

**Ben Thomas, Ph.D.**  
**Senior Managing Scientist****Professional Profile**

Dr. Ben Thomas is a Senior Managing Scientist in Exponent's Health Sciences practice. He has over 30 years of experience in toxicology, pathology, risk assessment, risk management, regulatory negotiations, litigation support, strategic planning, program development, and program management. He has supervised large, multidisciplinary projects using risk-based methods to establish remedial priorities and to achieve closure under RCRA, Superfund, and state programs. He is well respected in the regulatory community, and was appointed as a member of the Science Advisory Panel of the National Urban Air Toxics Research Center (NUATRC), that was created by the Clean Air Act Amendments of 1990. He has served as a consulting and/or testifying expert in toxic tort and environmental litigation cases claiming injuries due to benzene, petroleum crude oil and distilled products, solvents, PAHs, PCBs, dioxins, cigarette smoke, carbon monoxide, anhydrous ammonia, chlorine gas, metals, aluminum welding fumes, asbestos, crystalline silica, mycotoxins (mold), and other toxicants. In addition to his consulting work, Dr. Thomas holds an academic appointment as Professor (adjunct) at the University of Texas Graduate School of Biomedical Sciences at Houston.

**Credentials and Professional Honors**

Ph.D., Pathology, University of Texas Health Science Center at Houston, 1973

M.S., Pathology, University of Texas Health Science Center at Houston, 1971

B.S., Biology, Tulane University, 1969

Rosalie B. Hite Postdoctoral Fellow, University of Texas M.D. Anderson Hospital & Tumor Institute, Houston (1974-1977)

Sigma Xi

**Prior Experience**

Principal and Vice President, RAM Group, 2003-2005

Senior Scientist, Conestoga-Rovers & Associates/RAM Group, 2001-2003

Principal and Vice President, RAM Group, 1999-2001

Adjunct Professor (Toxicology/Risk Assessment), University of Texas Health Science Center, 1996-present

Principal and Executive Vice President; Compliance Solutions, Inc., 1995-1999

Principal/Senior Science Advisor; ENVIRON Corporation, 1993-1995

Regional Program Manager/Director of Toxicology and Risk Management, ENSR Consulting & Engineering, 1990-1993

Staff Toxicologist; Shell Oil Company; Health, Safety & Environment, 1977-1990

## Publications

Zheng N, Thomas B. Causal relationships between occupational and environmental exposures and injury: general causation vs. specific causation. *J Environ Occup Med* 2005; 22:181-183. [Chinese].

Cox LA, Jr., Thomas FB. A generic PBPK modeling tool for rapidly developing PBPK models. *Toxicologist* 1992; 12(1):188 (Abstract 684).

Thomas FB, Halder CA, Holdsworth CE, Cockrell BY. Hydrocarbon nephropathy in male rats. Part II. Temporal and morphologic characterization of the renal lesions. In: *Proceedings of the Symposium on Hydrocarbon Toxicity*, University of Surrey, Surrey, England, 1984.

Thomas FB, Thomas DM, Shewach DS, Furlong NB. Substrate specificity of aryl hydrocarbon (benzo(a)pyrene) hydroxylase. In: *Polynuclear Aromatic Hydrocarbons, 3<sup>rd</sup> International Symposium on Chemistry and Biology--Carcinogenesis and Mutagenesis*, P.W. Jones and P. Leber (eds.), pp. 669- 683, 1979.

Thomas FB, Furlong NB. A simple radioassay of benzo(a)pyrene activation: Observations on the covalent interactions of benzo(a)pyrene with protein. *Analytical Biochemistry* 1976; 72:546-551.

Tessmer CF, Hrgovcic M, Thomas FB, Wilbur J, Mumford DM. Long-term serum copper studies in acute leukemia in children. In: *The Year Book of Cancer 1974*, R.L. Clark and R.S. Cumley (eds.), 1974.

Furlong NB, Thomas FB, and Mintz CG. A probable mechanism for apurinic acid inhibition of DNA synthesis. *FEBS Letters* 1974; 41:256-258.

Tessmer CF, Hrgovcic M, Thomas FB, Fuller LM, Castro JR. Serum copper as an index of tumor response to radiotherapy. *Radiology* 1973; 106-112.

