

**BIBLIOGRAPHY OF KEY
PFOA AND PFOS STUDIES**

As of October 2009

[Click on Study Title to View Report](#)

TABLE OF CONTENTS

I. HUMAN STUDIES	1
A. Medical Surveillance	1
1. 3M Cottage Grove.....	1
2. 3M Decatur	1
3. Both Decatur and Cottage Grove	2
4. DuPont/Washington Works	2
5. Miteni Workers (Verona, Italy).....	2
6. Environmentally Exposed Populations	2
B. Mortality Studies	3
1. 3M Cottage Grove.....	3
2. 3M Decatur	3
3. DuPont/Washington Works	3
4. Environmentally Exposed Populations	3
C. Site-specific Biomonitoring	4
D. General Population – Biomonitoring	5
1. Serum	5
a) United States.....	5
b) Germany	6
c) Japan	6
d) China	6
e) Spain.....	6
2. Cord Blood.....	6
3. Milk	7
4. Diet	7
5. Liver	8

E. General Population - Mortality	8
F. General Population – Reproductive.....	8
II. TOXICOLOGICAL STUDIES	9
A. Reviews.....	9
B. Chronic and Subchronic Toxicity.....	9
1. PFOA.....	9
2. PFOS	10
C. Mechanism of Action	10
1. PPAR α	10
2. CAR.....	11
D. Pharmacokinetic Studies	11
E. Developmental Studies.....	14
1. PFOA.....	14
2. PFOS	14
F. Thyroid Hormone Status.....	15
1. PFOS	15
a) Human.....	15
b) Animal – Laboratory Studies.....	16
2. PFOA.....	17
a) Human.....	17
b) Animal – Laboratory Studies.....	17
III. Risk Assessment	17
A. Both PFOA and PFOS.....	17
B. PFOA.....	18
C. PFOS	18
D. TEQ Questions	18
IV. ANALYTICAL DOCUMENTS.....	18

A. Publications	18
B. EPA Reference Method	19
C. 3M Environmental Laboratory Methods	19
V. Treatment Technology.....	19

BIBLIOGRAPHY OF KEY PFOA AND PFOS STUDIES

September 2009

I. HUMAN STUDIES

A. Medical Surveillance

1. 3M Cottage Grove

Ubel FA, Sorenson SD, Roach DE. 1980. Health status of plant workers exposed to fluorochemicals - a preliminary report. *Am Ind Hyg Assoc J* 41:584-589.

Gilliland FD, Mandel JS. 1996. Serum perfluorooctanoic acid and hepatic enzymes, lipoproteins, and cholesterol: a study of occupationally exposed men. *Am J Ind Med* 29:560-568.

Olsen GW, Gilliland FD, Burlew MM, Burris JM, Mandel JS, Mandel JR. 1998. An epidemiologic investigation of reproductive hormones in men with occupational exposure to perfluorooctanoic acid. *JOEM* 40:614-622.

Olsen GW, Burris JM, Burlew MM, Mandel JH. 2000. Plasma cholecystokinin and hepatic enzymes, cholesterol and lipoproteins in ammonium perfluorooctanoate production workers. *Drug Chem Toxicol* 23:603-620.

2. 3M Decatur

Olsen GW, Burris JM, Mandel JH, Zobel LR. 1999. Serum perfluorooctane sulfonate and hepatic and lipid clinical chemistry tests in fluorochemical production employees. *JOEM* 41:799-806.

Olsen GW, Logan PW, Hansen KJ, Simpson CA, Burris JM, Burlew MM, Vorarath PP, Venkateswarlu P, Schumpert JC, Mandel JH. 2003. An occupational exposure assessment of a perfluorooctanesulfonyl fluoride production site: biomonitoring. *AIHAJ* 64:651-659.

Olsen GW, Burris JM, Burlew MM, Mandel JH. 2003. Epidemiologic assessment of worker serum perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) concentrations and medical surveillance examinations. *JOEM* 45:260-270.

Olsen GW, Burlew MM, Marshall JC, Burris JM, Mandel JH. 2004. Analysis of episodes of care in a perfluorooctanesulfonyl fluoride production facility. *JOEM* 46:837-846.

Alexander BH, Olsen GW. 2007. Bladder cancer in perfluorooctanesulfonyl fluoride manufacturing workers. *Ann Epidemiol* 17:471-478.

Grice MM, Alexander BH, Hoffbeck R, Kampa DM. 2007. Self-reported medical conditions in perfluorooctanesulfonyl fluoride manufacturing workers. *J Occup Environ Med* 49:722-729.

3. Both Decatur and Cottage Grove

Olsen GW, Zobel LR. 2007. Assessment of lipid, hepatic, and thyroid parameters with serum perfluorooctanoate (PFOA) concentrations in fluorochemical production workers. *Int Arch Occup Environ Health* 81:231-246.

Olsen GW, Burris JM, Ehresman OJ, Froehlich JW, Seacat AM, Butenhoff JL, Zobel LR. 2007. Half-life of serum elimination of perfluorooctanesulfonate, perfluorohexanesulfonate, and perfluorooctanoate in retired fluorochemical production workers. *Environ Health Perspect* 115:1298-1305

4. DuPont/Washington Works

Sakr CJ, Kreckmann KJ, Green JW, Gillies PJ, Reynolds JL, Leonard RC. 2007. Cross-sectional study of lipids and liver enzymes related to a serum biomarker of exposure (ammonium perfluorooctanoate or APFO) as part of a general health survey in a cohort of occupationally exposed workers. *J Occup Environ Med* 49:1086-1096.

Sakr CJ, Leonard RC, Kreckmann KH, Slade MD, Cullen MR. 2007. Longitudinal study of serum lipids and liver enzymes in workers with occupational exposure to ammonium perfluorooctanoate. *J Occup Environ Med* 49:872-879.

5. Miteni Workers (Verona, Italy)

Costa G, Sartori S, Consonni D. 2009. Thirty Years of Medical Surveillance in Perfluorooctanoic Acid Production Workers. *JOEM* 51:364-372.

6. Environmentally Exposed Populations

Emmett EA, Zhang H, Shofer FS, Freeman D, Rodway NY, Desai C, Shaw LM. 2006. Community exposure to perfluorooctanoate: relationships between serum levels and certain health parameters. *JOEM* 48:771-779.

C8 Science Panel Status report: Association of perfluorooctanoic acid (PFOA) and perfluorooctanesulfonate (PFOS) with lipids among adults in a community with high exposure to (PFOA). October 15, 2008.

http://www.c8sciencepanel.org/pdfs/Status_Report_C8_and_lipids_Oct2008.pdf

MacNeil J, Steenland NK, Shankar A, Ducatman A. 2009. A cross-sectional analysis of type II diabetes in a community with exposure to perfluorooctanoic acid. *Environ Res*, doi:10.1016/j.envres.2009.08.002.

Nolan LA, Nolan JM, Shofer FS, Rodway NV, Emmett EA. 2009. The relationship between birth weight, gestational age and perfluorooctanoic acid (PFOA)-contaminated public drinking water. *Reproductive Toxicology* doi:10.1016/j.reprotox.2008.11.001.

