

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-3031. (1-Octanesulfonic acid) (CAS # 2795-39-3).

Remarks: The 3M production lot number was 2. The test sample is FC-3031. Current information indicates it is a mixture of 0.96% PFOS, 20% diethylene glycol butyl ether, 62.11% water, 10% ethylene glycol, 1.92% propane sultone foamer, 2.02% polyoxyethylene monooctylphenyl ether, 2.88% sodium octyl sulfate, 0.06% sodium lauryl sulfate, and 0.05% benzotriazole.

The following is an abbreviated summary of multiple fathead minnow studies on FC-3031, Lot 2. These studies apply 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: 1976

Species: *Pimephales promelas*

Supplier: Not given.

Analytical monitoring: Not given.

Exposure period: 96-hours

Statistical methods: LC₅₀ values determined by graphic interpolation.

Test fish age: Juveniles

Length and weight: Average length = 48 - 50 mm
Average weight = 1.4 - 1.5 g (wet)

Loading: Not given.

Pretreatment: None.

Test conditions:

Dilution water: Aerated carbon filtered well water

Dilution water chemistry: Not given.

Lighting: Not given.

Stock and test solution preparation: Not given.

Concentrations dosing rate: Once

Stability of the test chemical solutions: Not noted.

Exposure vessels: Not given

Number of replicates: 1

Number of fish per replicate: 20 per test solution for one study. Not given for remaining studies.

Number of concentrations: five plus a blank control

Water chemistry ranges during the studies:

pH range (0-96 hours):

7.2 – 7.4 (control exposures)

Temperature range (0-96 hours):

21 - 22 °C (control exposures)

Dissolved oxygen range (0-96 hours):

5.0 – 9.2 mg/L (control exposures)

RESULTS

Nominal concentrations: Blank control, 100, 250, 500, 750, and 1000 mg/L for two studies (7/6-10/76, 7/27-31/76). Blank control, 250, 500, 750, 1000, and 1250 mg/L for one study (7/20-24/76). Blank control, 100, 180, 320, 560, and 1000 mg/L for one study (8/10-14/76).

Element values: 96-hour LC₅₀ range = 560 – 800 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 range for fathead minnow was determined to be 560 to 800 mg/L.

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. Test solutions lack analytical confirmation of the amount of fluorochemical proportion in the solution.

REFERENCES

These studies were conducted by the 3M Company, Environmental Laboratory, St. Paul, MN, 1976.

