# EXPERT REPORT OF E. SCOTT TUCKER, III, Ph.D.

1. My name is Earl Scott Tucker, III, Ph.D. I have been retained by the defendant, Monsanto Company, in the case styled Owens, et al v. Monsanto Company, United States District Court, Northern District of Alabama, Civil Action No. CV- 96-P-440-E. I am currently employed by IT Corporation in Findley, Ohio, where I am Senior Consultant for Quality Assurance/Quality Control, Air Quality Monitoring and Analytical Laboratory Support Services for Thermal Treatment Superfund RD/RA programs.

2. In 1961, I received an Associates degree in Chemistry/Mathematics from the University of Michigan, Flint, Michigan. I was awarded a Bachelor of Science degree in Analytical Chemistry from Michigan State University, East Lansing, Michigan in 1963. I received a Ph.D. degree in Analytical/Organic Chemistry from the University of Iowa, Iowa City, Iowa, in 1968.

3. I have over 30 years of industrial management and technical experience with major chemical, engineering, and waste management companies. In the late 1960s and the 1970s, I adapted and developed analytical techniques for monitoring chemicals, including polychlorinated biphenyls ("PCBs"), in various matrices, including environmental samples. These techniques include gas chromatography with electron capture, flame ionization, thermal conductivity, flame photometric, nitrogen-phosphorous, photoionization, microcoulometric, electro-conductivity, and mass spectrometry detection for the analysis of environmental samples for trace organic compounds. I have also designed and implemented avian, mammalian, and aquatic toxicological study protocols for tissue residue, bacterial degradation, and bioaccumulation studies.

4. I have published numerous peer-reviewed papers and made numerous presentations before scientific and professional societies regarding analytical chemistry and the environmental fate of chemicals. A copy of my curriculum vitae is attached as Exhibit "1."

PLAINTIFF'S EXHIBIT
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5. In forming my opinions, I have relied on my education, training, experience, and research as an analytical chemist, and also on my personal knowledge of and involvement in the development of new, complex analytical techniques in the late 1960s and the 1970s that were capable of detecting and quantifying minute quantities of chemicals in the environment.

6. I will testify from a scientific and analytical perspective regarding the details of Monsanto's response to the discoveries of the international scientific community in the late 1960s and early 1970s regarding the persistence and accumulation of PCBs in the environment. I will testify as to my involvement in the development and use of analytical equipment to detect and measure trace quantities of PCBs, my investigation and testing of PCB biodegradation, and my contacts with the scientific community concerning scientific issues relating to PCBs and the development of scientific information regarding the presence of PCBs in the environment. As necessary, I will also furnish background information regarding analytical techniques and the behavior and properties of PCBs.

This report prepared by: E. Scott Tucker on 9/28/99

E. Scott Tucker, III, Ph.D.

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## EDUCATIONAL BACKGROUND

Ph.D. Analytical/Organic Chemistry
University of Iowa
Iowa City, Iowa
(February 3, 1968)

B.S. Analytical Chemistry
Michigan State University
East Lansing, Michigan
(August 13, 1963)

A.S. Chemistry/Mathematics
University of Michigan
Flint, Michigan
(June 16, 1961)

## EXPERIENCE SUMMARY

Dr. Tucker has accumulated over 30+ years of analytical chemistry research & development and industrial technical management experience during his career at five major chemical, engineering and waste management companies. He is one of the original principal industrial scientists and team leaders that confirmed the widespread presence and sources of polychlorinated biphenyl (PCBs) residues in our environment through the development and application of analytical methods for the absolute identification and analysis of PCB residues in industrial products and environmental samples. Dr. Tucker also has extensive direct technical knowledge and scientific extertise in the following asociated areas.

Air Toxics hazardous waste sites, thermal treatment stack testing, perimeter/on-site/off-site, and community environmental (air/water/soil) monitoring program plan preparation, QA/QC, equipment specification, cost estimation, installation, startup, operation, maintenance and data collection/verification/validation.

Design, development, start-up, operation, and management of high performance analytical service laboratories and field systems specializing in the characterization of hazardous, low level radioactive and mixed waste samples, environmental (air, water, soil) monitoring, and R&D treatability studies.

