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May 25, 2000

VIA EXPRESS MAIL



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Dr. Charles Auer
Director
Chemical Control Division
Office Of Pollution Prevention And Toxics
United States Environmental Protection Agency
401 M Street, Southwest
Room 403 East Tower (Mail Code 7405)
Washington, D. C. 20460

Re: **Information On Perfluorooctanoic Acid And
Supplemental Information On Perfluorooctane
Sulfonates And Related Compounds**

Center NO CBI

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Dear Charlie:

Pursuant to our recent communications, 3M is enclosing information on perfluorooctanoic acid. We also are enclosing information on perfluorooctane sulfonates and related compounds which supplements information submitted to you previously under cover of our April 21, 2000, May 4, 2000 and May 18, 2000 letters. We are providing this information on a voluntary basis as part of our continuing discussions with EPA regarding fluorochemistry.

The enclosed information on perfluorooctanoic acid includes the following:

- ⇒ Copies of post-1975 studies and certain other information relating to the following environmental science areas: (i) physical and chemical properties; (ii) environmental fate and transport; (iii) environmental monitoring; and (iv) ecotoxicity. For each study, 3M has prepared a summary in the HPV "robust summary" format.
- ⇒ Copies of post-1975 studies and certain other information relating to the following health effects areas: (i) acute toxicity; (ii) genotoxicity; (iii) repeated-dose toxicity; (iv) pharmacokinetics; (v) teratology; and (vi) medical surveillance and epidemiology. 3M has included a detailed index of this information subdivided by

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each compound. We also have enclosed summaries for the medical surveillance and epidemiology studies and have included copies of certain published studies in this area in order to provide appropriate context.

- ⇒ Lists of all studies in progress and planned studies, along with study protocols or study plans, where available.
- ⇒ A bibliography of pre-1976 studies subdivided by each compound.
- ⇒ A bibliography of acute toxicity studies subdivided by each compound, except that we are providing copies of key acute studies (with reference to the HPV guidance).
- ⇒ A bibliography of published studies in 3M's possession.

3M is continuing its file review and will supplement the enclosed information on perfluorooctanoic acid as appropriate. As you review this information, we ask that you bear several points in mind:

- ⇒ The enclosed information spans several boxes. We have organized the information in each box with labeled file folders and indices to aid EPA's review. To ensure that you and your staff are able to access the most pertinent information, we also are attaching to this letter the indices covering studies and other information.
- ⇒ 3M provided the Agency with a list of all fluorochemical-related submissions made by 3M to the TSCA Section 8(e) docket under cover of our May 4, 2000 letter. This list included all submissions on perfluorooctanoic acid.
- ⇒ The enclosed information includes studies on perfluorooctanoic acid as well as on aqueous and/or solvent solutions of this material. Many of the studies refer to the test substance only by a 3M product identification number with a "T", "L", "FM" or "FC" prefix. Although analysis of the test substance has been included, where available, it is often not possible to determine from the study report itself the identity of the test substance. To assist in interpreting the studies, we have used 3M's historical product number records to provide composition information (e.g., composition percentages; solvent content; purity grade, etc.) next to each study name on the index and/or on the study summary. Please note that some formulations contain a small amount of "perfluorochemical inerts" – a term which refers to a completely fluorinated carbon chain with no functionalized components. Finally, it should be recognized that product formulations have evolved over the years, and thus, some of the test substances do not constitute current products.

- ⇒ 3M understands that the Agency has requested information on perfluorooctanoic acid from duPont. For this reason, we are not providing copies of studies on perfluorooctanoic acid in 3M's files sponsored or conducted by duPont.
- ⇒ Consistent with the information previously provided on perfluorooctane sulfonates and related compounds, 3M has not provided all analytical chemistry reports on perfluorooctanoic acid. Rather, we have enclosed analytical chemistry reports which may prove useful to EPA in interpreting certain studies; understanding the details of analytical chemistry methods; or verifying human and biomonitoring data.
- ⇒ The enclosed information does not include a "Use And Exposure Information Profile" or "UEIP" for perfluorooctanoic acid. Our present intention is to provide you with completed a UEIP form for perfluorooctanoic acid by June 9, 2000.
- ⇒ The information on perfluorooctane sulfonates under cover of our May 4, 2000 letter included documents relating to ongoing mechanistic research by Dr. Ken Wallace of the University of Minnesota. Please note that this research also encompasses perfluorooctanoic acid. The comparative metabolism research by Dr. Marion Anders of the University of Rochester Medical Center also includes perfluorooctanoic acid; there are not documents yet available relating to this research.

Charles Auer
May 25, 2000
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3M looks forward to discussing the enclosed information with you and other EPA staff. In the meantime, please do not hesitate to contact me with any questions.