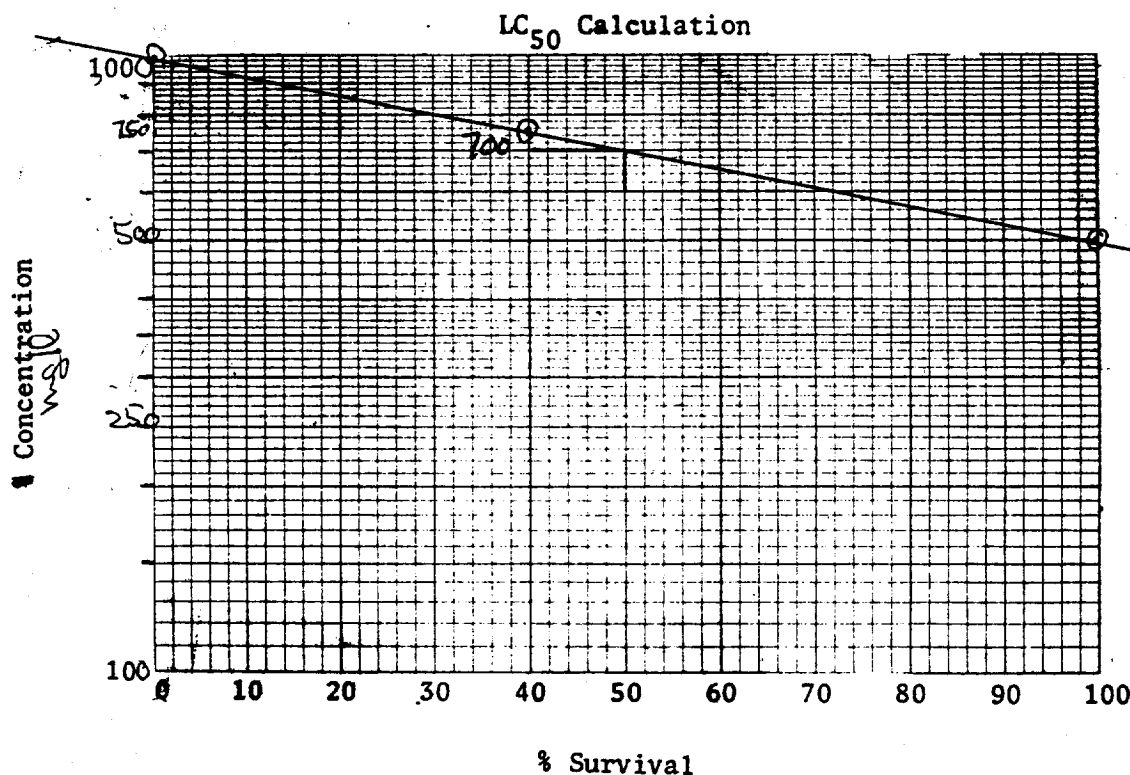
OTHER

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ENVIRONMENTAL ENGINEERING LABORATORY
AQUATIC TOXICITY WORK SHEETType Test 96 Hours - StaticMaterial Tested FC-3031 lot 2Test Organism Fathead MinnowAvg. Weight 1.4g Avg. Size 4.8cmDate Started 7/6/76Date Completed 7/10/76Time Started 2:00 pmPlotted LC₅₀ 700 mg/lDilution Water Carbon Filtered - Well Water

Conc.	24 hrs			48 hrs			72 hrs			96 hrs		
	% Survival	pH	D.O ppm	% Survival	pH	D.O ppm	% Survival	pH	D.O ppm	% Survival	pH	D.O ppm
Control	100	7.3	5.6	100	7.3	5.3	100	7.3	5.2	100	7.3	5.0
100 mg/l	100	7.2	5.3	100	7.2	5.0	100	7.2	5.0	100	7.2	4.9
250	100	7.2	5.2	100	7.2	5.0	100	7.2	4.9	100	7.2	4.5
500	100	7.2	5.0	100	7.1	4.9	100	7.0	4.9	100	7.1	4.5
750	100	7.0	5.0	100	7.1	4.5	40	7.0	4.3	40	7.1	4.0
1,000	100	7.0	5.0	40	7.0	4.2	20	7.0	4.0	0	7.0	3.9
Average Temperature			21°C	21			21			21		

Comments:

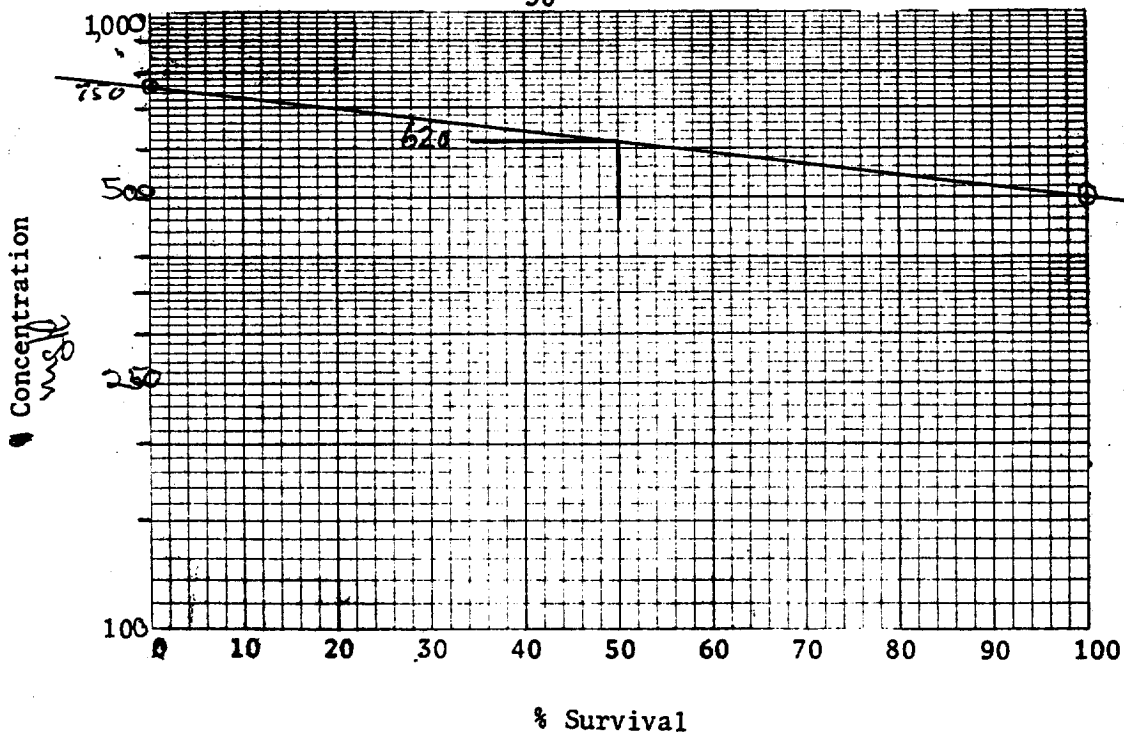


ENVIRONMENTAL ENGINEERING LABORATORY
 AQUATIC TOXICITY WORK SHEET

Type Test 96 Hours - Static Material Tested FC-3031 lot 2
 Test Organism Fathead Minnow Avg. Weight 1.5g Avg. Size 5cm
 Date Started 7/20/76 Date Completed 7/24/76
 Time Started 2:30 PM Plotted LC₅₀ 620 mg/l
 Dilution Water Carbon Filtered - Well Water

	24 hrs			48 hrs			72 hrs			96 hrs		
	%		D.O	%		D.O	%		D.O	%		D.O
Conc.	Survival	pH	ppm	Survival	pH	ppm	Survival	pH	ppm	Survival	pH	ppm
Control	100	7.2	5.9	100	7.2	5.3	100	7.2	5.2	100	7.2	5.0
250 mg/l	100	7.1	5.3	100	7.0	5.0	100	7.0	5.0	100	7.0	4.8
500	100	7.1	5.3	100	7.0	5.0	100	7.0	4.7	100	7.0	4.3
750	100	7.0	5.2	65	7.0	4.8	0	6.9	4.1	0	—	—
1,000	100	7.0	5.0	0	6.9	4.5	0	—	—	0	—	—
1,250	95	7.0	5.0	0	6.9	4.3	0	—	—	0	—	—
Average Temperature			21°C	22			21			21		

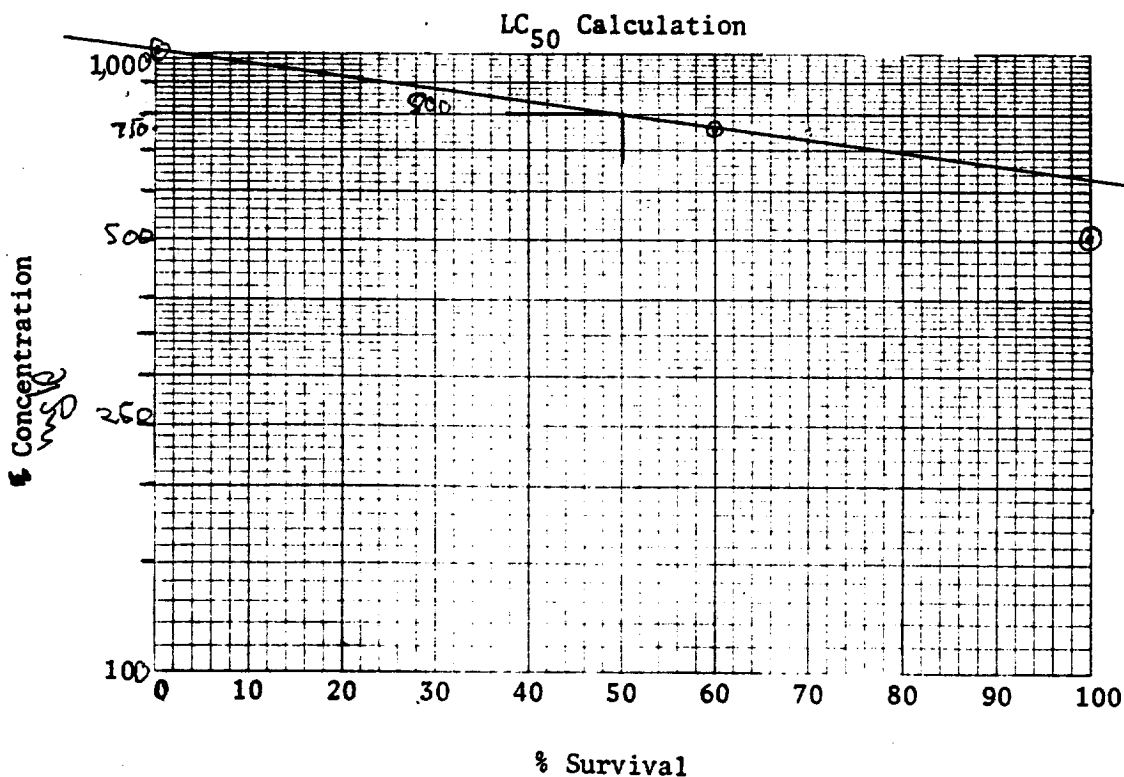
Comments: * 20 Fathead Minnow per test solution

