

US EPA ARCHIVE DOCUMENT

STUDY TITLE

F8426 Technical:
Analytical Method Validation in
Filtered and Unfiltered Saltwater

AUTHOR

Kacia L. Wenger

STUDY INITIATION DATE

March 29, 1996

STUDY COMPLETION DATE

June 4, 1996

PERFORMING LABORATORY

Toxikon Environmental Sciences
106 Coastal Way
Jupiter, Florida 33477

SPONSOR

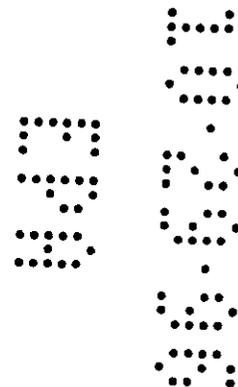
FMC Corporation
P. O. Box 8
Princeton, New Jersey 08543

FMC STUDY NUMBER

V96-0046

LABORATORY PROJECT ID

J9602001d



STATEMENT OF NO DATA CONFIDENTIALITY CLAIMS

Test Substance: F8426 Technical

Title: F8426 Technical: Analytical Method Validation in Filtered
and Unfiltered Saltwater

No claim of confidentiality is made for any information contained
in this study on the basis of its falling within the scope of
FIFRA 10(d)(1)(A), (B), or (C).

Study Sponsor: FMC Corporation

Company Agent:



Signature

11 June 1996

Date

COMPLIANCE WITH GOOD LABORATORY PRACTICE STANDARDS

Test Substance: F8426 Technical

Title: F8426 Technical: Analytical Method Validation in Filtered
and Unfiltered Saltwater

This study was conducted in accordance with and fully complies
with published Good Laboratory Practices (GLP) regulations for
tests of substances under the Federal Insecticide, Fungicide, and
Rodenticide Act (40 CFR Part 160).

Kacia L. Wenger
Kacia L. Wenger
Study Director
Toxikon Environmental Sciences

6-4-96
Date

Mark Palmieri
Sponsor

11 June 1996
Date

Callista Charles
Submitter

7/18/96
Date

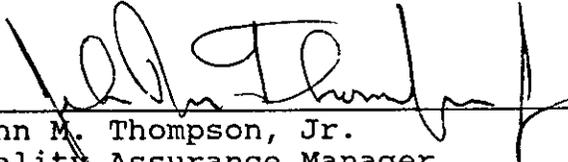
STATEMENT OF QUALITY ASSURANCE

Test Substance: F8426 Technical

Title: F8426 Technical: Analytical Method Validation in Filtered
and Unfiltered Saltwater

Test data were reviewed by the Quality Assurance Unit to assure that standard operating procedures and the protocol developed for this study were followed. This report is an accurate reflection of the raw data. The dates of all quality assurance audits are documented below.

<u>TYPE OF AUDIT</u>	<u>DATE OF AUDIT</u>	<u>DATE FINDINGS REPORTED TO THE STUDY DIRECTOR AND TO MANAGEMENT</u>
In-Life Audit:		
Aborted FSW Validation	04/01/96	04/01/96
Successful FSW Validation	04/23/96	04/29/96
Study Data Review:	04/17/96 04/29/96	04/18/96 04/29/96
Draft Report Review:	04/17/96 04/29/96	04/18/96 04/29/96
Final Report Review:	06/04/96	06/04/96



John M. Thompson, Jr.
Quality Assurance Manager
Toxikon Environmental Sciences

6/4/96

Date

FMC Corporation

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Princeton, New Jersey 08543
609 951 3000

FMC/SWMV/F8426
Toxikon Environmental Sciences
Study No J9602001d
FMC Study No V96-0046



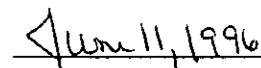
QUALITY ASSURANCE STATEMENT

FMC STUDY NUMBER
V96-0046

This report and raw data were reviewed for accuracy and compliance with the study protocol, FDA Good Laboratory Practice Regulations, EPA Good Laboratory Practice Standards and OECD Principles of Good Laboratory Practice by the FMC Toxicology Department's Quality Assurance Unit. Revisions were made where necessary.



Laura J. Ambrose, B.S.
Quality Assurance Associate



Date

LIST OF SCIENTIFIC PERSONNEL

Test Substance: F8426 Technical

Title: F8426 Technical: Analytical Method Validation in Filtered
and Unfiltered Saltwater

Study Director: Kacia L. Wenger

Chemical Services Manager: L. Dale Sivils, Ph.D.