Very truly yours



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Enclosures

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**Attachments to Letter to C. Auer dated May 25, 2000
Toxicology Studies and Other Information on PFOA**

PFOA	
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Acute Toxicity

- 1) Inhalation Toxicity Study of T-2305 CoC - Rat
 - a) Final Report, An Acute Inhalation Toxicity Study of T-2305 CoC in the Rat, Bio/dynamics, Inc., Study No. 78-7184, May 3, 1979
 - b) Technical Report Summary, Analysis of rat serum of FC-143, reported in terms of organic and inorganic fluorine, Central Research Laboratories, June 20, 1979
- 2) Final Report, Acute Oral Toxicity (LD₅₀) Study in Rats, International Research and Development Corporation, Study No. 137-091, 3M Reference No. Fluorad® FC-143, Lot 340, May 5, 1978
- 3) Final Report, Acute Oral Toxicity Study of T-6669 in Rats, Corning Hazelton, Inc., Study No. CHW 61001760, 3M Ref. FC-143, January 10, 1997
- 4) Final Report, Primary Skin Irritation Study - Rabbits, Biosearch, Inc., 3M Reference No. T-1395, FC-143, March 4, 1976
- 5) Final Report, Primary Eye Irritation Study - Rabbits (Washout Procedure), Biosearch, Inc., 3M Reference No. T-1395, FC-143, March 4, 1976
- 6) Final Report, Primary Eye Irritation Study - Rabbits (Not Washed), Biosearch, Inc., 3M Reference No. T-1395, FC-143, March 4, 1976
- 7) Final Report, Primary Skin Irritation Test with T-3371 in Albino Rabbits, Riker Laboratories, Study No. 0883EB0079, 3M Reference FC-26, Lot 389, July 13, 1983
- 8) Final Report, Acute Oral Toxicity - Rats, Biosearch, Inc., 3M Reference No. T-1585, FC-26 (perfluorooctanoic acid), September 16, 1976
- 9) Final Report, Primary Eye Irritation Study - Rabbits, Biosearch, Inc., 3M Reference No. T-1585, FC-26 (perfluorooctanoic acid), September 16, 1976
- 10) Final Report, Acute Dermal Toxicity Study of T-6342 in Rabbits, Corning Hazelton, Inc., Study No. HWI 50800374, 3M Ref. No. FC-1090, L13364, Lot 1, F11426, sodium perfluorooctanoate solution, October 24, 1995

**Attachments to Letter to C. Auer dated May 25, 2000
Toxicology Studies and Other Information on PFOA**

Acute Studies - Bibliography Only

- 1) Final Report, Acute Oral Toxicity - Rats, Biosearch, Inc., 3M Reference No. T-1395, FC-143, March 4, 1976
- 2) Final Report, Primary Skin Irritation Study - Rabbits, Biosearch, Inc., 3M Reference No. T-1585, FC-26 (perfluorooctanoic acid), September 16, 1976
- 3) Final Report, Acute Oral Toxicity Study in Rats, Hazelton Laboratories America, Inc., 3M Reference No. T-3974, Lot 390 (FC-126, approximately 88% solid), February 6, 1987
- 4) Final Report, Primary Dermal Irritation Study in Rabbits - Method, Summary, Raw Data Appendix, Hazelton Laboratories America, Inc., 3M Reference No. T-3974, Lot 390 (FC-126, approximately 88% solid), December 31, 1986
- 5) Final Report, Primary Eye Irritation Study in Rabbits - Method, Summary, Raw Data Appendix, Hazelton Laboratories America, Inc., 3M Reference No. T-3974, Lot 390 (FC-126, approximately 88% solid), January 14, 1987
- 6) Final Report, Primary Eye Irritation/Corrosion Study of T-6564 in Rabbits, Corning Hazelton, Inc., Study No. CHW 60504574, 3M Ref. No. FC-1015, Fluorad® fluorochemical emulsifier, L13167, straight-chain APFO solution, September 5, 1996
- 7) Final Report, Primary Dermal Irritation/Corrosion Study of T-6564 in Rabbits, Corning Hazelton, Inc., Study No. CHW 60504573, 3M Ref. No. FC-1015, Fluorad® fluorochemical emulsifier, L13167, straight-chain APFO solution, August 15, 1996
- 8) Final Report, Acute Oral Toxicity Study of T-6564 in Rats, Corning Hazelton, Inc., Study No. CHW 60504572, 3M Ref. No. FC-1015, Fluorad® fluorochemical emulsifier, L13167, straight-chain APFO solution, November 8, 1996
- 9) Final Report, Acute Oral Toxicity Study of T-6342 in Rats, Hazelton Wisconsin, Inc., Study No. HWI 50800373, 3M Ref. No. FC-1090, L13364, Lot 1, F11426, sodium perfluorooctanoate solution, November 16, 1995
- 10) Final Report, Primary Eye Irritation/Corrosion Study of T-6342 in Rabbits, Hazelton Wisconsin, Inc., Study No. HWI 50800376, 3M Ref. No. FC-1090, L13364, Lot 1, F11426, sodium perfluorooctanoate solution, October 12, 1995
- 11) Final Report, Primary Dermal Irritation/Corrosion Study of T-6342 in Rabbits, Hazelton Wisconsin, Inc., Study No. HWI 50800375, 3M Ref. No. FC-1090, L13364, Lot 1, F11426, sodium perfluorooctanoate solution, September 28, 1995

