

BIOCONCENTRATION

TEST SUBSTANCE

Identity: N-ethylperfluorooctane sulfonamidoethanol; may also be referred to as N-EtFOSE Alcohol or FM-3422. (1-Octanesulfonamide, N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-N-(2-hydroxyethyl)-, CAS # 1691-99-2)

Remarks: Material is an off-white, waxy solid of uncharacterized purity.

METHOD:

Method/guideline followed: 3M derived method outlined in the test procedure for determining the aquatic Bioconcentration Factor of N-EtFOSE alcohol.

Type: Static exposure with a flow-through clearance phase.

GLP (Y/N): No

Year: 1978

Species: Channel catfish (*Ictalurus punctatus*)

Supplier: Not noted in the report.

Analytical monitoring: Concentration of N-EtFOSE alcohol in water and fish by GC with electron capture; temperature

Length and weight: Not noted in the report.

Exposure period: 7 days

Clearance period: 5 days

Statistical methods: 3M Trac system, MINITAB II program

Test fish age: Not noted in report.

Loading: Not noted in report.

Pretreatment: Not noted.

Test conditions:

Dilution water: Carbon-filtered well water

Dilution water chemistry: Not included in report.

Stock and test solution preparation: The primary stock solution was prepared by dissolving 57 grams of N-EtFOSE alcohol in 50 ml of acetone, applying the solution to 10 pounds of 3.5 mm glass beads, evaporating off the acetone, and circulating carbon filtered well water through the glass beads. The system was designed to result in a final loading ratio of 0.5 grams per liter. Aerobic conditions were maintained throughout and the system was assumed to go to saturation. Length of time allowed to circulate was not noted.

Exposure vessels: 114 liter aquarium. Volume utilized was not noted.

Number of replicates: Two

Number of fish per replicate: Not noted in the report.

Number of concentrations: One plus negative control

Water chemistry during the study:

Dissolved oxygen: Not noted in the report.

Test temperature: 21±1°C

pH: Not noted in the report.

Photoperiod: 16 hours light and 8 hours dark with a 30 minute transition period.

Remarks field: Following the introduction of the channel catfish into the experimental and control aquaria samples of 4 channel catfish and three water samples, top, middle and bottom layer, for N-EtFOSE alcohol uptake analysis were obtained at the following time periods: Control, prior to introduction, 15 minutes, one hour, two hours, four hours, eight hours, twelve hours, sixteen hours, twenty hours, twenty-four hours, and at twenty-four hour intervals for a period of 7 days. The channel catfish were then removed to clearance tanks for two hours and finally transferred to a flow-through system having flow rates through the test chambers of four water volumes per 24 hours. A sampling regimen identical to that of the uptake phase of the study was immediately initiated and terminated after five days.

RESULTS

N-EtFOSE Alcohol Uptake by Channel Catfish (*Ictalurus punctatus*) – Whole fish samples

Time	Fish Group A (ug/g)	Fish Group B (ug/g)
15 min.	1	1
1 hour	4	4
2 hours	9	10
4 hours	16	29
8 hours	58	42
12 hours	62	60
16 hours	51	56
20 hours	61	74
24 hours	104	110
48 hours	132	213
72 hours	222	159
96 hours	190	257
120 hours	211	201
144 hours	320	279
168 hours	552	158

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N-EtFOSE Alcohol Clearance of Channel Catfish (*Ictalurus punctatus*) – Whole fish samples

Time	Fish Group A (ug/g)	Fish Group B (ug/g)
15 min.	306	319
1 hour	269	216
2 hours	252	309
4 hours	260	242
8 hours	260	242
12 hours	253	206
16 hours	235	177
20 hours	238	255
24 hours	237	201
48 hours	-- ^b	190
72 hours	200	227
96 hours	136	226
120 hours	106	78

^b Sample lost.

N-EtFOSE Alcohol Uptake of Channel Catfish (*Ictalurus punctatus*) Muscle

Time	Muscle Concentration (ug/g)
Control	<0.1
15 min.	<0.1
1 hour	3
2 hours	5
4 hours	10
8 hours	22
12 hours	31
16 hours	38
20 hours	49
24 hours	61
48 hours	118
72 hours	127
96 hours	135
120 hours	153
144 hours	197
168 hours	147

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N-EtFOSE Alcohol Clearance of Channel Catfish (*Ictalurus punctatus*) Muscle

Time	Muscle Concentration (ug/g)
15 min.	118
1 hour	127
2 hours	108
4 hours	128
8 hours	147
12 hours	148
16 hours	181
20 hours	117
24 hours	75
48 hours	102
72 hours	77
96 hours	69
120 hours	72

