

ACUTE TOXICITY TO INVERTEBRATES (GRASS SHRIMP)

TEST SUBSTANCE

Identity: A mixture containing perfluorooctanesulfonate, which may also be referred to as PFOS, FC-95, or as a component of FC-206 or L-3243. (1-Octanesulfonic acid) (CAS # 2795-39-3).

Remarks: The 3M production lot number was not noted. The test sample is FC-206, identified by the laboratory as "Sample C". Current information indicates it is a mixture of 0.67% PFOS, 17.5% diethylene glycol butyl ether, 78.91% water, 1.33% Sultone foamer, 1% sodium octyl sulfate, 0.04% sodium lauryl sulfate, 0.5% polyoxyethylene monoctylphenyl ether, and 0.05% benzotriazole.

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

METHOD:

Method: Standard Methods (APHA) 1971 Edition

Type: Acute static

GLP: No

Year completed: 1974

Species: *Palaemonetes vulgaris*

Supplier: Field collected locally in MA.

Analytical monitoring: Temperature, and dissolved oxygen.

Exposure period: 96-hours

Statistical methods: TL₅₀ (median tolerance limit) values calculated using a linear regression equation.

Test organism age: Juveniles.

Length and weight: Average length = 30 mm

Loading: Not given.

Pretreatment: None

Test conditions:

Dilution water: Synthetic sea water

Dilution water chemistry:

pH 8.0

Salinity 25 ppt

Lighting: Not given.

Stock and test solution preparation: Not given.

Concentrations dosing rate: Once

Stability of the test chemical solutions: Not noted

Exposure vessels: 5 gallon glass vessels containing 15 L of test solution.

Number of replicates: 1

**Exhibit
1719**

State of Minnesota v. 3M Co.,
Court File No. 27-CV-10-28862

3M_MN00437323

Number of organisms per replicate: 10
Number of concentrations: six plus a blank control
Water chemistry during the study:
 Temperature range (0-96 hours): 20 ± 1 °C
 Dissolved oxygen range (0-96 hours): 4.2 – 8.6 mg/L

RESULTS

Nominal concentrations: Blank control, 100, 180, 240, 320, 420, and 1000 mg/L

Element values: 96-hour TL_{50} = 280 (230 – 342) mg/L
 96-hour NOEL = 180 mg/L

Element values based on nominal concentrations.

Remarks: Testing was conducted on the 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 grass shrimp was determined to be 280 mg/L with a 95% confidence interval of 230 to 342 mg/L. The 96-hour no observed effect level (NOEL) was 180 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, the 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 Bionomics, EG&G, Inc., of Wareham, MA at the request of the 3M Company, St. Paul, MN, 1974.


OTHER

Last changed: 6/28/00

6/29

Date -

dark city

Light water 

BIOASSAY REPORT

SUBMITTED TO

3 M COMPANY

SAINT PAUL, MINNESOTA

1) Do you have a
sample calculation
showing how 95%
confidence levels
(p.2) is obtained?

2) what is crabace (?) p 1.

Date.

ACUTE TOXICITY OF SAMPLE C TO MUMMICHOG (Fundulus heteroclitus),
GRASS SHRIMP (Palaemonetes vulgaris), AND FIDDLER CRAB (Uca
pugilator).

Bionomics
E G & G, Inc.
790 Main Street
Wareham, Massachusetts
May, 1974

METHODS AND MATERIALS

These investigations were performed at the aquatic toxicology laboratory of Bionomics, E G & G, Inc., Wareham, Massachusetts. The susceptibility of mummichog (Fundulus heteroclitus), grass shrimp (Palaemonetes vulgaris), and fiddler crab (Uca pugilator) to Sample C, a brown liquid, tested as 100% active, was evaluated under static bioassay conditions for a 96 hour period. The results were reported as the median tolerance limit (TL₅₀), the concentration of the sample in water causing 50 percent mortality after 24 and 96 hours. The predicted TL₅₀ value and its 95% confidence intervals were arrived at by converting the concentrations tested and the corresponding observed percent mortalities to logs and probits, respectively. These values were then used to calculate a linear regression equation.