Chemist: Kacia Wenger

Director: G. Scott Ward

Kacia L. Wenger
Kacia L. Wenger
Study Director
Toxikon Environmental Sciences

6-4-96
Date

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1.0 INTRODUCTION

An analytical method validation study was conducted at Toxikon Environmental Sciences (TES), Jupiter, Florida, to determine the precision and accuracy of a procedure to analyze F8426 Technical in filtered and unfiltered saltwater. The analysis of F8426 Technical in saltwater required direct injection of aqueous samples (after dilution into 50:50 acetonitrile:water if necessary to stay within calibration range).

Quantitation of F8426 Technical was performed by liquid chromatography (LC) using a UV/VIS detector and external standardization. The method was first validated by fortifying filtered saltwater with F8426 Technical at two concentrations which encompassed the range of test concentrations expected to be utilized in toxicity tests with saltwater organisms. This study was conducted on April 1, 1996. Since in this validation a degradation of sample was observed, a second validation was conducted at two concentrations on April 23, 1996. Only the second validation of the filtered saltwater is described in this report. In the second validation of the filtered saltwater, as well as the unfiltered saltwater validation and all other work with F8426 Technical, all samples and standards were kept at 4°C until analysis to prevent this degradation of test substance.

A third validation was conducted by fortifying unfiltered saltwater with F8426 Technical at two concentrations which encompassed the range of test concentrations expected to be utilized in a toxicity test on the Eastern Oyster. This study was conducted on April 9, 1996.

2.0 MATERIALS AND METHODS

2.1 TEST METHODS

The analytical method for F8426 Technical was developed and validated in filtered and unfiltered saltwater at Toxikon Environmental Sciences following the test protocol entitled: "F8426 Technical: Analytical Method Validation In Filtered and Unfiltered Saltwater" (Appendix A).

2.2 TEST SUBSTANCE

The test substance, F8426 Technical (Lot No. PL93-356) was provided by FMC Corporation and received at Toxikon Environmental Sciences on February 16, 1996, in a plastic bottle labeled "F8426 Technical Herbicide: Reference: PL93-356; Amount 1 kg; Date 2-5-96." The substance was received as a viscous orange oil and stored in the dark at ambient room temperature. F8426 Technical was reported by FMC Corporation to be 90.3% pure and stable for at least 30 days (FMC Study No. P96-0125).

2.3 APPARATUS AND MATERIALS

HPLC Pump: Shimadzu LC-10AD

HPLC Detector: Shimadzu SPD 10A UV/VIS

Autoinjector: Waters Model 710B (100 μ L injection volume)

Data Acquisition System: Hewlett-Packard Model 3396 Series II

HPLC Column: Intersil 5 (C-8), 4.6-mm x 150-mm
5- μ m particle size

Solvents and Reagents:

a. Water (H₂O): HPLC Grade (JT Baker)

b. Acetonitrile (ACN): HPLC grade (B&J or JT Baker)

Liquid Chromatographic (HPLC) Mobile Phase: 60:40 ACN:H₂O,
degassed by continuous helium sparging

Matrices: Natural; filtered saltwater with the following
characteristics: salinity of 20 ‰; temperature 24°C

(Natural, unfiltered saltwater with the following characteristics: salinity of 28-36 ‰; temperature 24°C

2.4 PREPARATION OF STANDARD SOLUTIONS

A primary test substance stock solution (2.49 mg ai/mL) was prepared by weighing 0.2760 gram (g) of F8426 Technical into a 100-mL volumetric flask and bringing to volume with ACN. The solution was thoroughly mixed. Two secondary stock solutions (0.100, 1.00 mg/mL) were prepared by adding, respectively, 4.02 mL and 40.2 mL of the primary stock solution into 100 mL volumetric flasks and bringing to volume with ACN. A series of five working calibration standards was prepared as shown in Table 1 by adding the appropriate volumes of the secondary test substance stock solutions to 100-mL volumetric flasks and bringing to volume with 50:50 ACN:H₂O.

2.5 PREPARATION OF SPIKE SAMPLES

Spike samples were prepared at F8426 Technical concentrations of 0.125 and 16.0 mg ai/L in both filtered and unfiltered saltwater. The low concentration spike sample (0.125 mg ai/L) for each saltwater was prepared by adding 12.5 µL of the 0.100 mg ai/mL secondary test substance stock solution to a 10.0-mL volumetric flask and bringing to volume with saltwater. The high concentration spike sample (16.0 mg ai/L) for each saltwater was prepared by adding 160 µL of the 1.00 mg ai/mL secondary test substance stock solution to a 10.0-mL volumetric flask and bringing to volume with saltwater.