Stein CR, Savitz DA, Dougan M. Serum Levels of Perfluorooctanoic Acid and Perfluorooctane Sulfonate and Pregnancy Outcome. *American Journal of Epidemiology* 2009 170:837-846

C8 Science Panel Status Report: PFOA and immune biomarkers in adults exposed to PFOA in drinking water in the mid Ohio valley. March 18, 2009.
http://www.c8sciencepanel.org/pdfs/Status_Report_C8_and_Immune_markers_March2009.pdf

C8 Science Panel Status report: Association of perfluorooctanoic acid (PFOA) and perfluorooctanesulfonate (PFOS) with uric acid among adults with elevated community exposure to PFOA. January 27, 2009.
http://www.c8sciencepanel.org/pdfs/Status_Report_C8_and_uric_acid_Jan2009.pdf

B. Mortality Studies

1. 3M Cottage Grove

Schuman LM, Mandel JS. An Epidemiologic Mortality Study of Employees at the Chemolite Plant. 1980. EPA Docket No. AR226-0470.

Mandel JS, Schuman LM. Mortality Study at the 3M Chemolite Plant. 1989. EPA Docket No. AR226-0471.

Gilliland FD, Mandel JS. 1993. Mortality among employees of a perfluorooctanoic acid production plant. *J Occup Med* 35:950-954.

Lundin JI, Alexander BH, Olsen GW, Church TR. 2009. Ammonium Perfluorooctanoate Production and Occupational Mortality. *Epidemiology* 20:921-928

2. 3M Decatur

Alexander BH, Olsen GW, Burris JM, Mandel JH, Mandel JS. 2003. Mortality of employees of a perfluorooctanesulphonyl fluoride manufacturing facility. *OEM* 60:722-729.

3. DuPont/Washington Works

Leonard RC, Kreckmann KH, Sakr CJ, Symons JM. 2008. Retrospective cohort mortality study of workers in a polymer production plant including a reference population of regional workers. *Ann Epidemiol* 18:15-22.

Sakr CJ, Symons JM, Kreckmann KH, Leonard RC. 2009. Ischemic Heart Disease Mortality Study among Workers with Occupational Exposure to Ammonium Perfluorooctanoate. *JOEM* doi:10.1136/oem.2008.041582

4. Environmentally Exposed Populations

Minnesota Cancer Surveillance System Report, Cancer Incidence in Dakota and Washington Counties. Minnesota Department of Health, Chronic Disease and Environmental Epidemiology Section. June 2007.
<http://www.health.state.mn.us/divs/hpcd/cdee/mcss/documents/dakotawashingtoncancerreport.pdf>

C. Site-specific Biomonitoring

- Harada K, Saito N, Sasaki K, Inoue K, Koizumi A. 2003. Perfluorooctane sulfonate contamination of drinking water in the Tama River, Japan: estimated effects on resident serum levels. *Bull Environ Contam Toxicol* 71:31-36.
- Emmett EA, Shofer FS, Zhang H, Freeman D, Desai C, Shaw LM. 2006. Community exposure to perfluorooctanoate: relationships between serum concentrations and exposure sources. *JOEM* 48:759-70.
- Fromme H, Midasch O, Twardella D, Angerer J, Boehmer S, Liebl B. 2007. Occurrence of perfluorinated substances in an adult German population in southern Bavaria. *Int Arch Occup Environ Health* 80:313-19.
- Holzer J, Midasch O, Rauchfuss K, Kraft M., Reupert R., Angerer J., Kleeschulte P., Marschall N., Wilhelm M. 2008. Biomonitoring of Perfluorinated Compounds in Children and Adults Exposed to Perfluorooctanoate (PFOA) - contaminated Drinking Water. *Environ Health Perspect* 116:651-57.
- Wilhelm M, Kraft M, Rauchfuss K, Holzer J. 2008. Assessment and Management of the First German Case of a Contamination with Perfluorinated Compounds (PFC) in the Region Sauerland, North Rhine-Westphalia. *J Toxicol Environ Health A* 71:725-33.
- C8 Science Panel Status report: Factors associated with PFOA levels in a community surrounding a chemical plant. October 15, 2008.
http://www.c8sciencepanel.org/pdfs/Status_Report-factors_associated_with_C8_levels_Oct2008.pdf
- Steenland K, Jin C, MacNeil J, Lally C, Ducatman A, Veiera V, Fletcher T. 2009. Predictors of PFOA Levels in a Community Surrounding a Chemical Plant. *EHP* 117:1083-88.
- Wilhelm M, Angerer J, Fromme H, Holzer J. 2009. Contribution to the evaluation of reference values for PFOA and PFOS in plasma of children and adults from Germany. *Int J Hyg Environ Health* 212:56-60.
- Wilhelm M, Holzer J, Dobler L, Rauchfuss K, Midasch O, Kraft M, Angerer J, Wiesmuller, GA. 2009. Preliminary observations on perfluorinated compounds in plasma samples (1977-2004) of young German adults from an area with perfluorooctanoate-contaminated drinking water. *Int J Hyg Environ Health* 212:142-45.
- Minnesota Department of Health. 2009. East Metro Perfluorochemical Biomonitoring Pilot Project.
- C8 Science Panel Status report: Residents' PFOA serum concentrations before and after granular activated carbon filtration at public water systems in Little Hocking, Ohio and Lubeck, West Virginia. March 26, 2009.
http://www.c8sciencepanel.org/pdfs/Status_Report_C8_half-life_year1_March2009.pdf

D. General Population – Biomonitoring

1. Serum

a) United States

- Olsen GW, Hansen KJ, Stevenson LA, Burriss JM, Mandel JH. 2003. Human Donor Liver and Serum Concentrations of Perfluorooctanesulfonate and Other Perfluorochemicals. *Env Sci Technol* 37:888-91.
- Olsen GW, Church TR, Miller JP, Burriss JM, Hansen KJ, Lundberg JK, Armitage JB, Herron RM, Medhdizadehkashi Z, Nobiletti JB, O'Neill EM, Mandel JR, Zobel LR. 2003. Perfluorooctanesulfonate and other fluorochemicals in the serum of American Red Cross adult blood donors. *Environ Health Perspect* 111:1892-1901.
- Olsen GW, Church TR, Hansen KJ, Burriss JM, Butenhoff JL, Mandel JH, Zobel LR. 2004. Quantitative evaluation of perfluorooctanesulfonate (PFOS) and other fluorochemicals in the serum of children. *J Children Health* 2:53-76.
- Olsen GW, Church TR, Larson EB, van Belle G, Lundberg JK, Hansen KJ, Burriss JM, Mandel JH, Zobel LR. 2004. Serum concentrations of perfluorooctanesulfonate and other fluorochemicals in an elderly population from Seattle, Washington. *Chemosphere* 54:1599-1611.
- Olsen GW, Huang HY, Helzlsouer KJ, Hansen KJ, Butenhoff JL, Mandel JH. 2005. Historical comparison of perfluorooctanesulfonate, perfluorooctanoate, and other fluorochemicals in human blood. *Environ Health Perspect* 113:539-45.
- Calafat AM, Kuklennyik Z, Caudill SP, Reidy JA, Needham LL. 2006. Perfluorochemicals in pooled serum samples from United States residents in 2001 and 2002. *Environ Sci Technol* 40:2128-34.
- Butenhoff JL, Olsen GW, Pfahles-Hutchens A. 2006. The applicability of biomonitoring data for perfluorooctanesulfonate to the environmental public health continuum. *Environ Health Perspect* 114:1776-82.
- Calafat AM, Wong LY, Kuklennyik Z, Reidy JA, Needham LL. 2007. Polyfluoroalkyl chemicals in the U.S. population: data from the National Health and Nutrition Examination Survey (NHANES) 2003-2004 and comparisons with NHANES 1999-2000. *Environ Health Perspect* 115:1596-1602.
- Olsen GW, Mair DC, Reagen WK, Ellefson ME, Ehresman OJ, Butenhoff JL, Zobel LR. 2007. Preliminary evidence of a decline in perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) concentrations in American Red Cross blood donors. *Chemosphere* 68:105-11.
- Apelberg BJ, Goldman LR, Calafat AM, Herbstman JB, Kuklennyik Z, Heidler J, Needham L, Halden RU, Witter FR. 2007. Determinants of Fetal Exposure to Polyfluoroalkyl Compounds in Baltimore, Maryland. *Environ Sci Technol*. 41:3891-97.