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Genotoxicity

- 1) An Assay of Cell Transformation and Cytotoxicity in the C3H 10T 1/2 Clonal Cell Line for the Test Chemical T-2942 CoC, Environmental Pathology Laboratory, Stone Research Laboratories, University of Minnesota, 3M Ref. No. FC-143 Lot 340, L138679, March 5, 1981
- 2) Final Report, Mutagenic Evaluation of T-2015 CoC in the Ames Salmonella/Microsome Plate Test, Litton Bionetics, Inc., Study No. 20838, 3M Ref. No. FC-143, February 1978
- 3) Final Report, Mutagenicity Test on T-6564 in an *In Vivo* Mouse Micronucleus Assay, Corning Hazelton, Inc., Study No. 17750-0-455, 3M Ref. No. FC-1015, L13167, straight-chain APFO, November 1, 1996
- 4) Final Report, Mutagenicity Test on T-6564 Measuring Chromosomal Aberrations in Chinese Hamster Ovary (CHO) Cells: with a Confirmatory Assay with Multiple Harvests, Corning Hazelton Inc., Study No. 17750-0-437CO, 3M Ref. No. FC-1015, L13167, straight-chain APFO, September 16, 1996
- 5) Final Report, Mutagenicity Test with T-6564 in the *Salmonella - Escherichia Coli*/Mammalian-Microsome Reverse Mutation Assay with a Confirmatory Assay, Corning Hazelton Inc., Study No. 17750-0-409R, 3M Ref. No. FC-1015, L13167, straight-chain APFO, September 13, 1996
- 6) Final Report, Mutagenicity Test on T-6342 Measuring Chromosome Aberrations in Human Whole Blood Lymphocytes with a Confirmatory Assay with Multiple Harvests, Corning Hazelton, Inc., Study No. 17073-0-449CO, 3M Ref. No. FC-1090, L13364, F11426, Lot 1, sodium perfluorooctanoate, November 1, 1996
- 7) Final Report, Mutagenicity Test on T-6342 Measuring Chromosomal Aberrations in Chinese Hamster Ovary (CHO) Cells: with a Confirmatory Assay with Multiple Harvests, Corning Hazelton, Inc., Study No. 17073-0-437CO, 3M Ref. No. FC-1090, L13364, F11426, Lot 1, sodium perfluorooctanoate, September 16, 1996
- 8) Final Report, Mutagenicity Test on T-6342 in an *In Vivo* Mouse Micronucleus Assay, Corning Hazelton, Inc., Study No. 17073-0-455, 3M Ref. No. FC-1090, L13364, F11426, Lot 1, sodium perfluorooctanoate, December 14, 1995
- 9) Final Report, Mutagenicity Test with T-6342 in the *Salmonella - Escherichia Coli*/Mammalian-Microsome Reverse Mutation Assay, Corning Hazelton, Inc., Study No. 1703073-0-409, 3M Ref. No. FC-1090, L13364, F11426, Lot 1, sodium perfluorooctanoate, December 14, 1995

**Attachments to Letter to C. Auer dated May 25, 2000
Toxicology Studies and Other Information on PFOA**

Repeated-Dose Toxicity

- 1) Final Report, Volumes 1-4, Two Year Oral (Diet) Toxicity / Carcinogenicity Study of Fluorochemical FC-143 in Rats, Riker Laboratories, Inc., Study No. 0281CR0012, conducted during April 1981 - May 1983, August 29, 1987, with Study Report Amendment No. 1, dated November 2, 1987
- 2) Ninety Day Subacute Rat Toxicity Study on Fluorad[®] Fluorochemical FC-143
 - a) Final Report, Ninety Day Subacute Rat Toxicity Study on Fluorad[®] Fluorochemical FC-143, International Research and Development Corporation, Study No. 137-089, 3M Reference No. T-3141, November 6, 1978
 - b) 3M Internal Correspondence re FC-143 analysis of serum samples from rats of 90-day subacute study, from Jon Belisle to JE Long, dated March 20, 1978
 - c) 3M Internal Correspondence re FC-143 analysis of liver samples from rats of 90-day subacute study, from Jon Belisle to JE Long, dated March 31, 1978
- 3) Final Report, 28-Day Oral Toxicity Study with FC-143 in Albino Mice, Industrial Bio-Test Laboratories, Inc., Study No. 8532-10655, 3M Reference No. T-1742CoC, Lot 269, Undated [1977]
- 4) Final Report, 28-Day Oral Toxicity Study with FC-143 in Albino Rats, Industrial Bio-Test Laboratories, Inc., Study No. 8532-10654, 3M Reference No. T-1742CoC, Lot 269, September 29, 1977
- 5) Final Report, Repeat Application 28 Day Percutaneous Absorption Study with T-2618CoC in Albino Rabbits, Safety Evaluation Laboratory, Riker Laboratories, Inc., Study No. 09790AB0485, 3M Ref. No. FC-143, March 15, 1981
- 6) Ninety Day Subacute Rhesus Monkey Toxicity Study
 - a) Final Report, Ninety Day Subacute Rhesus Monkey Toxicity Study, International Research and Development Corporation, Study No. 137-090, November 10, 1978
 - b) Analytical data, FC-143 Analysis of IRDC 137-090 Samples [monkey serum and liver samples], 3M Central Research Laboratories, May 16, 1978
- 7) Final Report, Vol. I-II, 13-Week Dietary Toxicity Study with T-5180, Ammonium Perfluorooctanoate (CAS No. 3825-26-1) in Male Rats, Hazelton Wisconsin, Inc., Study No. HWI 6329-100, May 17, 1993
- 8) Final Report, 5 Daily Dose Oral Toxicity Study with T-6669 (FC-143) in Rats, Corning Hazelton, Inc., Study No. CHW 6329-197, April 30, 1997

