.0 (control exposure)

7.6 – 8.0 (1350 mg/L exposure)

Temperature range (0-96 hours): 20 – 20 °C

Dissolved oxygen range (0-96 hours):

5 – 9.1 mg/L (control exposure)

0.9 – 9.1 mg/L (1350 mg/L exposure)

Remarks: Fish were surfacing in all exposure concentrations, except the control, throughout the study. The dissolved oxygen was below 60% saturation in the exposure concentrations by 24 hours, and remained low for the duration of the study.

RESULTS

Nominal concentrations: Blank control, 420, 560, 750, 1000, and 1350 mg/L.

Element values: 96-hour LC_{50} = 1303 (1094 – 1930) mg/L (Replicate 1)
96-hour LC_{50} = 1228 (1098 – 1485) mg/L (Replicate 2)

Element values based on nominal concentration.

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 LC_{50} for fathead minnow was determined to be 1303 mg/L with a 95% confidence interval of 1094 to 1930 mg/L for one replicate, and 1228 mg/L with a 95% confidence interval of 1098 to 1485 mg/L for the other replicate.

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

DATA QUALITY

Reliability: Klimisch ranking 3. Testing lacks record of methodology used. There is a lack of characterization of the test sample 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 4970S, 1979.

OTHER

Last changed: 6/26/00

**ENVIRONMENTAL LABORATORY
AQUATIC TOXICITY DATA SHEET**

LR 49705

Type Test Acute 96-Hour Static Material Tested FC-206 A Lot 285-22
 Test Organism Fathead minnow Source Brady, Nel. Date Rec'd. 6-7-79 Batch No. 8
 Avg. Wt. .64 ± .2 grams Avg. Size 4.1 ± .4 cm No. Organisms per dose 16
 Test Solution Volume 16 Liters/All-Glass Tank Tank Dimensions: 36x21 cm and 24 cm deep
 Time Started 2:00 pm Date Started 7-10-79 Date Completed 7-14-79
 Dilution Water Carbon-filtered well water (Temp. 20 °C, D.O. 9.1 ppm, pH 8.1)
 Investigator M. S. Chasany LC₅₀ (95% Confidence Limits) 1303 1094 1350
 (Full Signature)

Tank No.	Init. Conc. mg/l	Total Amount Added	24 Hours			48 Hours			72 Hours			96 Hours		
			Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm
	Control	<u>—</u>	0	8.0	6.9	0	8.0	6.5	0	8.0	5.9	0	8.0	5.5
1-B	420	6,720	0	7.6	3.5	0	7.6	3.6	0	7.6	2.5	0	7.6	2.2
2	560	8,960	0	7.6	2.8	0	7.6	2.5	1	7.6	2.2	1	7.6	2.1
3	750	12,000	0	7.6	2.4	2	7.6	2.0	2	7.6	1.5	2	7.6	1.1
4	1,000	16,000	0	7.6	2.4	2	7.6	1.5	2	7.6	1.2	2	7.6	1.1
5	1,350	21,600	0	7.6	1.0	9	7.6	1.0	10	7.6	.9	10	7.6	.5
Test Temp. °C.			20 °C			20 °C			20 °C			20 °C		
Signature & Date			M. S. Chasany 7-11-79			M. S. Chasany 7-12-79			M. S. Chasany 7-13-79			M. S. Chasany 7-14-79		

Comments: _____

Effects other than Mortality

EC₅₀ _____

Init. Conc. mg/l	Symptoms or Reactions	Total No. Affected			
		24-Hr.	48 Hr.	72-Hr.	96-Hr.
Control		None	None	None	None
Signature & Date					

Comments: _____

**ENVIRONMENTAL LABORATORY
AQUATIC TOXICITY DATA SHEET**

LR 4970 S

Type Test Acute 96-hour Static Material Tested FC-206 A CC 785-22
 Test Organism Fathead minnow Source Brady, Neb. Date Rec'd. 6-7-79 Batch No. 8
 Avg. Wt. .64 ± .2 grams Avg. Size 4.1 ^{±.4} cm No. Organisms per dose 16
 Test Solution Volume 16 Liters/All-Glass Tank Tank Dimensions: 36x21 cm and 24 cm deep
 Time Started 2:00 PM Date Started 7-10-79 Date Completed 7-14-79
 Dilution Water Carbon-filtered well water (Temp. 20 °C., D.O. 9.1 ppm, pH 8.0)
 Investigator M. J. MacSweeney LC₅₀ (95% Confidence Limits) 122.5 ¹⁰⁹⁸ ₁₄₈₅
 (Full Signature)