Olsen GW, Mair DC, Church TR, Ellefson ME, Reagen WK, Boyd TM, Herron RM, Medhdizadehkashi Z, Nobiletti JB, Rios JA, Butenhoff JL, Zobel LR. 2008. Decline in perfluorooctanesulfonate and other polyfluoroalkyl chemicals in American Red Cross adult blood donors, 2000-2006. *Environ Sci Technol* 42:4989-95.

b) Germany

Midasch O, Schettgen T, and Angerer J. 2006. Pilot study on the perfluorooctanesulfonate and perfluorooctanoate exposure of the German general population. *Int J Hyg Environ Health* 209:489-96.

Wiesmuller GA, Eckard R, Dobler L, Gonsel A, Oganowski M, Schroter-Kermani C, Schluter C, Gies A., Kemper FH. 2007. The Environmental Specimen Bank for Human Tissues as part of the German Environmental Specimen Bank. *International Journal of Hygiene and Environmental Health* 210:299-305.

c) Japan

Harada K, Koizumi A, Yoshinaga T, Inoue K, Saito N. 2004. A long-term trend of serum levels of perfluorooctane sulfonate (PFOS) and perfluorooctanoate (PFOA) in Japanese. *The Toxicologist* 78.

Harada K, Saito N, Inoue K, Yoshinaga T, Watanabe T, Sasaki S, Kamiyama S, Koizumi A. 2004. The influence of time, sex and geographic factors on levels of perfluorooctane sulfonate and perfluorooctanoate in human serum over the last 25 years. *J Occup Health* 46:141-47.

Harada K, Koizumi A, Saito N, Inoue K, Yoshinaga T, Date C, Fujii S, Hachiya N, Hirosawa I, Koda S, Kusaka Y, Murata K, Omae K, Shimbo S, Takenaka K, Takeshita T, Todoriki H, Wada Y, Watanabe T, Ikeda M. 2007. Historical and geographical aspects of the increasing perfluorooctanoate and perfluorooctane sulfonate contamination in human serum in Japan. *Chemosphere* 66:293-301.

d) China

Jin Y, Saito N, Harada KH, Inoue K, Koizumi A. 2007. Historical trends in human serum levels of perfluorooctanoate and perfluorooctane sulfonate in Shenyang, China. *Tohoku J Exp Med* 212, 63-70.

e) Spain

Ericson I, Gomez M, Nadal M, van Bavel B, Lindstrom G, Domingo JL. 2007. Perfluorinated chemicals in blood of residents in Catalonia (Spain) in relation to age and gender: a pilot study. *Environ Int* 33:616-23.

2. Cord Blood

Apelberg BJ, Goldman LR, Calafat AM, Herbstman JB, Kuklennyik Z, Heidler J, Needham L, Halden RU, Witter FR. 2007. Determinants of Fetal Exposure to Polyfluoroalkyl Compounds in Baltimore, Maryland. *Environ Sci Technol*. 41:3891-97.

Inoue K, Okada F, Ito R, Kato S, Sasaki S, Nakajima S, Uno A, Saijo Y, Sata F, Yoshimura Y, Kishi R, Nakazawa H. 2004. Perfluorooctane sulfonate (PFOS) and related perfluorinated compounds in human maternal and cord blood samples: assessment of PFOS exposure in a susceptible population during pregnancy. *Environ Health Perspect* 112:1204-07.

Midasch O, Drexler H, Hart N, Beckmann MW, Angerer J. 2007. Transplacental exposure of neonates to perfluorooctanesulfonate and perfluorooctanoate: a pilot study. *Int Arch Occup Environ Health* 80:643-48.

Monroy R, Morrison K, Teo K, Atkinson S, Kubwabo C, Stewart B, Foster WG. 2008. Serum levels of perfluoroalkyl compounds in human maternal and umbilical cord blood samples. *Environ Res* 108:56-62.

Spliethoff HM, Tao L, Shaver SM, Aldous KM, Pass KA, Kannan K, Eadon GA. 2008. Use of Newborn Screening Program Blood Spots for Exposure Assessment: Declining Levels of Perfluorinated Compounds in New York State Infants. *Environ Sci Technol* 42:5361-67.

3. Milk

So MK, Yamashita N, Taniyasu S, Jiang Q, Giesy JP, Chen K, Lam PK. 2006. Health risks in infants associated with exposure to perfluorinated compounds in human breast milk from Zhoushan, China. *Environ Sci Technol* 40:2924-29.

Karrman A, Ericson I, van Bavel B, Darnerud PO, Aune M, Glynn A, Lignell S, Lindstrom G. 2007. Exposure of perfluorinated chemicals through lactation: levels of matched human milk and serum and a temporal trend, 1996-2004, in Sweden. *Environ Health Perspect* 115:226-30.

Tao L, Kannan K, Wong CM, Arcaro KF, Butenhoff JL. 2008. Perfluorinated Compounds in Human Milk from Massachusetts, U.S.A. *Environ Sci Technol* 42:3096-01.

Tao T, Ma J, Kunisue T, Libelo E, Tanabe S, Kannan K. 2008. Perfluorinated Compounds in Human Breast Milk from Several Asian Countries, and in Infant Formula and Dairy Milk from the United States. *Environ Sci Technol* 42:8597-8602.

Karrman A, Domingo JL, Llebaria X, Nadal M, Bigas E, van Bavel B, Lindstrom G. 2009. Biomonitoring perfluorinated compounds in Catalonia, Spain: concentrations and trends in human liver and milk samples. *Environ Sci Pollut Res* (in press).

4. Diet

Ericson I, Marti-Cid R, Nadal M, Van Bavel B, Lindstrom G, Domingo JL. 2008. Human Exposure to Perfluorinated Chemicals through the Diet: Intake of Perfluorinated Compounds in Foods from the Catalan (Spain) Market. *Journal of Agricultural and Food Chemistry* 56, 1787-94.

Jogsten IE, Perello G, Llebaria X, Bigas E, Marti-Cid R, Karrman A, Domingo JL. 2009. Exposure to perfluorinated compounds in Catalonia, Spain, through consumption of various raw and cooked foodstuffs, including packaged food. *Food and Chemical Toxicology* 47:1577-83.