Hrgovcic M, Tessmer CF, Thomas FB, Fuller LM, Gamble JF, Shullenberger CC. Significance of serum copper levels in adult patients with Hodgkin's disease. *Cancer* 1973; 31:1337-1345.

Tessmer CF, Krohn W, Johnston D, Thomas FB, Hrgovcic M, Brown BW. Serum copper in children (6-12 years): an age correction factor. *Amer. J. Clin. Path.* 1973; 60:870-878.

Hrgovcic M, Tessmer CF, Thomas FB, Ong PS, Gamble JF, Shullenberger CC. Serum copper observations in patients with malignant lymphoma. *Cancer* 1973; 32:1512-1514.

Thomas FB. Copper binding proteins in normal human serum and in Hodgkin's disease. Doctoral Dissertation, The University of Texas Health Science Center at Houston, Graduate School of Biomedical Sciences, 1973.

Tessmer CF, Hrgovcic M, Brown BW, Wilbur J, Thomas FB. Serum copper correlations with bone marrow. *Cancer* 1972; 30:293-297.

Tessmer CF, Hrgovcic M, Thomas FB, Wilbur JR, Mumford DM. Long-term serum copper studies in acute leukemia in children. *Cancer* 1972; 30:358-365.

Thomas FB. Serum copper relation to estrogen administration: A comparative study. Master's Thesis, The University of Texas Health Science Center at Houston, The Graduate School of Biomedical Sciences, 1971.

Pienta RJ, Tessmer CF, Thomas FB. Effect of murine oncogenic viruses on serum copper levels. *Cancer Res* 1969; 10:69 (Abstract).

### **Book Chapters**

Thomas FB, Simpson BJ. Application of short-term assays by the petroleum industry to identify skin carcinogens. In: *Skin Carcinogenesis: Mechanisms and Human Relevance*, T.J. Slaga, A.J.P. Klein-Szanto, R.K. Boutwell, D.E. Stevenson, H.L. Spitzer, and B. D'Motto (eds.), pp. 393-399, 1989.

Thomas FB. Toxicological effects of benzene. In: *Benzene in Florida Groundwater: An Assessment of the Significance to Human Health*, American Petroleum Institute, Washington, D.C., pp. 7-15, 1986.

Sussman RM, Thomas FB, Irons RD. Risk assessment issues presented by 1,3-butadiene. In: *Risk Assessment in the Chemical Industry*, Chemical Manufacturers Association, Washington, D.C., pp. 177-214, 1985.

Hrgovcic M, Tessmer CF, Brown BW, Wilbur JR, Mumford DM, Thomas FB, Shullenberger CC, Taylor HG. Serum copper studies in the lymphomas and acute leukemias. In: *Progress in Clinical Cancer*, I.M. Ariel (ed.), Vol. V, 121-153, 1973.

### **Presentations**

Thomas B. Health risks associated with PFOA. Invited paper, presented at the Mealey's PFOA/C-8 Science, Risk, and Litigation Conference, Philadelphia, PA, October 24, 2005.

Zheng N, Thomas B. Does aluminum welding fume cause clinically significant pneumoconiosis and lung cancer? – An analysis of specific causation. Poster presented at the 44<sup>th</sup> Annual Meeting of the Society of Toxicology, New Orleans, LA, 2005.

Bobst S, Zheng N, Thomas B. Real world toxicology: a framework for evaluating tort claims in the courtroom. Poster presented at the 44<sup>th</sup> Annual Meeting of the Society of Toxicology, New Orleans, LA, 2005.

Zheng N, Thomas B. Causal relationships between occupational and environmental chemical exposures and diseases in toxic tort cases. Presented, 3<sup>rd</sup> International Academic Conference on Environmental and Occupational Medicine, Shanghai, China, 2004. [Chinese].

Thomas B. MTBE and benzene toxicology. Panel discussion with Scott R and Mehlman M at Mealey's MTBE & UST Litigation Conference; Marina del Rey, CA, November 4, 2002.