Test procedures for the static bioassays are those described for Fish Bioassay Procedures in the 1971 edition of Standard Methods (APHA). The mummichog, grass shrimp, and fiddler crabs used in these tests were collected locally by laboratory personnel. The mummichog had a mean weight and length of 1.1 g and 35 mm, respectively. The grass shrimp had a mean length of 30 mm. The fiddler crabs had a mean carapace width of 20 mm.

The test species were observed in the laboratory hatchery facility for at least 30 days prior to testing. These species were acclimated over a 10 day period, prior to testing, to laboratory test diluent water quality and temperature. During that period mortality in the test population was $<3\%$ and these animals were judged to be in excellent physical condition. The bioassays were conducted in 5 gallon glass vessels containing 15 l of water at 20°C (± 1.0), and there was a single introduction of the sample into each test vessel. The test containers were not aerated.

The test diluent consisted of synthetic sea water¹ with a salinity of 25 ‰, a pH of 8.0 and a temperature of 20°C (± 1.0). Dissolved oxygen levels for the tests ranged from 8.6 at the beginning of the tests to 4.2 at the end of testing. Ten specimens were introduced into each test vessel 24 hours prior to the start of the assay.

RESULTS

The predicted TL_{50} values and 95% confidence intervals are presented in Table 1. Table 2 presents a summary

¹Laroche, G. E. Eisler, and C. R. Tarzwell, 1970. Bioassay Procedures for Oil and Oil Dispersant Toxicity Evaluations. J. W. Poll. Cont. Fed. 42 (11): 1982-1989.

) of observed mortality for each individual concentration after 24 and 96 hours of exposure. The mortality syndrome in all tests was similar. The mummichog and grass shrimp generally became dark and lethargic, lost equilibrium, and expired. The fiddler crabs became lethargic before expiring.

SUBMITTED BY:

Bionomics
E G & G, Inc.
790 Main Street
Wareham, Massachusetts
May, 1974

PREPARED BY:

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Bevier Hasbrouck Sleight III
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3M_MN00437329

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Table 1 -- Acute toxicity of Sample C to mummichog^a (Fundulus heteroclitus), grass shrimp^b (Palaemonetes vulgaris), and fiddler crab^c (Uca pugnator). These data are based on results of bioassays conducted at the fish toxicology of Bionomics, E G & G, Inc., Wareham, Massachusetts.

Species	TL ₅₀ - milligram/liter		No Effect Level (mg/l)
	24 hour	96 hour	
mummichog	>1,800 <2,400	1,820(1,360-2,420) ^d	1,400
grass shrimp	>1,000.0	280(230-342)	180
fiddler crab	>10,000	3,260(2,760-3,860)	2,400

→ Coastal
Estuarine

^aAssays conducted at 20°C (± 1.0), mean weight of the mummichog 1.1

^bAssays conducted at 20°C (± 1.0), mean length of the grass shrimp 30 mm.

^cAssays conducted at 20°C (± 1.0), mean carapace width of the fiddler crabs 20 mm.

^d95% confidence intervals.

→ would not be expected to be found in offshore area

Table 2 -- Concentrations tested and corresponding observed percent mortalities of mummichog (Fundulus heteroclitus), grass shrimp (Palaemonetes vulgaris), and fiddler crab (Uca pugilator) after 24 and 96 hours of exposure to Sample C.

Species	Concentration (mg/l)	% mortality observed	
		24 hour	96 hour
mummichog	3,200	100	100
	2,400	100	100
	1,800	0	30
	1,400	0	0
	1,000	0	0
	control	0	0
grass shrimp	1,000	0	100
	420	0	100
	320	0	100
	240	0	40
	180	0	20
	140	0	0
	control	0	0

Table 2 -- Continued

Species	Concentration (mg/l)	% mortality observed	
		24 hour	96 hour
fiddler crab	10,000	100	100
	6,500	0	100
	4,900	0	100
	3,700	0	70
	2,800	0	30
	2,400	0	0
	2,100	0	0
	control	0	0