Karrman A, Harada KH, Inoue K, Takasuga T, Ohi E, Koizumi A. 2009. Relationship between dietary exposure and serum perfluorochemical (PFC) levels - A case study. *Environment International* 35:712-17.

5. Liver

Olsen GW, Hansen KJ, Stevenson LA, Burris JM, Mandel JH. 2003. Human donor liver and serum concentrations of perfluorooctanesulfonate and other perfluorochemicals. *Environ Sci Technol* 37:888-91.

Karrman A, Domingo JL, Llebaria X, Nadal M, Bigas E, van Bavel B, Lindstrom G. 2009. Biomonitoring perfluorinated compounds in Catalonia, Spain: concentrations and trends in human liver and milk samples. *Environ Sci Pollut Res* in press.

E. General Population - Mortality

Eriksen KT, Sorensen M, McLaughlin JK, Lipworth L, Tjonneland A, Overvad K, Raaschou-Nielsen O. 2009. Perfluorooctanoate and Perfluorooctanesulfonate Plasma Levels and Risk of Cancer in the General Danish Population. *J Natl Cancer Inst.* 101:605-09.

F. General Population – Reproductive

Inoue K, Okada F, Ito R, Kato S, Sasaki S, Nakajima S, Uno A, Saijo Y, Sata F, Yoshimura Y, Kishi R, Nakazawa H. 2004. Perfluorooctane sulfonate (PFOS) and related perfluorinated compounds in human maternal and cord blood samples: assessment of PFOS exposure in a susceptible population during pregnancy. *Environ Health Perspect* 112:1204-07.

Apelberg BJ, Whitter FR, Herbstman JB, Calafat AM, Halden RU, Needham LL, Goldman LR. 2007. Cord serum concentrations of perfluorooctane sulfonate (PFOS) and perfluorooctanoate (PFOA) in relation to weight and size at birth. *Environ Health Perspect* 115:1670-1676.

Savitz DA. 2007. Biomarkers of per fluorinated chemicals and birth weight. *Environ Health Perspect* 115:A528-A529.

Fei C, McLaughlin JK, Tarone RE, Olsen J. 2007. Perfluorinated chemicals and fetal growth: a study within the Danish National Birth Cohort. *Environ Health Perspect* 115: 1677-1682.

Grice MM, Alexander BH, Hoffbeck R, Kampa DM. 2007. Self-reported medical conditions in perfluorooctanesulfonyl fluoride manufacturing workers. *J Occup Environ Med* 49:722-729.

Fei C, McLaughlin JK, Tarone RE, Olsen J. 2008. Fetal growth indicators and perfluorinated chemicals: a study in the Danish National Birth Cohort. *Am J Epidemiol* 168:66-72.

Fei C, McLaughlin JK, Lipworth L, Olsen J. 2008. Prenatal exposure to PFOA and PFOS and maternally reported developmental milestones in infancy. *Environ Health Perspect* 116:1391-95.

Scialli AR. Perfluoroalkane acids and fetal growth (letter to editor). 2008. *Environ Health Perspect* 116:A238.

Monroy R, Morrison K, Teo K, Atkinson S, Kubwabo C, Stewart B, Foster WG. 2008. Serum levels of perfluoroalkyl compounds in human maternal and umbilical cord blood samples. *Environ Res* 108:56-62.

Olsen GW, Butenhoff JL, Zobel LR. 2009. Perfluoroalkyl chemicals and human fetal development: an epidemiologic review with clinical and toxicological perspectives. *Reprod Toxicol* 27:212-30.

Washino N, Saijo Y, Sasaki S, Kato S, Ban S, Konishi K, Ito R, Nakata A, Iwasaki Y, Saito K, Nakazawa H, Kishi R. 2009. Correlations Between Prenatal Exposure to Perfluorinated Chemicals and Reduced Fetal Growth. *Environ Health Perspect* 117:660-667.

II. TOXICOLOGICAL STUDIES

A. Reviews

OECD. 2002. Hazard Assessment of Perfluorooctane Sulfonate (PFOS) and Its Salts. Paris, France, pp. 1-362.

3M. 2003. Environmental and Health Assessment of Perfluorooctane sulfonic acid and its salts. AR226-1486.

Kennedy GL, Butenhoff JL, Olsen GW, O'Connor JC, Seacat AM, Perkins RG, Biegel LB, Murphy SR, Farrar DG. 2004. The toxicology of perfluorooctanoate. *Crit Rev Toxicol* 34:351-84.

Lau C, Butenhoff JL, Rogers JM. 2004. The developmental toxicity of perfluoroalkyl acids and their derivatives. *Toxicol Appl Pharmacol* 198:231-241.

Lau C, Anitole K, Hodes C, Lai D, Pfahles-Hutchens A, Seed J. 2007. Perfluoroalkyl Acids: A Review of Monitoring and Toxicological Findings. *Tox Sci* 99:366-394.

Andersen ME, Butenhoff JL, Chang SC, Farrar DG, Kennedy GL, Lau C, Olsen GW, Seed J, Wallace KB. 2008. Perfluoroalkyl acids and related chemistries – toxicokinetics and modes of action. *Toxicol Sci* 102:3-14.

Lau C. 2009. Perfluorinated chemicals 2008: PFAA Days II meeting report and highlights. *Reproductive Toxicology* 27:429-34.

Lau C. 2009. Perfluoroalkyl acids: Recent activities and research progress. *Reproductive Toxicology* 27:209-211.

B. Chronic and Subchronic Toxicity

1. PFOA

Griffith FD and Long JE. 1980. Animal toxicity studies with ammonium perfluorooctanoate. *Am Ind Hyg Assoc J* 41:576-83.

Sibinski LJ, Allen JL, Erickson EE. 1983. Two year oral (diet) toxicity/carcinogenicity study of fluorochemical FC-143 in rats. Expt. No. 0281

CROO12. Available on USEPA Docket AR226-0437 - AR226-0440. St. Paul, MN: Riker Laboratories, Inc: Document Links: [AR226-0437] [AR226-0438] [AR226-0439] [AR226-0440]

Biegel LB, Hurtt ME, Frame SR, O'Connor JC, Cook JC. 2001. Mechanisms of extrahepatic tumor induction by peroxisome proliferators in male CD rats. *Toxicol Sci* 60:44-55.

Butenhoff J, Costa G, Elcombe C, Farrar D, Hansen K, Iwai H, Reinhard J, Kennedy G, Lieder P, Olsen G, Thomford P. 2002. Toxicity of ammonium perfluorooctanoate in male cynomolgus monkeys after oral dosing for 6 months. *Toxicol Sci* 69:244-257.

Perkins RG, Butenhoff JL, Kennedy GL, Palazzolo MJ. 2004. 13-Week Toxicity Study of Ammonium Perfluorooctanoate (APFO) in Male Rats. *Drug & Chemical Toxicology* 27:361-378.

Frame SR, Butenhoff JL, Kennedy GL, Hardisty JF. 2005. Pathology Working Group Review Of Mammary Glands From Chronic Feeding Study In Rats With APFO. FLUOROS, University of Toronto, TOX021.

Zobel LR. 2006. Comments to PFOA Science Advisory Board, "SAB Review of Draft PFOA Panel Report."
http://www.epa.gov/sab/pdf/3m_ltr_re_draft_pfoa_panel_report.pdf.

