

ACUTE TOXICITY TO FISH

EE-16
AR226-0111

TEST SUBSTANCE

Identity: Perfluorooctanesulfonate, Lithium salt; may also be referred to as PFOS Li salt, FC-94, or FC-94-X. (1-Octanesulfonic acid, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-, lithium salt, CAS # 29457-72-5)

Remarks: Test sample was taken from 3M production lot #1. The test sample is a mixture of the test substance in water (approximately 24.5% test substance and 75.5% water). No calculations were made to adjust for the actual concentration of the test substance in the test sample.

METHOD

Method: Not noted.

Type: Static acute

GLP: No

Year completed: 1994

Species: *Pimephales promelas*

Supplier: Aquatic Biosystems Inc., Fort Collins, CO

Analytical monitoring: pH and DO content

Exposure period: 96-hours

Statistical methods: LC₅₀ values calculated by Trimmed Spearman - Karber.

Test fish age: 79 days.

Length and weight: Average length = 2.1 ± 0.3 cm, Average weight = 0.069 ± 0.03 g

Loading: 0.69 g fish / L

Pretreatment: None

Test conditions:

Dilution water: Carbon filtered well water

Dilution water chemistry:

pH: 8.4

DO: 8.1 mg/L

Stock and test solution preparation: A primary stock solution was prepared in dilution water to yield a test sample concentration of 400 mg/L. All test solutions were made by diluting the appropriate amount of stock solution with dilution water to make 1 L of solution per concentration.

Stability of the test chemical solutions: Not noted.

Exposure vessels: 2 L glass beakers

Number of replicates: two.

Number of fish per replicate: ten

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Number of concentrations: six plus a negative control

Water chemistry during the study:

Dissolved oxygen range (0 – 96 hours):

6.0-7.2 mg/L (control exposure)

4.8-7.9 mg/L (56.0 mg/L exposure)

pH range (0 – 96 hours)

8.0-8.4 (control exposure)

8.0-8.4 (56.0 mg/L exposure)

Test temperature range (0 – 96 hours)

19.2-19.5°C

RESULTS

Nominal concentrations: Bk control, 3.2, 5.6, 10.0, 18.0, 32.0, 56.0
mg/L

Element value: 96-hour LC₅₀ = 19 mg/L (95% C.I.: 16-24 mg/L)

Mortality of controls: None

Remarks: Values reported are for the test sample. No calculations were made to adjust for the concentration of the test substance in the test sample.

CONCLUSIONS

The test sample containing 24.5% Perfluorooctanesulfonate, Lithium salt exhibited a 96-hour LC₅₀ for fathead minnow of 19 mg/L.

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

DATA QUALITY

Reliability: Klimisch ranking 2. This study, while well conducted, lacks analytical data for: determination of the test substance concentration in the test solutions; and determination of the sample purity.

REFERENCES

This study was conducted by the 3M Company, Environmental Laboratory, Lab Request number M1018, 3/25/94.

OTHER

Last changed: 5/2/00

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ENVIRONMENTAL LABORATORY

LR: M1018

Date: 3/25/94

Analyst: JBD

Pimephales promelas
96-hour Toxicity Test Data Summary

SAMPLE: FC-94-X (F-11367, Lot #1)

Sample Conc. (mg/L)	Percent Mortality			
	24 hours	48 hours	72 hours	96 hours
3.2	0	0	0	0
5.6	0	0	0	5
10	0	0	0	15
18	0	0	10	50
32	0	0	50	65
56	0	20	60	100

24 h LC50 (95% C.I.) = > 56 mg/L
 48 h LC50 (95% C.I.) = > 56 mg/L
 72 h LC50 (95% C.I.) = 36 mg/L (15-85)
 96 h LC50 (95% C.I.) = 19 mg/L (16-24)

NOTE: Spearman-Kärber method used to calculate those LC50's which could be estimated.
 (72 h LC50 required 40% trim, 96 h LC50 did not require any trim)

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96-HR ACUTE TOXICITY TO FATHEAD MINNOW, *PIMEPHALES PROMELAS*TYPE TEST: STATIC X STATIC RENEWAL _____TEST SUBSTANCE: FC-94-X (F-11367, Lot #1)DILUTION WATER: CARBON-FILTERED WELL WATER (3M WELL #2, ST. PAUL, MN)
TEMP. 20.5°C, pH 8.4, D.O. 8.1 mg/LTEST FISH SOURCE: Aquatic Biosystems Inc.
Fort Collins, CO DATE RECEIVED: 1-21-94FISH AGE: 79 days AVG. WT.: 0.069 ± .03 g AVG. SIZE: 2.1 ± .3 cmNO. OF FISH/TEST CHAMBER: 10 LOADING RATE: 0.69 g fish / 1L soln.TEST SOLUTION VOLUME: 1 L SIZE OF TEST VESSELS: 2 LDATE INITIATED: 3-21-94 @ 11:00 DATE TERMINATED: 3-25-94 @ 11:00am