Environmental impact expert and fact witness for PolyChlorinated Biphenyl/Dioxin/Furan, Hexachlorobenzene, Toxaphene ... litigation, remediation litigation, affidavit preparation, data interperation/validation, arbritations, depositions, etc. for government, industrial companies, and law firms.

Working knowledge and experience with NRC, DOE, RCRA, CERCLA, TSCA, NPDES, POTW, OSHA, NIOSH, AIHA, CAA, BIF, etc. regulatory and analytical testing requirements for the characterization, treatment, and disposal of low level radioactive, hazardous, and mixed wastes.



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EMPLOYMENT HISTORY

ANALYTICAL CHEMISTRY CONSULTING SERVICES - ACCS. (Liberty, SC)
- Principal Director, (1992 - Current)

IT CORPORATION/OHM REMEDIATION SERVICES CORP. (Findlay, OH)
- Senior Consultant/Manager, Air Quality Monitoring & Analytical Laboratory Remediation Support, Thermal Treatment Facilities/Superfund Sites, (1995 - Current)

RUST REMEDIATION SERVICES Inc. (Anderson, SC)
- Project Manager, Air Quality Monitoring & Analytical Laboratory Remediation Support, Thermal Treatment Facilities/Superfund Sites, (1994 - 1995)
- Director, Analytical Laboratory and Facility Quality Assurance Programs, Clemson Technical Center, Inc. (1993 - 1994).

CHEMICAL WASTE MANAGEMENT, Inc. (Anderson, SC)
- Sr. Director, Mixed Waste Analytical Programs, Clemson Tech. Center, Inc. (1992 - 1993).

CHEM-NUCLEAR ENVIRONMENTAL SERVICES Inc. (Greenville, SC)
- Sr. Director, Mixed Waste Analytical and Facility Radioactive/Hazardous/Mixed Waste Programs Safety/Environmental/Regulatory Compliance & Quality Assurance Programs, Chem-Nuclear Laboratories Inc. (1990 - 1992).

CHEMICAL WASTE MANAGEMENT, Inc. (Chicago, IL)
- Senior Staff Manager, Corporate Analytical Programs, Science & Technology, Corporate Technical Center (1989 - 1990).

WASTE MANAGEMENT INTERNATIONAL, Inc. (Moedijk, The Netherlands)
- Corporate Staff Advisor, Science & Technology, Corporate Tech. Center (1988 - 1989).

CHEMICAL WASTE MANAGEMENT, Inc. (Chicago, IL)
- Senior Staff Scientist, Science and Technology, Corporate Technical Center (1987 - 1988).
- Manager, Corporate Hazardous Waste Analytical Chemistry Programs, Director's Staff, Technical Center Analytical Laboratories (1985 - 1987).

AMF INCORPORATED (Stamford, CT)
- Project Manager/Unit Manager/Research Specialist, Materials Science Center, Corporate Engineering and Research (1981 - 1985).
- Manager, Analytical Chemistry & Non-Tobacco Research, CUNO & Microflake Divisions (1980 - 1981).
- Manager, Analytical & Process Chemistry, World Tobacco Div. (1979 - 1980).

MONSANTO COMPANY (St. Louis, MO)
- Research Specialist/Staff Consultant, Corporate Environmental Health Laboratory and Monsanto Industrial Chemicals Co. (1975 - 1978).
- Research Group Leader, Analytical Chemistry Group, Applied Sciences Section, Technology Department, Monsanto Industrial Chemicals Co. (1970 - 1975).
- Senior Research Chemist, Applied Sciences, Organic Chemicals Division (1967 - 1970).

UNIVERSITY OF IOWA (Iowa City, IA)
- Research Teaching Assistant, Quantitative Analysis, Chemistry Department (1963 - 1964).