LC₅₀ Calculation

Type Test 96 Hours - StaticMaterial Tested FC-3031 lot 2
~~Chlorine Dioxide~~Test Organism Fathead MinnowAvg. Weight 1.5g Avg. Size 5 cmDate Started 7/27/76Date Completed 7/31/76Time Started 3:00pmPlotted LC₅₀ 800 mg/lDilution Water Carbon Filtered - Well Water (Aerated)

Conc.	24 hrs			48 hrs			72 hrs			96 hrs		
	% Survival	pH	D.O ppm	% Survival	pH	D.O ppm	% Survival	pH	D.O ppm	% Survival	pH	D.O ppm
Control	100	7.4	6.7	100	7.3	6.2	100	7.3	5.8	100	7.3	5.5
100 mg/l	100	7.2	6.2	100	7.2	5.7	100	7.2	5.3	100	7.2	5.0
250	100	7.2	6.0	100	7.0	5.5	100	7.1	5.2	100	7.2	5.0
500	100	7.0	6.0	100	7.0	5.3	100	7.0	5.0	100	7.0	4.9
750	100	6.9	6.0	90	7.0	5.0	80	7.0	4.8	60	7.1	4.5
1,000	100	6.9	5.6	0	7.0	5.0	0	—	—	0	—	—
Average Temperature			21.0	21			21			21		

Comments:



ENVIRONMENTAL ENGINEERING LABORATORY
 AQUATIC TOXICITY WORK SHEET
Type Test 96 Hours - StaticMaterial Tested FC-3031 lot 2Test Organism Fathead MinnowAvg. Weight 1.5gAvg. Size 5cmDate Started 8/10/76Date Completed 8-14-76Time Started 2:00pmPlotted LC₅₀ 560 mg/lDilution Water Carbon Filtered - Well Water (Aerated)^{*}

	24 hrs			48 hrs			72 hrs			96 hrs		
Conc.	% Survival	pH	D.O ppm	% Survival	pH	D.O ppm	% Survival	pH	D.O ppm	% Survival	pH	D.O ppm
Control	100	7.3	6.8	100	7.3	5.4	100	7.3	5.2	100	7.3	5.0
100mg/l	100	7.0	6.3	100	7.0	5.3	100	7.0	5.0	100	7.0	4.9
180	100	7.0	6.2	100	7.0	4.9	100	7.0	4.6	100	7.0	4.3
220	100	7.0	6.0	100	6.9	4.9	100	7.0	4.5	100	6.9	4.0
560	100	7.0	5.7	90	6.9	4.6	50	7.0	4.5	50	6.9	4.0
1,000	0	6.9	5.0	0	—	—	0	—	—	0	—	—
Average Temperature			22°C	22			21			21		

Comments: * Initial DO 4.2 mg/l