

BIOACCUMULATION

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: None given for sampling of the organisms. Extraction and analysis procedures were devised by 3M.

Type: Analysis of tissue for fluorochemical from indigenous fish caught in the Tennessee River above and below the Wheeler Dam.

GLP (Y/N): No

Year: 1979

Remarks field: There is no information on sampling procedures of the organisms from the Tennessee River near the manufacturing facility.

Four fish were caught and utilized as samples; Two channel catfish caught above Wheeler Dam, one white bass caught below and one white crappie caught above Wheeler Dam. Wheeler Dam is approximately 26 nautical miles downstream from the 3M Decatur Plant effluent discharge. It was not noted in the report how many miles above and below the dam the fish were caught.

A ten ppm standard of FM-3422 (N-EtFOSE alcohol) was prepared by diluting 1 ml of a 100 ppm standard (in ethyl acetate) to mark with ethyl acetate in a 10 ml volumetric flask.

One whole channel catfish was homogenized to create one sample. The other channel catfish was dissected and the various individual parts were homogenized to create individual samples.

The white bass had a 6.3 cm i.d. dinker die core sample taken just off the lateral line behind the gill plate making up a 20.591 g sample containing skin, filet, small part of the backbone, reproductive organs, part of the kidney, and rectum.

The white crappie had a dinker die core sample taken behind the gill plate to create a 16.684 gram sample containing filet, vertebrae, skin and bile.

All samples were homogenized in known volumes of DI water and divided into five aliquots each.

Samples were centrifuged, extracted with ethyl acetate, and analyzed by GC for organic and inorganic fluoride.

It was noted that FM-3925 (N-MeFOSE alcohol) and FM-3422 (N-EtFOSE alcohol) could not be distinguished with GC with electron capture parameters. The results are therefore a combined value.

RESULTS

N-MeFOSE alcohol / N-EtFOSE alcohol Concentration
In Tennessee River Fish by GC

Sample	N-MeFOSE alcohol & N-EtFOSE alcohol (ppm)
Water blank	N.D.
Ethyl Acetate blank	N.D.
Whole Channel Catfish	0.73
White Bass core sample	3.31
White Crappie core sample	N.D.
Channel Catfish Gills	0.80
Channel Catfish Liver	0.38
Channel Catfish Parts*	0.43
Channel Catfish Muscle	N.D.
Channel Catfish Fat **	6.12
Channel Catfish Gall Bladder	0.74

Upon completion of GC analysis, there was concern that the values were not definitive. Additional analysis of ethyl acetate homogenate extract was then done using Capillary Gas Chromatography with Electron Capture and GC using a Microwave Sustained Helium Plasma Detector.

Qualitative analysis of the fish extracts using Capillary Gas Chromatography with electron capture failed to identify the presence of N-EtFOSE alcohol. This was further supported by analysis by a Microwave Sustained Helium Plasma Detector where again, no evidence of any fluorochemicals were detected and specifically no N-EtFOSE alcohol and no N-EtFOSA (F-6309) were detected. The results obtained by the microwave plasma detector on spiked samples indicated that N-EtFOSE alcohol, if present, could have been detected from its fluorine content at 0.1 ppm in the ethyl acetate extracts. No reference was made to N-MeFOSE alcohol except for the general statement made "No fluorocarbon peaks were observed in the actual samples."

Remarks: The original report (5/22/79) referenced a sample for FM-3923. It was brought up after the report was generated that FM-3923 and FM-3422 are both the same compound (N-EtFOSE alcohol). Analytical was conducted to verify its

identity and it was found to be N-EtFOSA (F-6309). The attached report ("AR No. 7238 – Determination of Fluorinated Alcohols in Fish Extracts", 10/23/79) still refers to FM-3923 when in fact the sample labeled as FM-3923 is F-6309. This report also has inconsistencies. The last paragraph indicates the ability to detect fluorine content at 0.1 ppm level. However, a review of the procedure used indicates a detection limit of 0.5 ppm.

The first report (5/22/79) describes analysis of ethyl acetate extracts of fish homogenate by gas chromatography (GC) with electron capture detection. The analysis shows the presence of materials in fish tissue extracts that have GC retention times identical to both N-MeFOSE alcohol and N-EtFOSE alcohol and to N-EtFOSA. The GC retention times of N-MeFOSE alcohol and N-EtFOSE alcohol standards were the same (not resolved) by the method used in the first report. The first report indicates the presence of fluorochemicals in the fish extracts, but electron capture detection is not specific for fluorochemicals. Thus the results reported in the first report were not a specific identification of fluorochemicals detectable by GC. (Report 1 also has errors in column 4 of Table 1. In the 1B row, 0.40 should be changed to 4.13, and in the 2A row, 0.004 should be changed to 0.06.)

The second report (12/28/79) shows a misinterpretation in the first report. It includes a description of GC analyses of ethyl acetate extracts of two of the samples described in report 1 samples 1B and 3A. The work described in report 2 used electron capture detection and references a report using microwave sustained helium plasma detection (MSHPD) in the fluorine and sulfur mode. In fluorine mode, MSHPD method is specific for fluorine. The MSHPD results show no fluorochemicals in the ethyl acetate extracts. The results are interpreted as indicating that F-6309 and N-EtFOSE alcohol (FM-3422) are present in the ethyl acetate extracts at less than 0.1 ppm. In the first report, N-EtFOSA (F-6309) and N-MeFOSE alcohol (FM-3925) / N-EtFOSE alcohol (FM-3422) had appeared to be present respectively at 0.82 and 3.31 ppm in sample 1B and at 1.48 and 0.80 ppm in sample 3A. Thus, the GC-able compounds seen in the first report appear not to have been fluorochemicals and thus could not have been N-MeFOSE alcohol, N-EtFOSE alcohol or N-EtFOSA.

The first report shows the presence of unidentified organic fluorine and of inorganic fluorine in the fish tissue. This was not re-evaluated in the second report.

CONCLUSIONS

No reliable conclusions can be derived from this study.

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DATA QUALITY

Reliability: Klimisch ranking 3. Without an understanding of the sampling design in relation to the outfall and sampling points, verifiable data on the actual concentrations of fluorochemicals in the river from both the manufacturing facility and from natural sources, activities in the manufacturing facility prior to sampling, any applicable environmental conditions (e.g. rain events), and a clear understanding of how long the sampled fish were in the sampling area, there is little to be concluded. Additionally, the analytical data conflicts. It cannot be definitively concluded which analytical data set is correct. Extraction and analytical methodology were not validated. State units of results is ppm. It is not correlated to mg analyte per kg body weight. Identity and purity of reference compounds was not established therefore stated analyte concentrations have no basis in fact.

REFERENCES

3M Technical Report "Bioaccumulation of Fluorochemicals in Tenn. River Fish." James E. Gagnon, Project 78-2740, Decatur, Alabama – Tennessee River Fish, Report Number 001, May 22, 1979

3M Technical Report "AR No. 7238 – Determination of Fluorinated Alcohols in Fish Extracts." D. F. Hagen, Project A000007, Environmental Engineering and Pollution Control, Report Number 238, October 23, 1979.

3M Technical Report "Fluorochemicals in Tennessee River Fish." James E. Gagnon, Project 78-2740, Decatur, Alabama – Tennessee River Fish, Report Number 100, December 28, 1979

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

OTHER

Last changed: 5/18/00