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**Attachments to Letter to C. Auer dated May 25, 2000
Toxicology Studies and Other Information on PFOA**

Ongoing:

26-Week Capsule Toxicity Study with Ammonium Perfluorooctanoate (APFO) in Cynomolgus Monkeys, Covance Laboratories Inc., No. 6329-231, 3M Ref. No. T-6889.3. In progress. Protocol provided.

Note: The study is sponsored by the Association of Plastic Manufacturers of Europe, APFO Toxicology Working Group. 3M has submitted a notice under TSCA Section 8(e) regarding preliminary data from this study. 3M and other Working Group members have received draft reports on the 4-week range-finding study and the full study, but these drafts are now obsolete. Final reports are in preparation and will be provided to the docket when available. In addition, the Working Group is still awaiting the hormonal measurements report covering cholecystokinin data; serum, urine, feces and liver APFO levels; palmitoyl CoA oxidase determinations; cell proliferation evaluations; and bile acid and receptor level determinations.

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**Attachments to Letter to C. Auer dated May 25, 2000
Toxicology Studies and Other Information on PFOA**

Pharmacokinetic Studies

- 1) Final Report, Analytical Study, Single-Dose Intravenous Pharmacokinetic Study of T-6067 in Rabbits, 3M Ref. No. L13492 (45% perfluorooctanoic acid tetrabutylammonium salt in water and isopropyl alcohol), Study No. AMDT-120694.1, November 28, 1995; report includes Final Report, Single-Dose Intravenous Pharmacokinetic Study of T-6067 in Rabbits, Hazelton Wisconsin, Inc., Study No. HWI 6329-151, February 1, 1995
- 2) Final Report, Analytical Study, Single-Dose Absorption/Toxicity Study of T-6067 T-6068, and T-6069 in Rabbits, 3M Environmental Technology & Services, Study No. AMDT-011095.1, November 28, 1995; report includes Final Report, Single-Dose Absorption/Toxicity Study of T-6067, T-6068, and T-6069 in Rabbits, Hazelton Wisconsin, Inc., Study No. HWI 6329-152, May 26, 1995;

T-6067 is L13492, 45% perfluorooctanoate tetrabutyl ammonium salt in water and isopropyl alcohol;

T-6068 is fabric treated with high level of L13492, 45% perfluorooctanoate tetrabutyl ammonium salt in water and isopropyl alcohol;

T-6069 is fabric treated with low level of L13492, 45% perfluorooctanoate tetrabutyl ammonium salt in water and isopropyl alcohol
- 3) ADME studies with FC-143-¹⁴C
 - a) Final Report, Absorption of FC-143-¹⁴C in Rats After a Single Oral Dose, Riker Laboratories, Inc., January 14, 1980
 - b) Final Report, Synthesis and Characterization of FC-143-¹⁴C, Commercial Chemicals Division and Riker Laboratories, Inc., January 23, 1980
 - c) Final Report, Extent and Route of Excretion and Tissue Distribution of Total Carbon-14 in Male and Female Rats After a Single IV Dose of FC-143-¹⁴C, Riker Laboratories, Inc., February 7, 1980
 - d) Final Report, Extent and Route of Excretion of Total Carbon-14 in Pregnant Rats After a Single Oral Dose of Ammonium ¹⁴C-Perfluorooctanoate, Riker Laboratories, Inc., July 1, 1983
 - e) Final Report, Enhanced Elimination of FC-95-¹⁴C and FC-143-¹⁴C in Rats with Cholestyramine Treatment, Riker Laboratories, Inc., March 14, 1980
- 4) Final Report, Single-Dose Intravenous Pharmacokinetic Study of T-6564 in Rabbits, Corning Hazelton Inc., Study No. CHW 6329-186, April 18, 1997
- 5) Final Report, 5-Daily Dose Dermal Absorption/Toxicity Study of T-6564 in Rabbits, Corning Hazelton, Inc., Study No. CHW 6329-185, April 28, 1997

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Toxicology Studies and Other Information on PFOA**