Tank No.	Init. Conc. mg/l	Total Amount Added	24 Hours			48 Hours			72 Hours			96 Hours		
			Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm
	Control	<u>ml</u>	0	8.0	7.2	0	7.9	6.8	0	8.0	6.2	0	8.0	5.5
1-C	420	6,720	0	7.6	4.6	0	7.5	5.5	0	7.6	2.9	0	7.6	2
2	560	8,960	0	7.5	3.7	0	7.6	3.2	0	7.6	2.5	0	7.6	2
3	750	12,000	0	7.6	3.7	1	7.6	3.0	1	7.6	2.2	1	7.6	1
4	1,000	16,000	0	7.6	3.5	2	7.6	3.0	2	7.6	2.0	2	7.6	1
5	1,350	21,600	0	7.6	2.5	11	7.6	1.9	11	7.6	1.0	11	7.6	1
Test Temp. °C.			20°C			20°C			20°C			20°C		
Signature & Date			M. J. MacSweeney 7-10-79			M. J. MacSweeney 7-12-79			M. J. MacSweeney 7-13-79			M. J. MacSweeney 7-14-79		

Comments: _____

Effects other than Mortality

EC₅₀ _____

Init. Conc. mg/l	Symptoms or Reactions	Total No. Affected			
		24-Hr.	48 Hr.	72-Hr.	96-Hr.
Control		None	None	None	None
Signature & Date					

Comments: _____

3M ENVIRONMENTAL LABORATORY

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PROBIT ANALYSIS FOR BIODASSAY DATA

NO. OF CURVES: 2 4
NO. OF CONC. FOR CURVE 1: 2 4
INPUT DATA-CONC., NO. EXPOSED, NO. DEAD
? 560*16*0
? 750*16*1
? 1000*16*2
? 1350*16*11

COMMENTS FOR CURVE 1

? FC 206A FISH

LOG	FRACTION	FITTED
CONC.	CONC.	RESPONDING FRACTION
560	2.748188	0.001130384
750	2.875061	0.0625
1000	3	0.2119692
1350	3.130334	0.6875

CHI-SQ PROBABILITY IS > 0.05

NO. OF ITERATIONS	INTERCEPT (A)	SLOPE (B)	CHI-SQ FOR LINEARITY	CHI-SQ FOR PROBABILITY
6	-27.65447	9.951618	1.608148	0.447502

HETEROGENEITY FACTOR (H) = 1 G = 0.2756303

LC-50 = 1228.363

95 PCT. LOWER CONF. LIMIT = 1098.326
95 PCT. UPPER CONF. LIMIT = 1485.013

NO. OF CONC. FOR CURVE 2: 2 5
INPUT DATA-CONC., NO. EXPOSED, NO. DEAD

LOG	FRACTION	FITTED
CONC.	CONC.	RESPONDING FRACTION
420	2.623249	0.005238648
560	2.748188	0.0625
750	2.875061	0.125
1000	3	0.2749594
1350	3.130334	0.625

COMMENTS FOR CURVE 2

? FC 206A FISH

LOG	FRACTION	FITTED
CONC.	CONC.	RESPONDING FRACTION
420	2.623249	0.005238648
560	2.748188	0.0625
750	2.875061	0.125
1000	3	0.2749594
1350	3.130334	0.625

CHI-SQ PROBABILITY IS > 0.05

NO. OF ITERATIONS	INTERCEPT (A)	SLOPE (B)	CHI-SQ FOR LINEARITY	CHI-SQ FOR PROBABILITY
5	-16.21943	5.207192	3.195752	0.3624176

HETEROGENEITY FACTOR (H) = 1 G = 0.2767633

LC-50 = 1302.605

95 PCT. LOWER CONF. LIMIT = 1094.272
95 PCT. UPPER CONF. LIMIT = 1929.568

NO. OF CONC. FOR CURVE 3: 2 3
INPUT DATA-CONC., NO. EXPOSED, NO. DEAD

LOG	FRACTION	FITTED
CONC.	CONC.	RESPONDING FRACTION
1000	3	0.001701208
1350	3.130334	0.05
1800	3.255273	0.3

COMMENTS FOR CURVE 3

? DAPHNIA FC 206A

LOG	FRACTION	FITTED
CONC.	CONC.	RESPONDING FRACTION
1000	3	0.001701208
1350	3.130334	0.05
1800	3.255273	0.3

CHI-SQ PROBABILITY IS > 0.05

NO. OF ITERATIONS	INTERCEPT (A)	SLOPE (B)	CHI-SQ FOR LINEARITY	CHI-SQ FOR PROBABILITY
6	-31.30478	9.458595	0.04704249	0.8282919

HETEROGENEITY FACTOR (H) = 1 G = 0.6615563

LC-50 = 2040.161

95 PCT. LOWER CONF. LIMIT = 1792.836
95 PCT. UPPER CONF. LIMIT = 5364.881

NO. OF CONC. FOR CURVE 4: 2 3

LOG	FRACTION	FITTED
CONC.	CONC.	RESPONDING FRACTION
1000	3	0.002415658
1350	3.130334	0.05
1800	3.255273	0.25

COMMENTS FOR CURVE 4

? DAPHNIA FC 206A

LOG	FRACTION	FITTED
CONC.	CONC.	RESPONDING FRACTION
1000	3	0.002415658
1350	3.130334	0.05
1800	3.255273	0.25

CHI-SQ PROBABILITY IS > 0.05

NO. OF ITERATIONS	INTERCEPT (A)	SLOPE (B)	CHI-SQ FOR LINEARITY	CHI-SQ FOR PROBABILITY
4	-28.18185	8.45457	0.07407743	0.78549