Each spike level was prepared in triplicate, and a matrix blank was prepared in triplicate from an unfortified aliquot of laboratory saltwater. The high concentration spike samples were diluted with 50:50 ACN:H₂O prior to HPLC analysis to obtain an

instrument response within the calibration range. This preparation method was used with both the filtered and unfiltered saltwater matrix.

2.6 LIQUID CHROMATOGRAPHIC ANALYSIS

The Shimadzu HPLC pump and Shimadzu UV/VIS HPLC detector were set with the following conditions:

Column:	Intersil 5 (C-8) 4.6-mm x 150-mm column
Detector Wavelength:	272 nm
Mobile Phase:	60:40 ACN:H ₂ O, isocratic
Flow Rate:	1.20 mL/min

After equilibration of the system and attainment of a stable baseline on the integrator, quality control samples (method blank and calibration standards) were analyzed along with the validation spike samples to assess the accuracy and precision of the method.

2.7 QUANTITATION

The standard response curve (linear regression curve) of F8426 Technical concentration versus peak area (integrator response) was generated from the data obtained during the validation. The equation of the curve (4/23/96) is:

$$\text{mg/L F8426 Technical} = (\text{Peak Area} - 1237.46) / 407391.28,$$

with a correlation coefficient of 1.000. The F8426 Technical concentration found in the samples was calculated using the following equation:

$$\text{mg/L F8426 Technical} = \text{mg/L F8426 Technical from std curve} * \text{dilution factor}$$

2.8 EXAMPLE CALCULATION

Run Date: April 23, 1996

Sample ID: 496469

Response = 48073

Dilution Factor = 1.00

mg/L F8426 Technical = $(48073 - 1237.46)/407391.28$
= $0.115 * 1.00$
= 0.115 mg ai/L

2.9 LIMIT OF DETECTION

The limit of detection (LOD) for F8426 Technical was calculated from interpolation of one-half the peak area of the low standard times the dilution factor of the matrix blank. The limit of quantitation (LOQ) was determined from the response of the lowest concentration standard times the dilution factor of the matrix blank.

2.10 ARCHIVES

The final report and all data related to this study will be initially archived at Toxikon Environmental Sciences. Following acceptance of the final report, the raw data and original final report will be sent to FMC Corporation, Princeton, New Jersey, for permanent archiving.

3.0 RESULTS AND DISCUSSION

Recovery data from the fortified filtered saltwater samples analyzed during this method validation study are presented in Table 2. Average recovery percentages ranged from 95% to 96% in the range of 0.125 to 16.0 mg ai/L. The overall average recovery was 95% with a standard deviation of 5%. The limit of detection was 0.0484 mg/L and the limit of quantitation was 0.0999 mg/L.
LQD *LOQ*

Recovery data from the fortified unfiltered saltwater samples analyzed during this method validation study are presented in Table 3. Average recovery percentages ranged from 87% to 99% in the range of 0.125 to 16.0 mg ai/L. The overall average recovery was 93% with a standard deviation of 8%. The limit of detection was 0.0319 mg/L and the limit of quantitation was 0.082 mg/L.

In both matrices, samples and standards must be kept at 4°C until analysis by HPLC to prevent degradation (possibly due to hydrolysis) of the test substance.

4.0 CONCLUSIONS

The method described is suitable for the analysis of F8426 Technical in filtered (20 ‰) saltwater over a concentration range of 0.125 to 16.0 mg ai/L, with a LOD of 0.0484 mg/L and LOQ of 0.0999 mg/L; and in unfiltered (28 - 36 ‰) saltwater over a concentration range of 0.125 to 16.0 mg ai/L, with a LOD of 0.0319 mg/L and LOQ of 0.082 mg/L.

5.0 PROTOCOL DEVIATIONS

There were no deviations from the test protocol during the performance of this study.