Teratology

- 1) Teratology Study of T-2998CoC in Rats
 - a) Oral Rangefinder Study of T-2998CoC in Pregnant Rats, Riker Laboratories, Inc., Study No. 0680RR0018, February 25, 1981
 - b) Final Report, Oral Teratology Study of T-2998 CoC in Rats, Riker Laboratories, Inc., Study No. 0681TR0110, December 15, 1981, with Amendment to Final Report, December 22, 1981 and Protocol
- 2) Teratology Study of T-3141CoC in Rabbits
 - a) Oral Rangefinder Study of T-3141 CoC in Pregnant Rabbits, Riker Laboratories, Inc., Study No. 0681RB0331, November 18, 1981
 - b) Final Report, Oral Teratology Study of T-3141CoC in Rabbits, Riker Laboratories, Inc., Study No. 0681TB0398, February 23, 1982
 - c) 3M Internal Correspondence re analytical analyses of T-3141CoC, from LD Winter to DR Ricker, dated February 5, 1982
- 3) Letter re further testing from E. Marshall Johnson, Jefferson Medical College to Dr. Franklin D. Griffith, dated November 19, 1982
- 4) 3M Memo re FC 95 and 143 Teratology, from Marv Case to Georjean Adams, dated May 26, 1998, enclosing an analysis of the eye lens defect

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Toxicology Studies and Other Information on PFOA**

Human Sera/Medical Surveillance/Epidemiology

- 1) F. A. Ubel, et al. *Health Status of Plant Workers Exposed to Fluorochemicals- A Preliminary Report*, 41 Am. Ind. Hyg. Assoc. J. 584-589 (August 1980), with Summary.
- 2) Leonard M. Schuman & Jack S. Mandel, *An Epidemiologic Mortality Study of Employees at the Chemolite Plant* (February 1980), with Summary of study.
- 3) Jack S. Mandel & Leonard M. Schuman, "Mortality Study at the 3M Chemolite Plant" (January 1989), with Summary of study.
- 4) Frank D. Gilliland & Jack S. Mandel, *Mortality Among Employees of a Perfluorooctanoic Acid Production Plant*, 35 JOM 950-954 (September 1993), with Summary of study.
- 5) Frank Davis Gilliland, *Fluorocarbons and Human Health: Studies in an Occupational Cohort* (October 1992)(unpublished Ph.D. thesis, University of Minnesota), with Summary.
- 6) Geary W. Olsen, et al., *An Epidemiological Investigation of Reproductive Hormones in Men with Occupational Exposure to Perfluorooctanoic Acid*, 40 JOEM 614-619 (July 1, 1998), with Summary of study.
- 7) Frank D. Gilliland & Jack S. Mandel, *Serum Perfluorooctanoic Acid and Hepatic Enzymes, Lipoproteins, and Cholesterol: A Study of Occupationally Exposed Men*, 29 American Journal of Industrial Medicine 560-568 (1996), with Summary of study.
- 8) Geary W. Olsen, et al., *An Epidemiologic Investigation of Plasma Cholecystokinin and Hepatic Function in Perfluorooctanoic Acid Production Workers*, 3M Final Report EPI-0003, (1997), with Summary of study, Protocol, and Manuscript accepted for publication in 2000, Drug & Chemical Toxicology.
- 9) Physician Plant Summary Reports Regarding Medical Surveillance Program at Cottage Grove (1978-1991)
 - a) Summary of Program Reports
 - b) Blood Levels of RF/F in Selected Employees, dated June 20, 1978
 - c) 3M Internal Correspondence re 1981 Chemical Division Health Evaluations from DE Roach to PF Riehle, dated February 16, 1982
 - d) 3M Internal Correspondence re 1981 Chemolite Health Evaluations, from DE Roach to PF Riehle, dated August 12, 1982

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**Attachments to Letter to C. Auer dated May 25, 2000
Toxicology Studies and Other Information on PFOA**

- e) 3M Internal Correspondence re Inorganic Fluoride Determinations, from DE Roach to PF Riehle, dated April 9, 1984
- f) 3M Internal Correspondence re Organic Fluorine Levels, from DE Roach to PF Riehle, dated August 31, 1984
- g) 3M Internal Correspondence re Medical Examinations, from L Zobel to DW Dworak, dated March 20, 1987
- h) 3M Internal Correspondence re Chemolite Evaluations, Fall, 1990, from Larry R Zobel to Clair Murphy, et al., dated May 10, 1991

Previously submitted with April 21, 2000 letter to Charlie Auer, Fluorochemical Exposure (Serum) Assessment of (3M) Decatur Chemical and Film Plant Employees.

Ongoing Studies

See list of planned studies submitted with letter of April 21, 2000, which will address perfluorooctanoic acid as well as perfluorooctane sulfonate.

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Attachments to Letter to C. Auer Dated May 25, 2000
Published Literature in 3M's Possession

Abdellatif, A.G., V. Pr  at, H.S. Taper, and M. Roberfroid. The modulation of rat liver carcinogenesis by perfluorooctanoic acid, a peroxisome proliferator. *Toxicology & Applied Pharmacology* **111** (1991) 530-537.