TEST VESSEL	INITIAL CONC. mg/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	8.4	6.6	0	8.1	6.6	0	8.4	7.2	0	8.3	7.0
BK2	CONTROL	-	0	8.3	6.0	0	8.0	6.2	0	8.3	6.7	0	8.3	6.6
1	3.2	8	0	8.4	6.9	0	8.1	7.0	0	8.4	7.0	0	8.3	6.7
2	"	"	0	8.3	6.3	0	8.0	6.3	0	8.3	6.5	0	8.2	6.1
1	5.6	14	0	8.4	6.8	0	8.1	6.9	0	8.3	7.0	0	8.3	6.9
2	"	"	0	8.3	6.7	0	8.1	6.5	0	8.2	6.7	1	8.2	6.3
1	10.0	25	0	8.3	7.2	0	8.1	6.4	0	8.2	6.5	0	8.2	6.1
2	"	"	0	8.4	7.2	0	8.1	7.3	0	8.3	7.4	3	8.3	7.4
1	18.0	45	0	8.3	6.7	0	8.1	6.7	0	8.2	6.8	6	8.2	6.7
2	"	"	0	8.3	6.7	0	8.1	6.5	2	8.3	7.5	6	8.2	6.7
1	32.0	80	0	8.3	6.9	0	8.1	7.2	4	8.3	7.3	5	8.3	8.1
2	"	"	0	8.3	7.2	0	8.1	7.1	6	8.3	7.2	8	8.3	7.4
1	56.0	140	0	8.3	6.5	3	8.1	7.3	8	8.3	6.9	10	8.4	7.9
2	"	"	0	8.3	6.8	1	8.0	6.7	4	8.3	7.7	10	8.1	4.8
1														
2														
1														
2														

TEMP. °C	19.5 °C	19.5	19.2	19.5
DATE / ANALYST	3-22-94 / JBB	3-23-94 / JBD	3-24-94 / JBD	3-25-94 / JBD

TEMP. °C

DATE / ANALYST 3-22-94 / JBD

19.5°C

19.5

19.2

3-24-94 / JBD

19.5

3-25-94 / JBD

LC50 (95% C.I.)

96h LC50 = 19 mg/L (16-24 mg/L)method: Spearman-Kärber
(no trim)

COMMENTS

* mL of 400 mg/L stock soln. diluted to 1L with dilution water.
Initial pH of highest conc. tested (56.0 mg/L) = 8.2.

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

ANALYST:

JBD

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Lab Request No. M1018

Environmental Lab — Work Sheet

Page _____ of _____

Sample Description
FC-94-XDate: 3-25-94Analyst: JBD

Determination of length & weight of "Control" group
P. promelas at termination of 96-hour survival assay.

<u>Fish</u>	<u>Length (cm)</u>	<u>Weight (g)</u>
1	2.2	.0812
2	2.0	.0538
3	1.6	.0329
4	2.0	.0642
5	2.7	.1264
6	2.2	.0810
7	2.0	.0588
8	2.2	.0812
9	2.0	.0600
10	2.0	.0495
$\bar{x} = 2.1$		$\bar{x} = .0689$
s.d. = 0.3		s.d. = .03

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BURLINGTON RESEARCH, INC.
TRIMMED SPEARMAN-KARBER METHOD FOR CALCULATION OF
EC50 AND LC50 VALUES IN BIOASSAYS

FOR REFERENCE. CITE

M.A. HAMILTON, 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).

DATE 3/21/94
TEST # M1018
CHEMICAL FC-94-X
SPECIES *P. promelas*
DURATION 96 hours

RAW DATA

CONCENTRATION(mg/L)	3.20	5.60	10.00	18.00	32.00	56.00
NUMBER EXPOSED	20	20	20	20	20	20
MORTALITIES	0	1	3	10	13	20

SPEARMAN-KARBER TRIM

SPEARMAN-KARBER ESTIMATES LC50 0.00 19.4886284

95% LOWER CONFIDENCE 15.83

95% UPPER CONFIDENCE 24.00

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DATE 3/21/94
TEST # M1018
CHEMICAL FC-94-X
SPECIES F. promelas
DURATION 72 hours

RAW DATA

CONCENTRATION(mg/L)	3.20	5.60	10.00	18.00	32.00	56.00
NUMBER EXPOSED	20	20	20	20	20	20
MORTALITIES	0	0	0	2	10	12

SPEARMAN-KARBER TRIM

40.00

SPEARMAN-KARBER ESTIMATES

LC50

35.5052032

95% LOWER CONFIDENCE

14.86

95% UPPER CONFIDENCE

84.85

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Trimmed Spearman-Kärber Method for Calculation of EC50 and LC50 Values in Bioassays

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17

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3

3

3

3

F

3

3

5.

1610 1635 1650

LC10

LC25

LCSO

LC75

LC100

MORTALITIES

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