Table 1. Preparation of Working Calibration Standards for F8426
Technical

Standard Designation	Volume of Stock (μ L)	Stock Concentration (mg/mL)	Final Volume (mL)	Standard Concentration (mg/L)
Std 1	25.0	0.100	25.0	0.100
Std 2	125	0.100	25.0	0.500
Std 3	250	0.100	25.0	1.00
Std 4	625	0.100	25.0	2.50
Std 5	125	1.00	25.0	5.00

Table 2. Recovery Data for F8426 Technical From Filtered Saltwater During the Method Validation

Sample ID	Nominal Concentration (mg/L)	Dilution Factor	Measured Concentration (mg/L)	Percent Recovery*
496466	0.0	1.00	<0.0484	N/A
496467	0.0	1.00	<0.0484	N/A
496468	0.0	1.00	<0.0484	N/A
496469	0.125	1.00	0.115	92
496470	0.125	1.00	0.130	104
496471	0.125	1.00	0.114	91
Mean ± Standard Deviation =				96 ± 7%
496472	16.0	10.0	15.2	95
496473	16.0	10.0	15.1	94
496474	16.0	10.0	15.4	96
Mean ± Standard Deviation =				95 ± 1%
Grand Mean ± Standard Deviation =				95 ± 5%

* Percent Recovery = (mg/L measured ÷ mg/L nominal) X 100

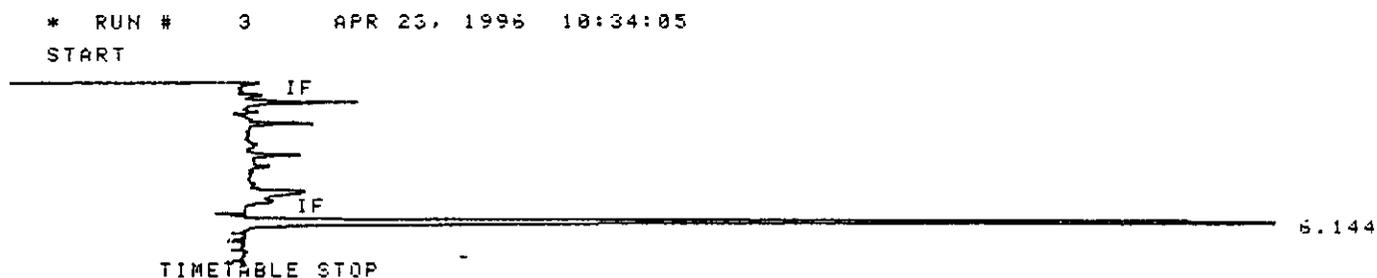
Table 3. Recovery Data for F8426 Technical From Unfiltered Saltwater During the Method Validation

Sample ID	Nominal Concentration (mg/L)	Dilution Factor	Measured Concentration (mg/L)	Percent Recovery*
496126	0.0	1.00	<0.0319	N/A
496127	0.0	1.00	<0.0319	N/A
496128	0.0	1.00	<0.0319	N/A
496129	0.125	1.00	0.116	93
496130	0.125	1.00	0.109	87
496131	0.125	1.00	0.102	82
Mean ± Standard Deviation = 87 ± 6%				
496132	16.0	10.0	15.3	96
496133	16.0	10.0	15.1	94
496134	16.0	10.0	16.9	106
Mean ± Standard Deviation = 99 ± 6%				
Grand Mean ± Standard Deviation = 93 ± 8%				

* Percent Recovery = (mg/L measured ÷ mg/L nominal) X 100

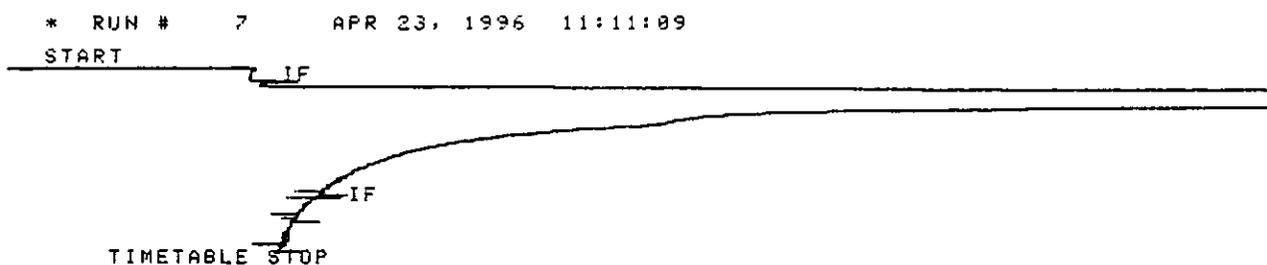
Figure 1. Typical Chromatograms of F8426 Technical

a) Standard 3: 1.00 mg/L F8426 Technical



Sample ID: Standard 3
Retention Time: 6.144 minutes
Peak Area: 407108
Date: 4/23/96