Abdellatif, A.G., V. Pr  at, J. Vamecq, R. Nilsson, and M. Roberfroid. Peroxisome proliferation and modulation of rat liver carcinogenesis by 2,3-dichlorophenoxyacetic acid, 2,4,5-trichlorophenoxyacetic acid, perfluorooctanoic acid and nafenopin. *Carcinogenesis* **11** (1990) 1899-1902.

Belisle, J., and D. Hagen. A method for determination of perfluorooctanoic acid in blood and other biological samples. *Analytical Biochemistry* **101** (1980) 369-376.

Biegel, L.B., M.E. Hurtt, and J.C. Cook. Effects of ammonium perfluorooctanoate (C8) on Leydig cell function: In vivo, ex vivo, and in vitro studies. *The Toxicologist* **13**[1] (1993) 399.

Biegel, L.B., R.C.M. Liu, M.E. Hurtt, and J.C. Cook. Effects of ammonium perfluorooctanoate on Leydig cell function: In vivo, ex vivo, and in vitro studies. *Toxicology & Applied Pharmacology* **134** (1995) 18-25.

Borjes, H.K. and R.G. Thurman. Peroxisomal proliferators inhibit Acyl CoA synthesis and stimulate protein kinase C in vivo. *Toxicology & Applied Pharmacology* **126** (1994) 233-239.

Clapperton, R.M., B.T. Ingram, R.H. Ottewill, and A.R. Rennie. NMR spectroscopic and neutron scattering studies on ammonium decanoate-ammonium perfluorooctanoate mixtures. In: *Mixed Surfactant Systems. ACS Symposium Series 501*, Eds.: P.M. Holland and D.N. Rubingh, American Chemical Society: Washington, DC, 1992, 268-277.

Clegg, E.D., J.C. Cook, R.E. Chapin, P. Foster, and G.P. Daston. Leydig cell hyperplasia and adenoma formation: Mechanisms and relevance to humans (abstract). *Reproductive Toxicology* **11**(1) (1997) 107-121.

Cook, J.C., S.M. Murray, S.R. Frame, and M.E. Hurtt. Induction of Leydig cell adenomas by ammonium perfluorooctanoate: A possible endocrine related mechanism. *Toxicology & Applied Pharmacology* **113** (1991) 209-217.

Cook, J.C., M.E. Hurtt, S.R. Frame, L.B. Biegel. Effects of Wyeth-14,643 (WY) and ammonium perfluorooctanoate (C8) in Crl:CD BR (CD) rats. *The Toxicologist* **13**[1] (1993) 399.

Cook, J.C., M.E. Hurtt, S.R. Frame, L.B. Biegel. Mechanisms of extrahepatic tumor induction by peroxisome proliferators in Crl:CD BR (CD) rats. *The Toxicologist* **14**[1] (1994) 301.

Feller, D.R. and U. Intrasuk Sri. Mechanism of peroxisome proliferation by perfluorinated fatty acids in primary cultures of rat hepatocytes (abstract). *Toxicologist* **13** (1993) 395.

Gilliland, F.D. Fluorocarbons and human health: Studies in an occupational cohort. Unpublished Ph.D. Dissertation, University of Minnesota, 1992.

Gilliland, F.D. and J.S. Mandel. Mortality among employees of a perfluorooctanoic acid production plant. *JOM* **35**[9] (September 1993) 950-954.

Gilliland, F.D. and J.S. Mandel. Serum perfluorooctanoic acid and hepatic enzymes, lipoproteins, and cholesterol: a study of occupationally exposed men. *American Journal of Industrial Medicine* **29** (1996) 560-568.

Griffith, F.D., and J.E. Long. Animal toxicity studies with ammonium perfluorooctanoate. *American Industrial Hygiene Association Journal* **41** (1980) 576-583.

Handler, J.A., C.B. Seed, B.U. Bradford, and R.G. Thurmond. Induction of peroxisomes by treatment with perfluorooctanoate does not increase rates of H₂O₂ production in intact liver. *Toxicology Letters* **60** (1990) 61-68.

Hanhijärvi, H., M. Ylinen, A. Kojo, and V.M. Kosma. Elimination and toxicity of perfluorooctanoic acid during subchronic administration in the Wistar rat. *Pharmacology & Toxicology* **61** (1987) 66-68.

Hanhijärvi, H., R.H. Ophaug, and L. Singer. The sex-related difference in perfluorooctanoate excretion in the rat. *Proceedings of the Society for Experimental Biology & Medicine* **171** (1982) 50-55.

Haughom, B., and O. Spydevold. The Mechanism Underlying the Hypolipemic Effect of Perfluorooctanoic Acid (PFOA), Perfluorooctane Sulphonic Acid (PFOSA) and Clofibrilic Acid. *Biochim. Biophys. Acta.* **1128**[1] (1992) 65-72.