HETEROGENEITY FACTOR (H) = 1 G = 0.7854512

LC-50 = 2154.405

95 PCT. LOWER CONF. LIMIT = 1824.618
95 PCT. UPPER CONF. LIMIT = 18864.85

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LR 49705

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PROBATION ANALYSIS FOR BIOASSAY DATA

NO. OF CURVES = 1

NO. OF CONC. FOR CURVE 1 = 3

INPUT DATA CONC., NO. EXPOSED, NO. DEAD

1000, 20, 4

1350, 20, 13

1800, 20, 20

COMMENTS FOR CURVE 1

96 HR LC-50 FC-206A BLUEGILL STATIC

LOG CONC.	FRACTION RESPONDING	FITTED FRACTION
3	0.2	0.1712226
3.130334	0.65	0.7132899
3.255273	1	0.9779314

CHI-SQ PROBABILITY IS > 0.05

NO. OF ITERATIONS	INTERCEPT (A)	SLOPE (B)	CHI-SQ FOR LINEARITY	CHI-SQ FOR PROBABILITY
5	-35.76147	11.60403	0.9602308	0.3271287

HETEROGENIETY FACTOR (H) = 1

LC-50 = 1207.296

PCT. LOWER CONF. LIMIT =

PCT. UPPER CONF. LIMIT =

1097.271

1314.239

NO. OF CONC. FOR CURVE 2 = 3

INPUT DATA CONC., NO. EXPOSED, NO. DEAD

1000, 40, 0

1350, 40, 1

1800, 40, 11

COMMENTS FOR CURVE 2

96 HR EC-50 FC-206A DAPHNIA STATIC

LOG CONC.	FRACTION RESPONDING	FITTED FRACTION
3	0	0.0003153147
3.130334	0.025	0.0240186
3.255273	0.275	0.2757216

CHI-SQ PROBABILITY IS > 0.05

NO. OF ITERATIONS	INTERCEPT (A)	SLOPE (B)	CHI-SQ FOR LINEARITY	CHI-SQ FOR PROBABILITY
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5 35.76147 11.60403 0.9602308 0.3271287

LC-50 = 1207.296

NO. OF CONC. FOR CURVE 3 IS
IN DATA CONC. NO. EXPOSED NO. DEAD

420, 32, 0
560, 32, 1
750, 32, 3
1000, 32, 4
1350, 32, 21

COMMENTS FOR CURVE 3

7-96-HR LC-50-FC-206A FATHEAD STATIC

CONC.	LOG CONC.	FRACTION RESPONDING	FITTED FRACTION
420	2.623249	0	0.001051011
560	2.748188	0.03125	0.01155297
750	2.875061	0.09375	0.0727705
1000	3	0.125	0.2572989
1350	3.130334	0.65625	0.5740839

CHI-SQ PROBABILITY IS > 0.05

NO OF ITERATIONS	INTERCEPT (A)	SLOPE (B)	CHI-SQ FOR LINEARITY	CHI-SQ FOR PROBABILITY
6	-19.95153	6.43328	5.144122	0.1615429

HETEROGENEITY FACTOR (H) = 1

G = 0.1346302

LC-50 = 1262.701

95 PCT. LOWER CONF. LIMIT =

1136.175

95 PCT. UPPER CONF. LIMIT =

1493.742

RUN TIME: 1.226 SECS ELAPSED TIME: 0:07:51

READY
MONITOR
CLOSE

KILLED JOB 26, USER R49.003, ACCOUNT EAR, TTY 42,
AT 28-DEC-79 09:11:10, USED 0:0:18 IN 0:29:51

XPOR

LAB REQUEST NO. 4382 (STANDING)

AM

DATE

SHEET

ATTACHMENT #1

YSIS FORM

SAMPLE DESCRIPTION:
CARBON FILTERED WELL
H₂O - BIOASSAY ROOM

	PH	TOTAL CL ₂ RESIDUAL	C.O.D.	CONDUCTIVITY µmhos/cm	M-ALK.	P-ALK.	TOTAL SOLIDS	TOTAL HARDNESS	AMMONIA
7-18-78	7.8	-	<1	430	221	0	287	236	<0.1
7-25-78	7.7	-	<1	440	219	0	288	236	<0.1
7-31-78	7.7	-	<1	420	221	0	287	236	<0.1
8-14-78	7.7	-	<1	420	222	0	298	236	<0.1
8-21-78	7.6	-	<1	445	221	0	296	236	<0.1
9-01-78	7.7	-	<1	400	220	0	276	236	<0.1
9-07-78	7.7	-	<1	400	220	0	281	236	<0.1
9-15-78	7.7	<0.1	<1		222	0		232	<0.1
9-22-78	7.7	<0.1		405	222	0		232	<0.1
9-29-78	7.5	<0.1	<1	405	220	0	323	232	<0.1