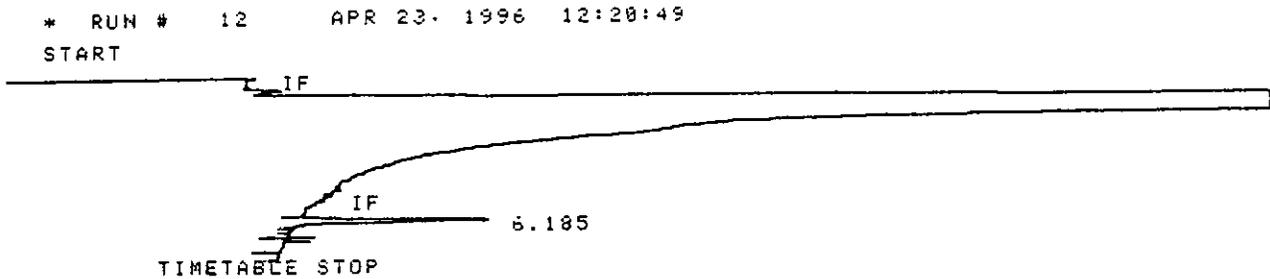
b) Unspiked Filtered Saltwater



Sample ID: 496466
Retention Time: N/A
Peak Area: 0
Dilution Factor: 1.00
Date: 4/23/96

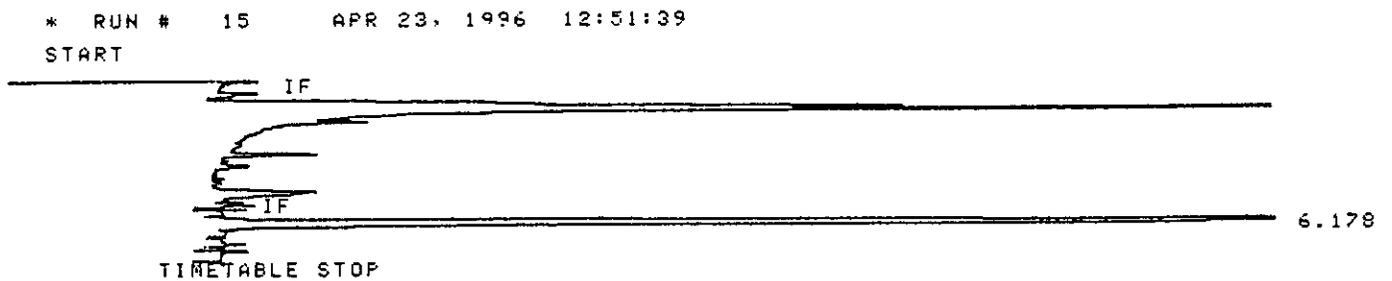
Figure 1 (Cont.) Typical Chromatograms of F8426 Technical

c) 0.125 mg/L Spike Concentration in Filtered Saltwater



Sample ID: 496469
Retention Time: 6.185 minutes
Peak Area: 48073
Dilution Factor: 1.00
Date: 4/23/96

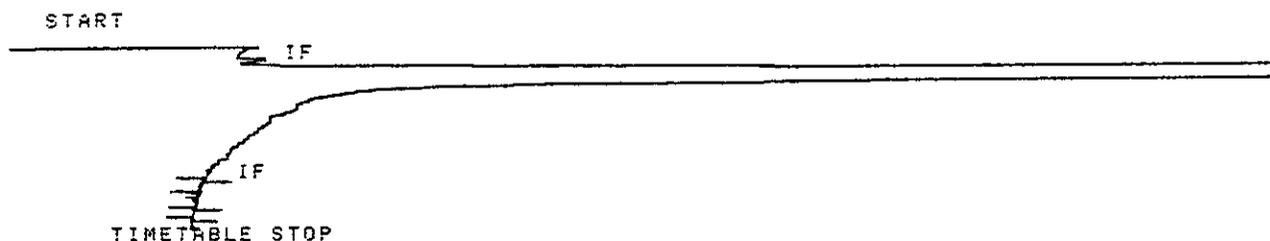
d) 16.0 mg/L Spike Concentration in Filtered Saltwater



Sample ID: 496472
Retention Time: 6.178 minutes
Peak Area: 621294
Dilution Factor: 10.0
Date: 4/23/96