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PROFESSIONAL ACTIVITIES AND SELECTED AWARDS

- International Association of Environmental Testing Laboratories. Past Member IATEL Board of Directors, Chairman Mixed Waste Committee, Member National Accreditation and Technical Committees.
- Nominee for WMI Presidents Award for Technical Excellence for - The Clemson Technical Center $10 Million Mixed Waste Analytical/Treatability Laboratory Facility Design Team in 1993 and The Hong Kong $ 125 Million Hazardous Waste Treatment Facility Design Team in 1990.
- Air & Waste Management Association.
- American Chemical Society.
- National Aeronautics and Space Administration Graduate Research Traineeship.
- National Science Foundation Undergraduate Research Traineeship.
- American Association for the Advancement of Science.
- St. Louis Society of Analysts Past: Board Member, Chairman, Treasurer, Secretary, and Membership Chairman.
- Sigma Xi
- Phi Lambda Epsilon
- Alpha Chi Sigma.

TECHNICAL AND MANAGERIAL EXPERIENCE

IT CORPORATION, OHM REMEDIATION SERVICES CORP., WASTE MANAGEMENT, WASTE MANAGEMENT INTERNATIONAL, CHEM. NUCLEAR ENVIRONMENTAL SERVICES, CHEM-NUCLEAR LABORATORY SERVICES, CLEMSON TECHNICAL CENTER (1985 - 1999)

- Air Toxics hazardous waste sites, thermal treatment stack testing, perimeter/on-site/off-site, and community environmental (air/water/soil) monitoring program plan preparation, QA/QC, equipment specification, cost estimation, installation, startup, operation, maintenance and data collection/verification/validation.
- Corporate, regional, and site low/high level radioactive, hazardous, mixed waste and environmental monitoring analytical laboratory-design, technical, operational, and management support services.
- Ongoing design, operation, management, and development of large, medium, and small high performance permanent, transportable, and mobile hazardous and/or mixed wastes analytical support laboratories.
- Mixed Waste Analytical Laboratory Industrial & Radiation Safety, Environmental & Regulatory Compliance, and Quality Assurance Programs.



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TECHNICAL AND MANAGERIAL EXPERIENCE (continued ...)

AMF INCORPORATED (1979 - 1985)

PROCESS RESEARCH & DEVELOPMENT

- Established and improved existing chemical and mechanical plant process operations and QA/QC testing procedures required to produce "top of the line" high performance natural gut HEAD racquet string.
- Responsible for ongoing Engineered Leather laboratory research and development as well as batch/continuous pilot plant operations.
- Demonstrated feasibility of Engineered Leather as a viable industrial/consumer product.
- Designed and carried out scale up of bench process to pilot plant level concurrent with continued laboratory research for improved product formulations and their evaluations.

MOLECULAR SEPARATIONS & POROUS COMPOSITE MEDIA

- Evaluated feasibility of novel (low pressure, high capacity, and high throughput) porous media for commercial scale ion exchange and reverse phase liquid chromatographic separations for biotechnology process operations.

NATURAL FIBER REFINING & COLLAGEN CHEMISTRY

- Conceived, and implemented the laboratory R&D program for producing highly refined (fibrillated) chrome tanned leather fibers from leather waste and conversion of these fiber systems into reconstituted (Engineered) leather substrates.

TOBACCO & CHARGED COMPOSITE MEDIA CHEMISTRY

- Planned and directed chemical research and analytical programs for reconstituted tobacco cigarette filler and cigar binder/wrapper systems, pathogen attracting surface media, and non-tobacco smoking products.

ANALYTICAL TOBACCO & TOBACCO SMOKE CHEMISTRY

- Planning and implemention of all analytical support for tobacco analytical programs.
- Liaison with regulatory and consultant laboratories for the evaluation and testing of the smoke chemistry of additives for reconstituted tobacco sheet products.

MONSANTO COMPANY (1967 - 1978)

RESIDUE/POLLUTANT ANALYSIS & GAS CHROMATOGRAPHY

- Principal U.S. industrial scientist and team leader that confirmed the widespread presence and sources of polychlorinated biphenyl (PCBs) residues in our environment.
- Development and application of analytical methods for the absolute identification and analysis of PCB residues in industrial products and environmental samples.
- Gas chromatography (packed, capillary, etc.) with electron capture, flame ionization, thermal conductivity, flame photometric, nitrogen-phosphorous, photoionization, microcoulometric, and electro-conductivity detection techniques for the analysis of environmental samples for trace organic pollutants.



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TECHNICAL AND MANAGERIAL EXPERIENCE (continued ...)