2. PFOS

Seacat AM, Thomford PJ, Hansen KJ, Olsen GW, Case MT, Butenhoff JL. 2002. Subchronic toxicity studies on perfluorooctanesulfonate potassium salt in cynomolgus monkeys. *Toxicol Sci* 68:249-264.

Thomford PJ. 2002. Final report: 104-week dietary chronic toxicity and carcinogenicity with perfluorooctanesulfonic acid potassium salt (PFOS; T-6295) in rats January 2002. Covance Laboratory Inc. Madison WI.

Seacat AM, Thomford PJ, Hansen KJ, Clemen LA, Eldridge SR, Elcombe CR, Butenhoff JL. 2003. Sub-chronic dietary toxicity of potassium perfluorooctanesulfonate in rats. *Toxicol* 183:117-131.

C. Mechanism of Action

1. PPAR α

Klaunig JE, Babich MA, Baetcke KP, Cook JC, Corton JC, David RM, DeLuca JG, Lai DY, McKee RH, Peters JM, Roberts RA, Fenner-Crisp PA. 2003. PPAR α agonist-induced rodent tumors: modes of action and human relevance. *Crit Rev Toxicol* 33:655-780.

Cheng X, Klaassen CD. 2008. Perfluorocarboxylic acids induce cytochrome p450 enzymes in mouse liver through activation of PPAR α and CAR transcription factors *Tox Sci* 106:29-36.

Gonzalez FJ, Shah YM. 2008. PPAR α : mechanism of species differences and hepatocarcinogenesis of peroxisome proliferators. *Toxicology* 246:2-8.

Rosen MB, Lee JS, Ren H, Vallanat B, Liu J, Waalkes MP, Abbott BD, Lau C, Corton JC. 2008. Toxicogenomic dissection of the perfluorooctanoic acid transcript profile in mouse liver: evidence for the involvement of nuclear receptors PPAR alpha and CAR. *Toxicol Sci* 103:46-56.

B. Elcombe, 4-Week study to investigate perfluorooctane sulfonate (PFOS)-induced hepatomegaly in male Sprague Dawley rats, CXR Biosciences Ltd., Feb. 8, 2008. AR226-3802a1.

B. Elcombe, 13-Week Study to Investigate the Reversibility of Perfluorooctane Sulfonate (PFOS)-Induced Effects in Male Sprague Dawley Rats, CXR Biosciences Ltd., July 22, 2008. Submitted to AR226 (no number yet assigned).

Bjork JA, Wallace KB. 2009. Structure-activity relationships and human relevance for perfluoroalkyl acid-induced transcriptional activation of peroxisome proliferation in liver cell cultures. *Toxicol Sci* 111:89-99.

Rosen MB, Lau C, Corton JC. 2009. Does exposure to perfluoroalkyl acids present a risk to human health? *Toxicol Sci* 111:1-3.

2. CAR

Whysner J, Ross PM, Williams GM. 1996. Phenobarbital mechanistic data and risk assessment: enzyme induction, enhanced cell proliferation, and tumor promotion. *Pharmacol Ther* 71:153-191.

D. Pharmacokinetic Studies

Johnson JD, Gibson SJ, Ober RE. 1984. Cholestyramine-enhanced fecal elimination of carbon-14 in rats after administration of ammonium [¹⁴C]perfluorooctanoate or potassium [¹⁴C]perfluorooctanesulfonate. *Fundam Appl Toxicol* 4:972-976.

Kojo A, Hanhijarvi H, Ylinen M, Kosma VM. 1986. Toxicity and kinetics of perfluoro-octanoic acid in the Wistar rat. *Arch Toxicol Suppl* 9:465-468.

Manning RO, Bruckner JV, Mispagel ME, Bowen JM. 1991. Metabolism and disposition of sulfluramid, a unique polyfluorinated insecticide, in the rat. *Drug Metab Dispos* 19:205-211.

Vanden Heuvel JP, Kuslikis BI, Van Rafelghem MJ, Peterson RE. 1991. Tissue distribution, metabolism, and elimination of perfluorooctanoic acid in male and female rats. *J Biochem Toxicol* 6:83-92.

Ylinen M, Auriola S. 1990. Tissue distribution and elimination of perfluorodecanoic acid in the rat after single intraperitoneal administration. *Pharmacol Toxicol* 66:45-48.

Ylinen M, Kojo A, Hanhijarvi H, Peura P. 1990. Disposition of perfluorooctanoic acid in the rat after single and subchronic administration. *Bull Environ Contam Toxicol* 44:46-53.

- Vanden Heuvel JP, Davis JW, Sommers R, Peterson RE. 1992. Renal excretion of perfluorooctanoic acid in male rats: inhibitory effect of testosterone. *J Biochem Toxicol* 7:31-36.
- Kudo N, Suzuki E, Katakura M, Ohmori K, Noshiro R, Kawashima Y. 2001. Comparison of the elimination between perfluorinated fatty acids with different carbon chain length in rats. *Chem Biol Interact* 134:203-216.
- Kudo N, Katakura M, Sato Y, Kawashima Y. 2002. Sex hormone-regulated renal transport of perfluorooctanoic acid. *Chem Biol Interact* 139:301-316.
- Kudo N, Kawashima Y. 2003. Toxicity and toxicokinetics of perfluorooctanoic acid in humans and animals. *J Toxicol Sci* 28:49-57.
- Kemper RA. 2003. Perfluorooctanoic acid: toxicokinetics in the rat. Laboratory Project ID: DuPont-7473. USEPA Administrative Record AR-226-1499, DuPont Haskell Laboratories, Washington, DC.
- Ohmori K, Kudo N, Katayama K, Kawashima Y. 2003. Comparison of the toxicokinetics between perfluorocarboxylic acids with different carbon chain length. *Toxicology* 184:135-140.
- Butenhoff, JL, Kennedy, GL, Hinderliter, PM, Lieder, PH, Jung, R, Hansen, KJ, Gorman, GS, Noker, PE and Thomford, PJ. 2004. Pharmacokinetics of perfluorooctanoate in cynomolgus monkeys. *Toxicol Sci* 82:394-406.
- Lau C, Strynar MJ, Lindstrom AB, Hanson RG, Thibodeaux J, Barton HA. 2005. Pharmacokinetic evaluation of perfluorooctanoic acid in the mouse. *The Toxicologist* 84.
- Hinderliter PM, Mylchreest E, Gannon SA, Butenhoff JL, and Kennedy GL. 2005. Perfluorooctanoate: placental and lactational transport pharmacokinetics in rats. *Toxicology* 211:139-148.
- Han X, Kemper RA, Jepson GW. 2005. Subcellular distribution and protein binding of perfluorooctanoic acid in rat liver and kidney. *Drug Chem Toxicol* 28:197-209.
- Harada K, Inoue K, Morikawa A, Yoshinaga T, Saito N, Koizumi A. 2005. Renal clearance of perfluorooctane sulfonate and perfluorooctanoate in humans and their species-specific excretion. *Environ Res* 99:253-261.
- Fasano WJ, Kennedy GL, Szostek B, Farrar DG, Ward RJ, Haroun L, Hinderliter PM. 2005. Penetration of ammonium perfluorooctanoate through rat and human skin in vitro. *Drug Chem Toxicol* 1:79-90.
- Hinderliter PM, Han X, Kennedy GL, Butenhoff JL. 2006. Age effect on perfluorooctanoate (PFOA) plasma concentration in post-weaning rats following oral gavage with ammonium perfluorooctanoate (APFO). *Toxicology* 225:195-203.
- Andersen ME, Clewell JH, Tan YM, Butenhoff JL, Olsen GW. 2006. Pharmacokinetic modeling of saturable, renal resorption of perfluoroalkyl acids in monkeys – Probing the determinants of long plasma half-lives. *Toxicology* 227:156-164.
- Hinderliter PM, Delorme MP, Kennedy GL. 2006. Perfluorooctanoic acid: Relationship between repeated inhalation exposures and plasma PFOA concentration in the rat. *Toxicology* 222:80-85.