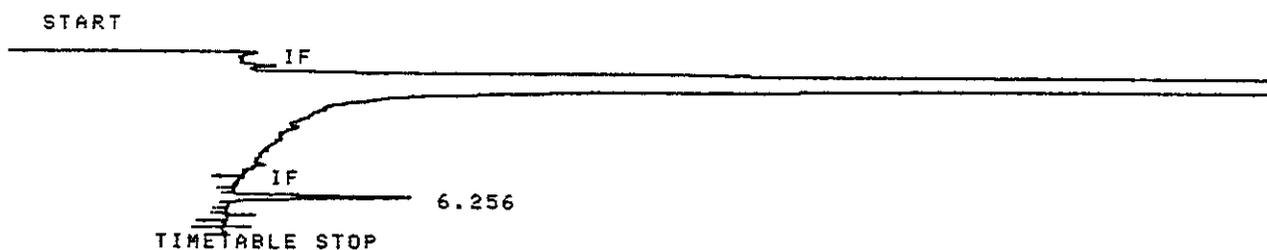
Figure 1 (Cont.) Typical Chromatograms of F8426 Technical

e) Unspiked Unfiltered Saltwater



Sample ID: 496126
Retention Time: N/A
Peak Area: 0
Dilution Factor: 1.00
Date: 4/9/96

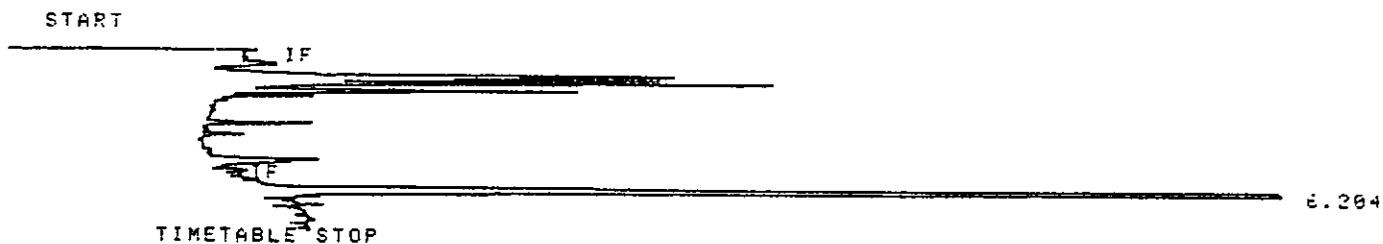
f) 0.125 mg/L Spike Concentration in Unfiltered Saltwater



Sample ID: 496131
Retention Time: 6.256 minutes
Peak Area: 47520
Dilution Factor: 1.00
Date: 4/9/96

Figure 1 (Cont.) Typical Chromatograms of F8426 Technical

g) 16.0 mg/L Spike Concentration in Unfiltered Saltwater



Sample ID: 496132
Retention Time: 6.204 minutes
Peak Area: 616551
Dilution Factor: 10.0
Date: 4/9/96

APPENDIX A
PROTOCOL AND AMENDMENTS



Test Protocol

**Analytical Method Validation
In Filtered and Unfiltered Saltwater**

This protocol is in support of U.S. EPA
FIFRA Environmental Testing Guidelines

Environmental Fate and Ecotoxicology
106 Coastal Way, Jupiter, FL 33477, TEL (407) 575-2477 FAX (407) 575-2497

FMC/F601.2
F8426 technical/Saltwater Validation
03/29/96

TOXIKON ENVIRONMENTAL SCIENCES
JUPITER, FLORIDA

STUDY NUMBER: J9602001d
PROTOCOL NUMBER: F601
FMC STUDY NUMBER: V96-0046

1.0 TITLE

F8426 technical: Analytical Method Validation In Filtered And Unfiltered Saltwater

2.0 OBJECTIVE

The objective of this study is to validate the analytical method of a test substance in dilution water which will be used in aquatic toxicity testing. The method will be suitable for measurement of the range of concentrations to be used in the aquatic toxicity test.

3.0 JUSTIFICATION FOR VALIDATION OF ANALYTICAL METHOD

In general, the analytical method will be supplied by the Sponsor for the typical dilution water. Validation by the Testing Facility is required to demonstrate the applicability and/or ruggedness of the method under specific study conditions. In addition, validation data will be generated to cover the particular range of exposure concentrations to be studied.