Zheng N, Thomas B. Development of generic soil and groundwater cleanup standards for sodium chlorate. Invited paper, 3<sup>rd</sup> National Conference of the Chinese Society of Toxicology, Beijing, China, 2001. [Also presented to Fudan University and Beijing University School of Public Health] [Chinese].

Thomas B. A toxicologist's perspective of MTBE. Invited paper, presented at the Petroleum Marketing Attorneys Meeting, Washington, DC, April 4, 2000.

Thomas B. Kekulé's devils and E&P waste. Invited paper, presented at the Society of Petroleum Engineers, Evangeline Section, Environmental Issues Forum, Lafayette, LA, February 22, 1999.

Thomas B. MTBE – toxicology and the use of animal data to prove causality. Invited paper, presented to the 2<sup>nd</sup> Annual Appellate Judges and Lawyers Symposium: Scientific Methodology and the Admissibility of Expert Testimony, The University of Kansas, Law and Organizational Economic Center, Lawrence, KS, May 13-15, 1999.

Thomas B. Evaluation of health issues associated with E&P wastes. Invited paper, presented at the Louisiana Gulf Coast Oil Exposition, Lafayette, LA, October 29, 1999.

Thomas B. Toxicology of methyl tertiary-butyl ether (MTBE) – an update. Invited paper, presented at Mealey's UST and MTBE Litigation Conference, Amelia Island, FL, November 16, 1999.

Thomas B, Handley B. Offsite consequence analysis: the public connection. Invited paper, presented at the Hazard Assessment/Offsite Consequence Analysis Session, Petro-Safe 98, Houston, TX, January 28, 1998.

Thomas B. Toxicological issues in the chemical processing industry. Invited paper; presented at the 1<sup>ST</sup> Annual Symposium of the Mary Kay O'Connor Process Safety Center, George Bush Presidential Conference Center; College Station, TX, May 30-31, 1998.

Thomas B. The toxicological significance of chemicals in water supplies (or what is clean water). Invited paper, presented at the ELA Seminar on New Ground-Water Supply Issues, Houston, TX, April 16, 1998.

Thomas B. The toxicology of methyl tertiary-butyl ether (MTBE). Invited paper, presented at Mealey's Underground Storage Tank Conference, Amelia Island, FL, June 9, 1998.

Thomas B, Handley B. Risk-based corrective action. Training course for the TNRCC certification of Corrective Action Project Managers. Texas Natural Resource Conservation Commission, contract through the Texas A&M Engineering Extension Service, 1997.

Thomas FB, Plunkett L, Libicki SB & Kappleman WB. The comprehensive assessment of risks due to emissions from hazardous waste incinerators. Training course for the Louisiana Department of Environmental Quality, Baton Rouge, LA, June 26-28, 1995.

Thomas B, Thompson R, Lu C. The risk-based remediation of total petroleum hydrocarbon contamination of soils. Invited paper, presented at Petro-Safe '93, Houston, TX, January 27, 1993.

Thomas B. Risk characterization. Invited paper, presented to the Association for the Environmental Health of Soils, Houston, TX, May 12, 1993.

Thomas B, Plunkett L, Wojciak J. Strategic approaches to implementing the Texas Water Commission's Risk Reduction Rules. Presented at the ENVIRON Workshop on the Risk Reduction Rules, Houston, TX, June 17, 1993.

Thomas FB. Multi-media risk assessment. Invited paper, presented to the Association for the Environmental Health of Soils, Houston, TX, July 1992.

Thomas B, Brassow C. The TWC Risk Reduction Rules and remediation of soil contamination. Presented at How to Classify and Clean up or Dispose of Solid Waste, sponsored by Texas Environmental Education Services, Houston, TX, October 16, 1992.

Thompson RA, Woodrow JO, Thomas FB. Risk based prioritization of remediation options. Presented at the Annual Meeting of the Society for Risk Analysis, San Diego, CA, December 7, 1992.

Cox LA, Jr., Thomas FB, Woodrow JO. Decisions with unknown consequences: a random valuation model. Presented at the Annual Meeting of the Society for Risk Analysis, San Diego, CA, December 9, 1992.

Thomas FB. The evolving Material Safety Data Sheet. Invited paper, presented to the Dallas Bar Association, Environmental Law Section, Dallas, TX, March 28, 1991.