Hundley SG, Sarrif AM, Kennedy GL. 2006. Absorption, distribution, and excretion of ammonium perfluorooctanoate (APFO) after oral administration to various species. *Drug Chem Toxicol* 29:137-145.

Henderson WM, Smith M.A. 2007. Perfluorooctanoic acid and perfluorononanoic acid in fetal and neonatal mice following in utero exposure to 8-2 fluorotelomer alcohol. *Toxicol Sci* 95:452-461.

Andersen ME, Butenhoff JL, Shang SC, Farrar DG, Kennedy GL, Lau C, Olsen GW, Seed J, Wallace KB. 2008. Perfluoroalkyl acids and related chemistries – toxicokinetics and modes of action. *Toxicol Sci* 102:3-14.

Harris LA, Barton HA. 2008. Comparing Single and Repeated Dosimetry Data for Perfluorooctane Sulfonate in Rats. *Toxicology Letters* 181:148-156.

Nakagawa H, Hirata T, Terada T, Jutabha P, Miura D, Harada KH, Inoue K, Anzai N, Endou H, Inui K, Kanai Y, Koizumi A. 2008. Roles of Organic Anion Transporters in the Renal Excretion of Perfluorooctanoic Acid. *Basic & Clinical Pharmacology & Toxicology* 103:1-8.

Tan YM, Clewell HJ, Andersen ME. 2008. Time Dependencies in Perfluorooctylacids Disposition in Rat and Monkeys: A Kinetic Analysis. *Toxicology Letters* 177:38-47.

Wambaugh JF, Barton HA, Setzer RW. 2008. Comparing models for perfluorooctanoic acid pharmacokinetics using Bayesian analysis. *J Pharmacokinetic Pharmacodyn* 35:683-712.

Barton HA. 2009. Pharmacokinetic modeling of perfluoroalkyl acids in rodents (PFAA Days II speaker abstract). *Reproductive Toxicology* 27:409.

Clewell H, Tan YM, Andersen M. 2009. Simulation modeling of PFAA exposure and pharmacokinetics (PFAA Days II speaker abstract). *Reproductive Toxicology* 27:410.

Cui L, Liao CY, Zhou QF, Xia TM, Yun ZJ, Jiang GB. 2009. Excretion of PFOA and PFOS in Male Rats During a Subchronic Exposure. *Arch Environ Contam Toxicol* in press.

De Silva AO, Benskin JP, Martin LJ, Arsenaault G, McCrindle R, Riddell N, Martin JW, Mabury SA. 2009. Disposition of perfluorinated acid isomers in Sprague-Dawley rats; part 2: subchronic dose. *Environ Toxicol Chem* 28:555-567.

Lou I, Wambaugh JF, Lau C, Hanson RG, Lindstrom AB, Strynar MJ, Zehr RD, Setzer RW, Barton HA. 2009. Modeling Single and Repeated Dose Pharmacokinetics of PFOA in Mice. *Toxicological Sciences* 107:331-341.

Rodriguez CE, Barton HA. 2009. Modeling the pharmacokinetics of perfluorooctanoic acid during gestation and lactation in mice (PFAA Days II Poster Abstract). *Reproductive Toxicology* 27:424.

Rodriguez CE, Setzer RW, Barton HA. 2009. Pharmacokinetic modeling of perfluorooctanoic acid during gestation and lactation in the mouse. *Reproductive Toxicology* 27:373-386.

Wambaugh JF, Lou I, Lau C, Hanson RG, Lindstrom AB, Strynar MJ, Zehr RD, Setzer RW, Barton HA. 2009. Modeling single and repeated dose pharmacokinetics of PFOA in mice (PFAA Days II poster abstract) *Reproductive Toxicology* 27:427.

Yang CH, Glover KP, Han X. 2009. Organic anion transporting polypeptide (Oatp) 1a1-mediated perfluorooctanoate transport and evidence for a renal reabsorption

mechanism of Oatp1a1 in renal elimination of perfluorocarboxylates in rats. *Toxicol Lett* 190:163-171.

E. Developmental Studies

1. PFOA

Butenhoff JL, Kennedy GL, Frame SR, O'Connor JC, and York RG. 2004. The reproductive toxicity of ammonium perfluorooctanoate (APFO) in the rat. *Toxicology* 196:95-116.

Lau C, Butenhoff JL, Rogers JM. 2004. The developmental toxicity of perfluoroalkyl acids and their derivatives. *Toxicol Appl Pharmacol* 198:231-241.

Hinderliter PM, Mylchreest E, Gannon SA, Butenhoff JL, and Kennedy GL. 2005. Perfluorooctanoate: placental and lactational transport pharmacokinetics in rats. *Toxicology* 211:139-148.

Lau, C, Thibodeaux, JR, Hanson, RG, Narotsky, MG, Rogers, JM, Lindstrom, AB and Strynar, MJ. 2006. Effects of Perfluorooctanoic Acid Exposure during Pregnancy in the Mouse. *Toxicol Sci* 90:510-518.

Hinderliter PM, Han X, Kennedy GL, Butenhoff JL. 2006. Age effect on perfluorooctanoate (PFOA) plasma concentration in post-weaning rats following oral gavage with ammonium perfluorooctanoate (APFO). *Toxicology* 225:195-203.

Abbott, BD, Wolf, CJ, Schmid, JE, Das, KP, Zehr, RD, Helfant, L, Nakayama, S, Lindstrom, AB, Strynar, MJ and Lau, CS. 2007. Perfluorooctanoic Acid (PFOA)-induced Developmental Toxicity in the Mouse is Dependent on Expression of Peroxisome Proliferator Activated Receptor-alpha (PPAR-alpha). *Toxicol Sci* 98:571-81.

2. PFOS

Case MT, York RG, Christian MS. 2001. Rat and rabbit oral developmental toxicology studies with two perfluorinated compounds. *Int J Toxicol* 20:101-109.

Thibodeaux JR, Hanson RG, Rogers JM, Grey BE, Barbee BD, Richards JH, Butenhoff JL, Stevenson LA, Lau C. 2003. Exposure to perfluorooctane sulfonate during pregnancy in rat and mouse. I: maternal and prenatal evaluations. *Toxicol Sci* 74:369-81.