4.0 STUDY SPONSOR

FMC Corporation
P.O. Box 8, 105 College Road East
Princeton, New Jersey 08543
TEL: (609) 951-3698 FAX: (609) 951-3837
Sponsor Representative: Mark A. Palmieri

5.0 TESTING FACILITY

Toxikon Environmental Sciences
106 Coastal Way
Jupiter, Florida 33477
TEL: (407) 575-2477 FAX: (407) 575-2497
Study Director: Kacia Wenger

6.0 PROPOSED SCHEDULE

PROPOSED EXPERIMENTAL START DATE: March 1996
PROPOSED EXPERIMENTAL COMPLETION DATE: April 1996
PROPOSED DRAFT REPORT SUBMITTAL DATE: April 1996
PROPOSED FINAL REPORT SUBMITTAL DATE: May 1996

7.0 TEST SUBSTANCE

Characterization of the test substance's physical and chemical properties, toxicological hazard, and safe handling procedures will be provided by the Sponsor. This information, as well as known toxicity values, will guide the technical staff in the handling of the test substance.

The test substance will be F8426 technical, lot P93-356. The test substance was determined by the Sponsor to be 90.3% pure and stable under their study number P96-0125. The test substance will be stored at room temperature. The test substance described above will also be utilized as the reference substance for preparation of analytical standards.

8.0 TEST SYSTEM

The test system will be saltwater (both filtered 20 ‰ saltwater and unfiltered saltwater with a usual salinity of 28 to 36 ‰) containing the test substance. The characteristics of the salt water utilized for method validation will be compatible with those required for the conduct of toxicity tests.

9.0 ANALYTICAL METHOD

The analytical method will be supplied by the Sponsor or developed by Toxikon Environmental Sciences.

The analytical method used to generate the validation data will be fully described by Toxikon Environmental Sciences in the final validation study report.

9.1 Calibration and Standardization

9.1.1 Instrument Performance Evaluation

The general instrument maintenance and operation procedures will be those described in the appropriate Toxikon Environmental Sciences standard operating procedures (SOP) and/or in the manufacturer's operation manuals.

9.1.2 Quantification

Quantification will be performed using external standardization.

9.1.3 Determination of the Limit of Detection and Limit of Quantitation

The Limit of Detection (LOD) will be the sample concentration equivalent to one-half the response of the lowest concentration standard in the calibration curve times the dilution factor of the control sample. The Limit of Quantitation (LOQ) will be the sample concentration equivalent to the response of the lowest concentration standard.

9.2 Control and Assessment of Interferences

9.2.1 Method Interferences

Method interferences may be caused by contaminants in solvents, reagents, glassware, and other sample processing apparatus that lead to discrete artifacts or drifting baseline. In order to minimize potential method interferences, all reagents and solvents should be pesticide residue grade or better and all glassware and teflonware will be cleaned in accordance with SOP. Appropriate blank analyses will be performed to demonstrate freedom from

interferences with each analytical set.

9.2.2 Matrix Interferences

Matrix interferences may result from the coextraction of contaminants from the sample matrix resulting in artificially low or high analytical results. Sample preparation procedures can be employed to minimize this type of interference. Matrix interferences will be evaluated from the analysis of matrix blanks (controls) and matrix spikes.

9.3 Stability/Homogeneity

The stability and homogeneity of the test substance in the test matrix will not be determined unless requested and authorized by the Sponsor.

9.4 Storage Stability

In general, the samples will be analyzed immediately upon collection thus eliminating the need for sample storage and storage stability. If analyses cannot be performed immediately, sample aliquots will be stored and analyzed periodically to determine storage stability. Samples must be stable (> 80% recovery) for a period equal to or greater than the longest period stored to validate this procedure. If analyte recovery during stability studies falls below 80%, the samples will be considered unstable and storage will not exceed this time period.

10.0 LEVEL OF VALIDATION

In general, the analytical method will be validated at concentration levels bracketing the test concentrations to be used in the definitive aquatic toxicity test(s). Unless there are analytical or physico-chemical reasons, the targeted high validation concentration will be approximately twice the highest test concentration and the targeted low validation concentration will be approximately one-half of the lowest test concentration, or the LOD (whichever is higher). Validation samples will include triplicate fortification samples at these two concentrations as well as triplicates of the appropriate matrix blank. If the concentrations of the fortified

samples are above the analytical calibration curve concentrations, the samples may be diluted into the calibrated range and validated. The method will be considered valid if the recoveries of the fortified samples are in the range of 80% to 120%. Recovery values outside of this range may be used depending on the Sponsor or specific laboratory requirements.