Thomas FB. Risk assessment and the Clean Air Act Amendments. Presented at the ENSR Breakfast Seminar, Houston, TX, May 2, 1991.

Thomas FB. Multi-media risk assessment. Invited paper, presented at the Bridgestone/Firestone Environmental Affairs Domestic Conference, May 8, Nashville, TN, 1991.

Thomas FB. Application of toxicology, epidemiology and industrial hygiene. Invited paper, presented at the "Toxic Tort Litigation" Course sponsored by the Continuing Legal Education Committee of the Houston Bar Association, October 11, Houston, TX, 1991.

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Von Burg R, Lakin M, Thomas B, Egan B. Public interest group use of your SARA 313 data. Invited paper, presented at the Annual Meeting of the National Petroleum Refiners Association, San Antonio, TX, March 25-27, 1990.

Thomas FB. Toxicological overview of ethylene oxide, butadiene, gasoline, polyolefin manufacturing, and composites. Invited paper, presented at the American Occupational Health Association (AOHA) Conference, Houston, TX, May 3, 1990.

Thomas FB. Air toxics impacts on human health and the ecology. Presented at Air Toxic Compliance Conference, Executive Enterprises, Inc., Houston, TX, June 11-12, 1990.

Thomas FB. The toxicology of 1,3-butadiene. Invited paper, presented to the American Petroleum Institute Toxicology Committee, Toronto, Ontario, September 2, 1990.

Thomas FB. Science vs. compliance: the argument for QA's involvement in science. Invited paper, presented at the Annual Meeting of the Society of Quality Assurance, Orlando, FL, October 3, 1990.

Thomas FB. The science and art of risk assessment. Invited paper, presented at Marathon Oil Company's Health, Environment and Safety Conference, Houston, TX, October 10, 1990.

Thomas FB, Hulse M. Compounds in asphalt cement fumes and their health effects. Invited paper, presented to the International Society for Asphalt Pavements, Baltimore, MD, November 9, 1989.

Thomas FB. Neurotoxicology. Invited paper, presented to the Gulf Coast Section of the American Industrial Hygiene Association, Houston, TX, March 8, 1984.

Lington AW, Lewis SC, Thomas FB, Granville GC, Cragg ST, Spencer PS. The neurotoxic activity of commercial hexane mixtures in the male rat (Part I). Presented to the Annual Meeting of the Society of Toxicology, 1983.

Lington AW, Lewis SC, Thomas FB, Granville GC, Cragg ST, Spencer PS. The neurotoxic activity of commercial hexane mixtures in the male rat (Part II). Presented to the Annual Meeting of the Society of Toxicology, 1983.

Thomas FB. Evaluation of the neurotoxic potential of hexacarbon solvent mixtures in the Sprague-Dawley rat. Invited paper, presented to the Mid-West Regional Chapter of the Society of Toxicology, Chicago, IL, May 12, 1983.

Thomas FB. Neurotoxicology. Invited paper, presented to the Deep South Section of the American Industrial Hygiene Association, New Orleans, LA, October 31, 1983.

Thomas FB. Applications of Sephadex G-200 chromatography to the study of the copper binding components of human serum. Presented to the Southeastern Texas Section of the American Chemical Society, Houston, TX, 1974.

Mintz CG, Thomas FB, Furlong NB. Approaches to the in-vitro synthesis of ara-C apurines. Presented to the Southwest Section of the American Association for Cancer Research, November 8-9, New Orleans, LA, 1974.

Thomas FB, Furlong NB. Biochemical studies on the role of DNA polymerase in benzo(a)pyrene carcinogenesis. Presented to the Southwest Section of the American Association for Cancer Research, November 8-9, New Orleans, LA, 1974.

Thomas FB. Atomic absorption spectrophotometry in the clinical laboratory. Presented to the Annual Convention of the Texas Society of Medical Technologists, Houston, TX, May 12, 1972.