- Setup and design of avian, mammalian, and aquatic toxicological study protocols with consultant laboratories for residue bioaccumulation studies.
- Bacterial river die away, semi-continuous activated sludge, and ultimate biodegradation studies. Static aquatic bioassay testing and bioaccumulation studies.
- General Analytical Support of pilot plant and existing plant processes.
- FDA indirect food additive clearance studies

INORGANIC/ORGANIC GENERAL ANALYTICAL CHEMISTRY

- Analysis of products, catalyst systems, etc. for trace metal via atomic adsorption, arc emission, and X-ray fluorescence techniques.
- Development of analytical methodology for product quality, process monitoring, and competitive product breakdown.

CLINICAL & ANALYTICAL BIOCHEMISTRY

- Design and planning (staffing/equipment/budget) of an analytical and clinical chemistry laboratory to support a new corporate environmental toxicology testing facility.
- Developed on-line computerized reporting and record keeping procedures for data acquisition, reduction, retention, and retrieval in compliance with anticipated regulatory environmental/toxicological GLP requirements.

MASS SPECTROSCOPY, RADIOCHEMISTRY, & BIODEGRADATION

- Application of computerized gas chromatograph/mass spectrometry for trace environmental pollutant identification and quantitative analysis.
- Improved techniques for the chemical syntheses and characterization of high specific activity raiolabled product for analytical environmental compatibility studies.
- Division Radiation Safety Officer and Member Corporate Radiation Safety Committee.
- Design and implementation of a company-wide computerized isotope inventory system for compliance with NRC regulations and inspections.
- Development and application of standardized protocols using radiolabled products in bacterial, aquatic, avian, and mammalian bioaccumulation and metabolism studies.

PRODUCT ENVIRONMENTAL & LIABILITY IMPACT STUDIES

- External and internal liaison on the environmental and analytical chemistry of dielectric fluids and plasticizers for corporate legal, manufacturing units, customers, consultant labs, and governmental regulatory agencies.
- Development of standardized protocols for the evaluation of the environmental compatibility of new and existing Monsanto Co. products.



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SELECTED PATENTS, PUBLICATIONS, AND PRESENTATIONS

A Comparision of Three Ambient Air Monitoring Strategies for Superfund Remediation Sites, Midwest Section Air & Waste Management Association Conference and Exhibition, Kansas City, KC, September 17, (1998).

Application of Real-Time Ambient Air GC Fenceline Network Monitoring to a Superfund Remediation Program, Air & Waste Management Association Symposium, "Measurement of Toxic and Related Air Pollutants", Research Triangle Park, NC, May 16-18, (1995).

A Performance Evaluation of a GC Based Continuous Air Monitoring System Used During a Superfund Site Remediation, Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, New Orleans, LA, March 5-10, (1995).

International Association of Environmental Testing Laboratories, "Federal Facilities Compliance Act", 6th IAETL Annual Conference, San Diego, CA, September 26-28, (1993).

Management of Laboratory Radioactive and Mixed Wastes Generated via Analysis of DOE Samples, Second International Mixed Waste Symposium, Baltimore, MD, August 17-20, (1993).

Commercial Laboratory Position on National Accreditation, USEPA 9th Annual Waste Testing and Quality Assurance Symposium, Washington, DC, July 12-16, (1993)

International Association of Environmental Testing Laboratories, Mixed Wastes Stakeholders Workshop on DOE's "Analytical Services Five Year Program Plan", Committee Co-Chair, McLean, VA, October 27-29, (1992) & IAETL Stakeholders Workshop Report, June (1993).

International Association of Environmental Testing Laboratories, "Mixed Waste Committee Objectives", 5th IAETL Annual Conference, Wyndham Harbour Island Hotel, Tampa, FL, October 18-20, (1992).

The Application of X-Ray Fluorescence Spectroscopy for Rapid Hazardous Waste Classification and Screening, USEPA 7th Annual Symposium on "Solid Waste Testing and Quality Assurance", Washington, DC, July 8-12, (1991).

Evaluation of EPA SW-846 Gas Chromatography/Mass Spectrometry Methods 8240 and 8270 for the Analysis of Volatile and Semi-volatile Halogenated Organic Constituents, USEPA 4th Annual Symposium on "Solid Waste Testing and Quality Assurance", Washington, DC, July 11-15, (1988).