Lau C, Thibodeaux JR, Hanson RG, Rogers JM, Grey BE, Stanton ME, Butenhoff JL, Stevenson LA. 2003. Exposure to perfluorooctane sulfonate during pregnancy in rat and mouse. II: Postnatal evaluation. *Toxicol Sci* 74:382-392.

Grasty RC, Wolf DC, Grey BE, Lau CS, Rogers JM. 2003. Prenatal window of susceptibility to perfluorooctane sulfonate-induced neonatal mortality in the Sprague-Dawley rat. *Birth Defects Res B Dev Reprod Toxicol* 68:465-471.

Luebker DJ, Case MT, York RG., Moore JA, Hansen KJ, Butenhoff JL. 2005. Two-generation reproduction and cross-foster studies of perfluorooctanesulfonate (PFOS) in rats. *Toxicology* 215:126-148.

Luebker DJ, York RG, Hansen KJ, Moore JA, Butenhoff JL. 2005. Neonatal mortality from in utero exposure to perfluorooctanesulfonate (PFOS) in Sprague-Dawley rats: dose-response, and biochemical and pharmacokinetic parameters. *Toxicology* 215:149-169.

Grasty RC, Bjork JA, Wallace KB, Wolf DC, Lau CS, Rogers JM. 2005. Effects of prenatal perfluorooctane sulfonate (PFOS) exposure on lung maturation in the perinatal rat. *Birth Defects Res B Dev Reprod Toxicol* 74:405-416.

Fuentes S, Colomina MT, Rodriguez J, Vicens P, Domingo JL. 2006. Interactions in developmental toxicology: Concurrent exposure to perfluorooctane sulfonate (PFOS) and stress in pregnant mice. *Toxicol Lett* 164:81-89.

Chang SC, Ehresman DJ, Bjork JA, Wallace K, Parker GA, Stump DG, Butenhoff JL. 2009. Gestational and Lactational Exposure to Potassium Perfluorooctanesulfonate (K+PFOS) in Rats: toxicokinetics, thyroid hormone status, and related gene expression. *Reproductive Toxicology* 27:387-399.

Abbott BD, Wolf CJ, Das K, Zehr RD, Schmid JE, Lindstrom AB, Strynar MJ, Lau C. 2009. Developmental Toxicity of Perfluorooctane Sulfonate (PFOS) is not dependent on expression of Peroxisome Proliferator activated Receptor-alpha (PPARα) in the mouse. *Reproductive Toxicology* 27:258-265.

Butenhoff JL, Ehresman DJ, Chang SC, Parker GA, Stump DG. 2009. Gestational and Lactational Exposure to Potassium Perfluorooctanesulfonate (K⁺PFOS) in Rats: Developmental Neurotoxicity. *Reproductive Toxicology* 27:319-330.

F. Thyroid Hormone Status

1. PFOS

a) Human

Olsen GW, Burris JM, Burlew MM, Mandel JH. 2003. Epidemiologic assessment of worker serum perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) concentrations and medical surveillance examinations. *J Occup Environ Med* 45:260-270.

Inoue K, Okada F, Ito R, Kato S, Sasaki S, Nakajima S, Uno A, Saijo Y, Sata F, Yoshimura Y, Kishi R, Nakazawa H. 2004. Perfluorooctane sulfonate (PFOS) and related perfluorinated compounds in human maternal and cord blood samples: assessment of PFOS exposure in a susceptible population during pregnancy. *Environ Health Perspect* 112:1204-1207.

Olsen GW, Zobel LR. 2007. Assessment of lipid, hepatic, and thyroid parameters with serum perfluorooctanoate (PFOA) concentrations in fluorochemical production workers. *Int Arch Occup Environ Health* 81:231-246.

Dallaire R, Dewailly E, Pereg D, Dery S, Ayotte P. 2009. Thyroid Function and Plasma Concentrations of Polyhalogenated Compounds in Inuit Adults. *Environmental Health Perspectives* 117:1380-1386.

Bloom MS, Kannan K, Spliethoff HM, Tao L, Aldous KM, Vena JE. 2009. Exploratory assessment of perfluorinated compounds and human thyroid function. *Physiology & Behavior* in press.

b) Animal – Laboratory Studies

Seacat AM, Butenhoff J, Hansen KJ, Olsen GW, Thomford PJ. 2001. Toxicity of potassium perfluorooctanesulfonate in cynomolgus monkeys after twenty-six weeks of oral dosing and one year of recovery (abstract # 1656). *Toxicol Sci* 60:348.

Thomford PJ. 2002. 104-week dietary chronic study and carcinogenicity study with perfluorooctane sulfonic acid potassium salt (PFOS:T-6295) in rats. Covance (Study No. 6329-183).

Thibodeaux JR, Hanson RG, Rogers JM, Grey BE, Barbee BD, Richards JH, Butenhoff JL, Stevenson LA, Lau C. 2003. Exposure to perfluorooctane sulfonate during pregnancy in rat and mouse. I: maternal and prenatal evaluations. *Toxicol Sci* 74:369-381.

Lau C, Thibodeaux JR, Hanson RG, Rogers JM, Grey BE, Stanton ME, Butenhoff JL, Stevenson LA. 2003. Exposure to perfluorooctane sulfonate during pregnancy in rat and mouse. II: postnatal evaluation. *Toxicol Sci* 74:382-392.

Luebker DJ, York RG, Hansen KJ, Moore JA, Butenhoff JL. 2005. Neonatal mortality from in utero exposure to perfluorooctanesulfonate (PFOS) in Sprague-Dawley rats: dose-response, and biochemical and pharmacokinetic parameters. *Toxicology* 215:149-169.

Fuentes S, Colomina MT, Rodriguez J, Vicens P, Domingo JL. 2006. Interactions in developmental toxicology: Concurrent exposure to perfluorooctane sulfonate (PFOS) and stress in pregnant mice. *Toxicol Lett* 164:81-89.

Martin MT, Brennan RJ, Hu W, Ayanoglu E, Lau C, Ren H, Wood CR, Corton JC, Kavlock RJ, Dix DJ. 2007. Toxicogenomic study of triazole fungicides and perfluoroalkyl acids in rat livers predicts toxicity and categorizes chemicals based on mechanisms of toxicity. *Toxicol Sci* 97:595-613.

Chang SC, Thibodeaux JR, Eastvold ML, Ehresman DJ, Bjork JA, Froehlich JW, Lau CS, Singh RJ, Wallace KB, Butenhoff JL. 2007. Negative bias from analog methods used in the analysis of free thyroxine in rat serum containing perfluorooctanesulfonate (PFOS). *Toxicology* 234:21-33.

Curran I, Hierlihy SL, Liston V, Pantazopoulos P, Nunnikhoven A, Tittlemier S, Barker M, Trick K, Bondy G. 2008. Altered Fatty Acid Homeostasis and Related Toxicologic Sequelae in Rats Exposed to Dietary Potassium Perfluorooctanesulfonate (PFOS). *J Toxicol Environ Health A* 71:1526-1541.

Chang SC, Thibodeaux JR, Eastvold ML, Ehresman DJ, Bjork JA, Froehlich JW, Lau C, Singh RJ, Wallace KB, Butenhoff JL. 2008. Thyroid hormone status and pituitary function in adult rats given oral doses of perfluorooctanesulfonate (PFOS). *Toxicology* 243:330-339.