11.0 STATISTICAL METHODS

The arithmetic mean and standard deviation will be reported on groups of sample recoveries at the same fortification concentration. The overall mean and standard deviation may also be reported.

12.0 REPORT

The report will be a typed document describing the results of the method validation and will be signed by the Study Director and the Quality Assurance Unit. It will include, but not be limited to, the following information:

1. Name of study, investigator, and laboratory;
2. A detailed description of the test and reference substances, including their source, lot number, and identity and concentrations of any solvents or other additives present;
3. Reference to the protocol and any amendments or deviations from the protocol;
4. Statistical methods employed for analyzing the data;
5. A description of sample preparation and the analytical procedures;
6. A description of the equipment and instrumentation used;
7. A description of all circumstances that may have affected the quality or integrity of the data;
8. A description of the transformations, calculations, or operations performed on the data, and a statement of the conclusions drawn from the analysis;
9. Dates encompassed by the study;
10. The location of the final report and all raw data are to be archived;

11. List of all study personnel;
12. A statement prepared and signed by the Study Director which specifies that the study was conducted in accordance with published U.S. EPA Good Laboratory Practice Standards; and
13. A statement prepared and signed by the Quality Assurance Unit which specifies the dates inspections were made and findings reported to management and to the Study Director.

13.0 GOOD LABORATORY PRACTICES

All test procedures, documentation, records, and reports will comply with the U.S. Environmental Protection Agency's Good Laboratory Practices as published under the Federal Insecticide, Fungicide, and Rodenticide Act (40 CFR part 160). To this end, Quality Assurance will, at random, select and audit at least one phase of the test while in progress. Quality Assurance will audit the final report against the raw data, protocol and standard operating procedures to assure the accuracy and integrity of the information presented. A statement, signed by Quality Assurance, attesting to the audits conducted will be included in the final report.

14.0 PROTOCOL AMENDMENTS AND DEVIATIONS

All changes (i.e., amendments and deviations) of the approved protocol plus the reason for the change will be documented in writing. The amendments will be signed and dated by the Study Director and the Sponsor Representative and maintained with the protocol.

15.0 RECORDS

Upon finalization of the report by the Study Director, all raw data generated in the conduct of the test, the protocol, pertinent written correspondence, and the final report will be temporarily archived at Toxikon Environmental Sciences. Following acceptance of the report by the Sponsor, all raw data, the protocol and written correspondence will be transferred to the Sponsor for permanent archiving at the Sponsor's expense.

16.0 TEST SUBSTANCE DISPOSAL

After acceptance of the final report by the Sponsor, Toxikon Environmental Sciences will return the remaining test substance to the Sponsor or arrange for proper disposal at the Sponsor's direction and expense.

17.0 CONFIDENTIALITY

Statements of confidentiality will be agreed upon prior to the study initiation.

18.0 APPROVAL OF STUDY PROTOCOL

SPONSOR REPRESENTATIVE: Mark Almeri DATE: 2-April-1996

STUDY DIRECTOR: Kasia Wang DATE: 3/25/96

TOXIKON ENVIRONMENTAL SCIENCES
JUPITER, FLORIDA

Protocol Amendment 1

TITLE: F8426 Technical: Analytical Method Validation in Filtered and Unfiltered Saltwater

STUDY NUMBER: J9602001d

FMC STUDY NUMBER: V96-0046

TEST SUBSTANCE: F8426 Technical

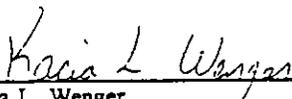
STUDY SPONSOR: FMC Corporation
105 College Road East, 2nd Floor
Princeton, New Jersey 08543
TEL: (609) 951-3698 FAX: (609) 951-3837

SPONSOR REPRESENTATIVE: Mark A. Palmieri

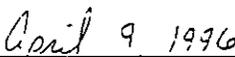
Amendment to test protocol

1. The test substance used in this study was PL93-356. A typographical error was made in original protocol.

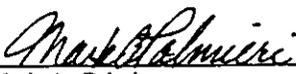
APPROVAL



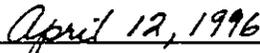
Kacia L. Wenger
Study Director
Toxikon Environmental Sciences



Date



Mark A. Palmieri
Sponsor Representative
FMC Corporation



Date