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PFOA and Associated Salts

Synonyms: FC-26, FX-1001, PFO, FC-143, 78.03, FC-126, N-2803-3, FX-1003, FC-118, FC-1015, FC-1015-X

Physical/Chemical Properties

Title	Laboratory or Author	Date Completed	Type
Water, acetone and toluene solubility estimates - FC-143	3M Env. Lab	11/17/81	Robust summary, copy of data sheet

Environmental Fate and Transport

Title	Laboratory or Author	Completion Date	Type
Ready biodegradation of FC-143 (BOD/COD/TOC)	3M Env. Lab	7/14/77	Robust summary, copy of laboratory data summary
Technical Report Summary - Adsorption of FC 95 and FC 143 on Soil, and a critique from Dr. S. Boyd, Michigan State University	3M Env. Lab	2/27/78, 5/19/93	Robust summary, technical report, critique by S. Boyd (MSU)
Technical Report Summary - Biodegradation Studies of Fluorocarbons - III (FC-143)	3M Env. Lab	7/19/78	Robust summary, technical report
Technical Report Summary - FC-143 Photolysis Study Using Simulated Sunlight	3M Agrichemical Lab	2/2/79	Robust summary, technical report.
Technical Report Summary - Analysis for Fluorochemicals in Bluegill Fish, and a critique by J. W. Gillett of Cornell University	3M Env. Lab	5/1/1979, 3/8/93	Robust summary, technical report, critique by J. Gillett (Cornell)
Ready biodegradation of FC-143 (BOD/COD)	3M Env. Lab	6/5/80	Robust summary, copies of data sheets.
Calculated octanol water partition coefficient - FC-143	3M Env. Lab	12/7/81	Robust summary, copy of calculations
Ready biodegradation of FX-1001 (BOD/COD)	3M Env. Lab	2/7/85	Robust summary, computer-generated final report, copies of raw data sheets.
Ready biodegradation of FC-126 (BOD/COD)	Pace Analytical, Minneapolis, MN	5/20/87	Robust summary, computer-generated final report, copy of final report

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PFOA and Associated Salts

Environmental Fate and Transport

Title	Laboratory or Author	Completion Date	Type
Technical Report Summary - Assessment of the Bioaccumulative Properties of Ammonium Perfluorooctanate: Static (fish test)	3M Env. Lab	5/31/95	Robust summary, technical report, critique by J. Giesy (MSU)

Ecotoxicity Elements

Title	Laboratory or Author	Completion Date	Type
96-hour acute static toxicity to fathead minnow - FC-143	3M Env. Lab	6/29/74	Robust summary, copy of data sheet
96-hour acute static toxicity to fathead minnow - FC-26	3M Env. Lab	11/10/74	Robust summary, copy of data sheet.
96-hour acute static toxicity to bluegill sunfish - FC-143	3M Env. Lab	4/8/78	Robust summary, copy of data sheet
96-hour acute static toxicity to bluegill sunfish - FC-143	3M Env. Lab	5/27/78	Robust summary, copy of data sheet
Two reports : "The Effects of Continuous Aqueous Exposure to 78.03 on Hatchability of Eggs and Growth and survival of Fry of Fathead Minnow (<u>Pimephales promelas</u>)" and "Summary of Histopathological Examinations of Fathead Minnow (<u>Pimephales promelas</u>) Exposed to 78.03 for 30 Days".	EG&G Bionomics, Wareham, MA	June 1978 and Sept. 1978	Robust summary, copies of two final reports.
Technical Report Summary - Aquatic Toxicity Testing: FC-143 (Lot-37) L.R. 5625 S	3M Env. Lab	5/8/80	Robust summary, technical report
Toxicity to activated sludge - FC-143	3M Env. Lab	6/4/80	Robust summary, copies of data sheets
Technical Report Summary - Multi-Phase Exposure/Recovery Algal Assay Test method (FC-143)	3M Env. Lab	11/16/81	Robust summary, technical report
48-hour acute static toxicity to <i>Daphnia magna</i> - FC-143 (3 studies on diet)	3M Env. Lab	5/5/82, 5/6/82, 6/2/82	Robust summary, copies of data sheets
Chronic Toxicity of Fluorochemicals to <u>Daphnia magna</u> (Water Flea) - FC-143, and statistical analysis of data provided by AScl Corp., Duluth, MN	3M Env. Lab	8/31/1984, 8/10/98	Robust summary, summary report, letter report
96-hour acute static toxicity to fathead minnow - FX-1001	3M Env. Lab	2/2/85	Robust summary, copy of data sheet.