Ion Chromatograph for the Analysis of Anions in Hazardous Waste Materials, USEPA 3rd Annual Symposium on "Solid Waste Testing and Quality Assurance", Washington, DC July 13-17, (1987).



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SELECTED PATENTS, PUBLICATIONS, AND PRESENTATIONS (continued ...)

Reconstituted Leather Products from Fibrillated Leather Fibers, Filed, Patent Pending, U.S. Serial No. 857,750/E.P. App. No. 83-102-425.2, Mar. 11 (1982). Additional Foreign Patent Fillings. Comparative Smoke Deliverables and Chemistries of Natural and Reconstituted Tobacco Cigarettes, German Health Board, Berlin, Germany, (1980).

Environmental Fate of Selected Phosphate Esters, Environmental Science and Technology, 13 (7), 840-4, (1979).

Tissue Residues from Subactive Oral Feeding of Biphenyl Dielectic Fluids, Bulletin of Environmental Contamination and Toxicology, 15 (6) 699-707, (1976).

Identification and Analysis of Organic Pollutants in Water, L. H. Kieth Ed., "Separation of Trace Organic Compounds from Water," Chapter 8, 113-133 Ann Arbor Science Publishers Inc. (1976).

Biodegradation of Phthalate Esters in River Water and Activated Sludge, Applied Microbiology, 31 (1), 29-34, (1976).

Activated Sludge Degradation of Adpic Acid Esters, Applied Microbiology, 31(6), 746-9, (1976).

Accessing Potential Ocean Pollutants, A Report on Assessing Ocean Pollutants, Ocean Affairs Board, Commission on Natural Resources, National Research Council, "Synthetic Organic Chemicals", Chapter 4, 64-224, National Academy of Sciences, Washington, DC, (1975).

Activated Sludge Primary Biodegradation of Polychlorinated Biphenyls, Bulletin of Environmental Contamination of Toxicology, 14(6), 703-13 (1975).

Migration of Polychorinated Biphenyls in Soil Induced by Percolating Water, Bulletin of Environmental Contamination and Toxicology, 13(1), 86-93, (1973).

Phthalate Esters Undergo Ready Degradation, Plastics Engineering, 29(8), 46-9 (1973)

Assessing Potential Ocean Pollutants, Ocean Affairs Board, Commission on Natural Resources, National Research Council, National Academy of Sciences, Chairman, Synthetic Organic Chemicals Section, Marine Biological Laboratory, Woods Hole, MA, Oct. 29 - Nov. 2, (1973).

Biodegradation of Phthate Esters, Regional Technical Conferences, Society of Plastics Engineers, Invited Technical Paper, 105-13, Lake Kamesha, NY. Mar. 20-22. (1973).

Assessing Potential Ocean Pollutants, Ocean Affairs Board, Commission on Natural Resources, Nation Research Council, National Academy of Sciences, Study Panel Member, July (1972).



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SELECTED PATENTS, PUBLICATIONS, AND PRESENTATIONS (continued ...)

Assessment of the Biological Persistence of Polychlorinated Biphenyls, President's Council on Environmental Quality, Interdepartmental Task Force on Polychlorinatined Biphenyls, Invited Industry Advisor, Washington, DC, May 15, (1972).

Spectrophotometric Determination of Cobalt with Benzyl Mono(2-Pyridyl) Hydrazones, Analytical Chemistry, 43(3), 458-9, (1971).

Atomic Adsorption Spectroscopy, American Chemical Society, Midwest Regional Meeting, Section Chairman, Manhattan, KA, Oct. 31 - Nov. 1 (1968).

An Analytical Investigation of Some Mono(2-Azaaryl) Hydrazones, 1-163, Dissertation Abstracts, 29(2), 511-2, (1968).

Spectrophotemetric Determination of Cobalt with Benzyl Mono(2-Pvirdyl) Hydrazone, American Chemical Society, Midwest Regional Meeting, Technical Paper, University of Missouri, Columbus, MO, Nov. 2-3, (1967).

Spectrophotometric Determination of Iron in Strong Alkalies, Analytical Chemistry, 38(3), 1980-1, (1965).



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