N-EtFOSE Alcohol Uptake by Brain Tissue and Gastrointestinal Tract of Channel Catfish (*Ictalurus punctatus*)

Time	Brain Concentration (ug/g)	Gastrointestinal Tract Concentration (ug/g)
Control	<0.1	<0.1
15 min.	2	<0.1
1 hour	8	6
2 hours	28	12
4 hours	50	41
8 hours	100	54
12 hours	115	110
16 hours	149	119
20 hours	240	206
24 hours	225	201
48 hours	352	230
72 hours	328	510
96 hours	606	533
120 hours	588	504
144 hours	695	688
168 hours	905	533

N-EtFOSE Alcohol Clearance of Brain Tissue and Gastrointestinal Tract of Channel Catfish (*Ictalurus punctatus*)

Time	Brain Concentration (ug/g)	Gastrointestinal Tract Concentration (ug/g)
15 min.	1152	281
1 hour	761	630
2 hours	712	325
4 hours	602	507
8 hours	511	302
12 hours	582	263
16 hours	618	1205
20 hours	559	805
24 hours	523	564
48 hours	586	264
72 hours	450	353
96 hours	423	390
120 hours	417	712

N-EtFOSE Alcohol Uptake by Liver, Kidney, and Gall Bladder of Channel Catfish (*Ictalurus punctatus*)

Time	Liver Concentration (ug/g)	Kidney Concentration (ug/g)	Gall Bladder Concentration (ug/g)
15 min.	<0.1	<0.1	<0.1
1 hour	11	<0.1	<0.1
2 hours	11	<0.1	<0.1
4 hours	31	37	<0.1
8 hours	67	59	<0.1
12 hours	89	77	158
16 hours	99	93	245
20 hours	161	149	271
24 hours	149	99	242
48 hours	329	189	1383
72 hours	261	200	1585
96 hours	481	359	1573
120 hours	469	315	2875
144 hours	384	349	3261
168 hours	561	152	13805

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N-EtFOSE Alcohol Clearance of Liver, Kidney, and Gall Bladder of Channel Catfish (*Ictalurus punctatus*)

Time	LiverConcentration (ug/g)	Kidney Concentration (ug/g)	Gall Bladder Concentration (ug/g)
15 min.	504	274	1543
1 hour	650	567	4908
2 hours	758	439	1286
4 hours	779	447	5058
8 hours	507	390	3710
12 hours	446	559	4321
16 hours	728	515	4247
20 hours	420	365	2495
24 hours	443	259	3912
48 hours	575	351	2810
72 hours	316	203	1221
96 hours	76	182	1411
120 hours	507	285	6497

CONCLUSIONS

No reliable conclusions can be derived from this study. General observations can be made.

N-EtFOSE alcohol concentrations increased in the fish tissues over the course of exposure.

Lipophilic organs and organs possessing a large surface area at the water/organ interface possess the highest uptake rate constants.

The brain and gastrointestinal tract have potentially high bioconcentration factors due to the lipophilic nature of N-EtFOSE alcohol.

The muscle fillet appeared to exhibit the least potential to bioaccumulate N-EtFOSE alcohol.

The gall bladder showed the highest concentration of N-EtFOSE alcohol

There is a potential for excretion of N-EtFOSE alcohol through both urinary and fecal pathways.

No signs of toxicity were apparent at the exposure concentration.

While concentration decreased in the whole fish samples at the end of the clearance phase, the time required for complete removal is longer than the 5 days used in the test.

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DATA QUALITY

Reliability: Klimisch ranking 3. There is a lack of description for the study's methodology and characterization of the test organisms. There is no attempt at correlating, nor is there any record of, the size, age, and body fat content of the fish as it relates to the concentration of N-EtFOSE alcohol found in the various samples. This is especially important due to the fact that older, larger fish are likely to have more fat content than younger, smaller ones. The vigorous method used to solubilize the test substance appears to have resulted in a supersaturated solution. The solubility is characterized as being 50 ppb, but the concentration in the aquarium was given to be 500 ppb, and it was noted that the N-EtFOSE alcohol was present as a suspension. Moreover, it was also noted that excitability of the test organisms would cause disturbance of the bottom layer and re-suspension of N-EtFOSE alcohol into the water. Test substance purity was not characterized.

Third party review by Dr. James W. Gillett of Cornell University (observations included with report) also indicate a lack of reliability.

REFERENCES

3M Technical Report "Evaluation of the Bioconcentration Potential of FM 3422" A. N. Welter, Project 9970612623, Fate of Fluorochemicals, Report Number 2, August 16, 1978

3M requested expert overview, "Bioaccumulation Studies", Dr. James Gillett, Cornell University, March 8, 1993

OTHER

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