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PFOA and Associated Salts

Ecotoxicity Elements

Title	Laboratory or Author	Completion Date	Type
Activated sludge respiration inhibition (OECD 209) - FC-126	3M Env. Lab	4/20/87	Robust summary, copy of data sheets.
Microtox test - FC-126	3M Env. Lab	4/29/87	Robust summary, copy of data sheets.
48-hour acute static toxicity to <i>Daphnia magna</i> - FC-126	3M Env. Lab	4/30/87	Robust summary, copy of data sheets.
96-hour acute static toxicity to fathead minnow - FC-126	3M Env. Lab	5/1/87	Robust summary, copy of data sheets.
Activated sludge respiration inhibition (OECD 209) - FX-1003	3M Env. Lab	2/16/90	Robust summary, copies of data sheets
Microtox test - FX-1003	3M Env. Lab	3/7/90	Robust summary, copies of data sheets
Static Acute Toxicity of FX-1003 to the Fathead Minnow, <i>Pimephales promelas</i>	EnviroSystems, Hampton, New Hampshire	3/15/90	Robust summary, final report, protocol
Static Acute Toxicity of FX-1003 to the Daphnid, <i>Daphnia magna</i>	EnviroSystems, Hampton, New Hampshire	4/9/90	Robust summary, final report, protocol
Growth and Reproduction Toxicity Test with N2803-3 and the Freshwater Alga, <i>Selenastrum capricornutum</i>	T.R. Wilbury Laboratories, Inc, Marblehead, MA	1/24/96	Robust summary, final report
Acute Toxicity of N2803-3 to the Fathead Minnow, <i>Pimephales promelas</i>	T.R. Wilbury Laboratories, Inc, Marblehead, MA	1/24/96	Robust summary, final report
Acute Toxicity of N2803-3 to the Daphnid, <i>Daphnia magna</i>	T.R. Wilbury Laboratories, Inc, Marblehead, MA	3/7/96	Robust summary, final report
Microtox test - FC-143	3M Env. Lab	4/24/96	Robust summary, copies of data sheets
Microtox test - FC-118	3M Env. Lab	4/24/96	Robust summary, copies of data sheets
Microtox test - FC-1015-X	3M Env. Lab	4/24/96	Robust summary, copies of data sheets

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PFOA and Associated Salts

Ecotoxicity Elements

Title	Laboratory or Author	Completion Date	Type
Activated Sludge Respiration Inhibition Test - FC-1015-X	3M Env. Lab	4/25/96	Robust summary, copies of data sheets
Acute Toxicity of FC-1015 to the Fathead Minnow, <i>Pimephales promelas</i>	T.R. Wilbury Laboratories, Inc, Marblehead, MA	5/15/96	Robust summary, final report
Growth and Reproduction Toxicity Test with FC-1015 and the Freshwater Alga, <i>Selenastrum capricornutum</i>	T.R. Wilbury Laboratories, Inc, Marblehead, MA	5/15/96	Robust summary, final report
Acute Toxicity of FC-1015 to the Daphnd, <i>Daphnia magna</i>	T.R. Wilbury Laboratories, Inc, Marblehead, MA	5/15/96	Robust summary, final report
Summary Reports			
Title	Laboratory or Author	Completion Date	Type
Technical Report Summary - Final Comprehensive Report: FC 143	3M Env. Lab	3/23/79	Robust summary, technical report

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**Attachments to Letter to C. Auer dated May 25, 2000
Toxicology Studies and Other Information on PFOA**

Update to Submission of May 18th

13. PFOS	Perfluorooctane Sulfonate
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- 1) Letter from E. Marshall Johnson to William C. McCormick, III, re Hazleton teratology studies, dated December 7, 1983.
- 2) Letter from E. Marshall Johnson to William C. McCormick, III re Riker teratology studies on PFOS and ethyl FOSE, dated November 12, 1982.

8. N-EtFOSE alcohol	N-ethyl perfluorooctane sulfonamidoethanol
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- 1) Letter from E. Marshall Johnson to William C. McCormick, III re Riker teratology studies on PFOS and ethyl FOSE, dated November 12, 1982.
- 2) Final Report, Biological Phase, Metabolism of N-Ethyl Perfluorooctane Sulfanomido Ethanol (Net-Fose; T-6316) In Cynomolgus Monkeys Following Administration of a Single Capsule Dose, Covance, Study No. 6329-226, June 9, 1999
Note: Analytical work associated with this study is ongoing.

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PFOS didecyldimethylammonium salt

Synonyms: P3025, L-14394

Physical/Chemical Properties

Title	Laboratory or Author	Date Completed	Type
None			

Environmental Fate and Transport

Title	Laboratory or Author	Completion Date	Type
Determination of the 28-day Carbonaceous Biochemical Oxygen Demand (CBOD) for P3025	3M Env. Lab	5/20/97	Robust summary, final report

Ecotoxicity Elements

Title	Laboratory or Author	Completion Date	Type
Acute Toxicity of P3025 Developmental Material to Fathead Minnow (<i>Pimphales promelas</i>)	ASCI Corporation, Duluth, MN	1/2/97	Robust summary, final report
Acute Toxicity of P3025 Developmental Material to <i>Daphnia magna</i>	ASCI Corporation, Duluth, MN	1/10/97	Robust summary, final report
Growth Inhibition of P3025 Green Alga (<i>Selenastrum capricornutum</i>)	ASCI Corporation, Duluth, MN	1/29/97	Robust summary, final report
Growth Inhibition of P3025 to Green Alga (<i>Selenastrum capricornutum</i>)	ASCI Corporation, Duluth, MN	2/21/97	Robust summary, final report
Inhibitory Effects of P3025 on Microtox	3M Env. Lab	5/12/97	Robust summary, final report
Inhibitory Effects of P3025 on Activated Sludge Respiration	3M Env. Lab	5/12/97	Robust summary, final report

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