Yu WG, Liu W, Jin YH. 2009. Effects of Perfluorooctane Sulfonate on Rat Thyroid Hormone Biosynthesis and Metabolism. *Env Tox Chem* 28:990-996.

Chang SC, Ehresman DJ, Bjork JA, Wallace K, Parker GA, Stump DG, Butenhoff JL. 2009. Gestational and Lactational Exposure to Potassium Perfluorooctanesulfonate (K+PFOS) in Rats: toxicokinetics, thyroid hormone status, and related gene expression. *Reproductive Toxicology* 27:387-399.

Butenhoff JL, Ehresman DJ, Chang SC, Parker GA, Stump DG. 2009. Gestational and Lactational Exposure to Potassium Perfluorooctanesulfonate (K⁺PFOS) in Rats: Developmental Neurotoxicity. *Reproductive Toxicology* 27:319-330.

2. PFOA

a) Human

Olsen GW, Burris JM, Burlew MM, Mandel JH. 2003. Epidemiologic assessment of worker serum perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) concentrations and medical surveillance examinations. *J Occup Environ Med* 45:260-270.

Inoue K, Okada F, Ito R, Kato S, Sasaki S, Nakajima S, Uno A, Saijo Y, Sata F, Yoshimura Y, Kishi R, Nakazawa H. 2004. Perfluorooctane sulfonate (PFOS) and related perfluorinated compounds in human maternal and cord blood samples: assessment of PFOS exposure in a susceptible population during pregnancy. *Environ Health Perspect* 112:1204-1207.

Olsen GW, Zobel LR. 2007. Assessment of lipid, hepatic, and thyroid parameters with serum perfluorooctanoate (PFOA) concentrations in fluorochemical production workers. *Int Arch Occup Environ Health* 81:231-246.

Dallaire R, Dewailly E, Pereg D, Dery S, Ayotte P. 2009. Thyroid Function and Plasma Concentrations of Polyhalogenated Compounds in Inuit Adults. *Environmental Health Perspectives* 117:1380-1386.

Bloom MS, Kannan K, Spliethoff HM, Tao L, Aldous KM, Vena JE. 2009. Exploratory assessment of perfluorinated compounds and human thyroid function. *Physiology & Behavior* in press.

Costa G, Sartori S, Consonni D. 2009. Thirty Years of Medical Surveillance in Perfluorooctanoic Acid Production Workers. *Journal of Occupational and Environmental Medicine* 51:364-372.

b) Animal – Laboratory Studies

Martin MT, Brennan RJ, Hu W, Ayanoglu E, Lau C, Ren H, Wood CR, Corton JC, Kavlock RJ, Dix DJ. 2007. Toxicogenomic study of triazole fungicides and perfluoroalkyl acids in rat livers predicts toxicity and categorizes chemicals based on mechanisms of toxicity. *Toxicol Sci* 97:595-613.

III. RISK ASSESSMENT

A. Both PFOA and PFOS

Minnesota Department of Health. Health Risk Limits for Perfluorochemicals: Report to the Minnesota Legislature 2008, Final Report. January 15, 2008.
<http://156.98.150.11/divs/eh/hazardous/topics/pfcs/finalreport011508.pdf>

B. PFOA

Butenhoff JL, Gaylor DW, Moore JA, Olsen GW, Rodricks J, Mandel JH, Zobel LR. 2004. Characterization of risk for general population exposure to perfluorooctanoate. *Reg Toxicol Pharmacol* 39:363-380.

Kennedy GL, Butenhoff JL, Olsen GW, O'Connor JC, Seacat AM, Perkins RG, Biegel LB, and Murphy SR, and Farrar DG. 2004. The toxicology of perfluorooctanoate. *Crit Rev Toxicol* 34:351-384.

Minnesota Department of Health: Health Risk Limit for Groundwater 2008 Rule Revision, Perfluorooctanoic Acid. May 2009.
<http://www.health.state.mn.us/divs/eh/risk/guidance/gw/pfoa.pdf>

Tardiff RG, Carson ML, Sweeney LM, Kirman CR, Tan YM, Andersen M, Bevan C, Gargas ML. 2009. Derivation of a Drinking Water Equivalent Level (DWEL) Related to the Maximum Contaminant Level Goal for Perfluorooctanoic Acid (PFOA), a Persistent Water Soluble Compound. *Food Chem Tox* 47:2557-2589.

C. PFOS

Minnesota Department of Health: Health Risk Limit for Groundwater 2008 Rule Revision, Perfluorooctane Sulfonic Acid. May 2009.
<http://www.health.state.mn.us/divs/eh/risk/guidance/gw/pfos.pdf>

3M. 2003. Environmental and Health Assessment of Perfluorooctane sulfonic acid and its salts. AR226-1486.

D. TEQ Questions

Scialli AR, Iannucci A, Turim J. 2007. Combining perfluoroalkane acid exposure levels for risk assessment. *Regul Toxicol Pharmacol* 49:195-202.

IV. ANALYTICAL DOCUMENTS

A. Publications

Hansen KJ, Clemen LA, Ellefson ME, Johnson HO. 2001. Compound-specific, quantitative characterization of organic fluorochemicals in biological matrices. *Env Sci Technol* 35:766-770.

Ehresman DJ, Froehlich JW, Olsen GW, Chang SC, Butenhoff JL. 2007. Comparison of human whole blood, plasma, and serum matrices for the determination of

perfluorooctanesulfonate (PFOS), perfluorooctanoate (PFOA), and other fluorochemicals. *Environ Res* 103:176-184.

Longnecker MP, Smith CS, Kissling GE, Hoppin JA, Butenhoff JL, Decker E, Ehresman DJ, Ellefson ME, Flaherty J, Gardner MS, Langlois E, Leblanc A, Lindstrom AB, Reagen WK, Strynar MJ, Studabaker WB. 2008. An interlaboratory study of perfluorinated alkyl compound levels in human plasma. *Environ Res* 107:152-159

Jahnke A, Berger U. 2009. Trace Analysis Of Per- and Polyfluorinated Alkyl Substances In Various Matrices - How Do Current Methods Perform? *Journal of Chromatography A*, 1216:410-421

B. EPA Reference Method

EPA Method 537: Determination of selected perfluorinated alkyl acids in drinking water by solid phase extraction and liquid chromatography/tandem mass spectrometry (LC/MS/MS), version 1.0, September 2008, National Exposure Research Laboratory Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio.

C. 3M Environmental Laboratory Methods

ETS-8-154, 3M Environmental Laboratory: Determination of Perfluorinated Acids, Alcohols, Amides and Sulfonates in Water by Solid Phase Extraction and High Performance Liquid Chromatography/Mass Spectrometry.

ETS-8-042, 3M Environmental Laboratory: Solvent Extraction and Isocratic LC/MS/MS Analysis of Soils for C4-C12 Perfluorinated Carboxylic Acids and Perfluorobutane Sulfonate, Perfluorohexane Sulfonate and Perfluorooctane Sulfonate.

V. TREATMENT TECHNOLOGY

Vecitis CD, Park H, Cheng J, Mader BT, Hoffman MR. 2009. Treatment Technologies For Aqueous Perfluorooctanesulfonate (PFOS) and Perfluorooctanoate (PFOA)" *Fron Environ Sci Engin China* 3(2):129-151.