### Academic Appointments

- Professor (Adjunct Faculty), University of Texas Graduate School of Biomedical Sciences at Houston (part of The University of Texas Health Science Center at Houston, and The University of Texas M.D. Anderson Cancer Center at Houston) (1996-Present)

### Research Experience

- Chairman, Toxicology Work Group, Asphalt Institute (1989-1990)
- Chairman, Toxicology Committee, American Petroleum Institute (1987-1989)
- *North American representative to the Butadiene Steering Committee, International Institute of Synthetic Rubber Producers (IISRP) (1986-1990)*
- Chairman, 1,3-Butadiene Toxicology Research Task Group, Chemical Manufacturers Association (now American Chemical Council) (1985-1990)
- Chairman, Neurotoxicology Task Force (PS-29), American Petroleum Institute (1980-1985)
- Chairman, Benzene Toxicology Task Force (PS-7), American Petroleum Institute (1977-1990)

### Science Advisory Boards/Panels

- Science Advisory Board, National Urban Air Toxics Research Center (1991-1993)

were associated with his exposure to asphalt fumes from his work. He was employed as a driver of a spray truck for repaving roads using an asphalt that was cut-back with kerosene. During the trial, the Plaintiff played a videotape of a repaving operation showing a billowing white cloud behind the spray truck. In my testimony, a short description of petroleum refining process gave the jury an understanding that kerosene begins to distill at a temperature of about 400°F and that

## Resume Supplement

### Relevant Experience

#### *Toxicology*

Provided primary toxicological support for a wide range of product/process areas including petroleum exploration and production, refinery operations, gasoline, gasoline additives, kerosene, diesel fuels, lubricants, lubricant additives, asphalts, aromatics, olefins, hydrocarbon and chemical solvents, metals, catalysts, radiation, mining, and synfuels.

Chairman, American Petroleum Institute's (API) Toxicology Committee, which was responsible for the design, contracting, monitoring, and interpretation of a wide range of industry-sponsored research programs on various chemicals and complex mixtures derived from petroleum. The committee also provided technical support to other API groups for use in issue and regulatory responses. In this capacity, provided toxicological advice to industry concerning the adverse health effects of lead and other metals used as fuel additives or emitted during the combustion of petroleum.

Chairman, API Benzene Toxicology (PS-7) Task Force for more than 10 years. Major contributor to the design and direction of API's interdisciplinary research program on this chemical and its effects on the body's blood-forming organs (including its leukemogenic mechanism).

Evaluated the toxicity of n-hexane and other chemicals to the central and peripheral nervous systems.

Chairman, Toxicology Research Task Group of the Chemical Manufacturers Association's (now American Chemistry Council) Butadiene Program Panel, and a major contributor to the development of regulatory and litigation strategies for this compound.

North American representative to the Butadiene Steering Committee of the International Institute of Synthetic Rubber Producers (IISRP), which developed international strategies for the Synthetic Rubber Industry with regard to butadiene health concerns.

Chairman, the Asphalt Institute's Toxicology Task Force. Major contributor to the development of a multidisciplinary strategy addressing health concerns related to exposures to asphalt fumes.

#### *Litigation (Selected)*

Testifying expert in a case of a man claiming a wide variety of health problems that he believed were associated with his exposure to asphalt fumes from his work. He was employed as a driver of a spray truck for repaving roads using an asphalt that was cut-back with kerosene. During the trial, the Plaintiff played a videotape of a repaving operation showing a billowing white cloud behind the spray truck. In my testimony, a short description of petroleum refining process gave the jury an understanding that kerosene begins to distill at a temperature of about 400°F and that

asphalt will not generate a fume until heated to temperatures greater than about 650°F and more likely >1000°F. Because the operating temperature of the spray truck was only 250°F, the Plaintiff did not have significant exposures to either asphalt fume (which is dark not white) or to kerosene vapor. The white cloud seen in the videotape was steam formed when the hot asphalt spray (250°F) contacted water (boiling point = 212°F) in the cracks of the road being resurfaced. Alternative causes for the Plaintiff's health complaints were suggested based on his medical records. The jury found for the Defendant within 45 minutes.

Testifying expert in case alleging severe restriction of lung expansion caused by pulmonary scarring (fibrosis) as a result of Plaintiff's workplace inhalation of aluminum welding fume. Scar tissue (when present in the lungs to a significant degree) cannot stretch, and restricts the lungs from expanding fully (i.e., a restrictive lung disease). Opposing experts in the case stated that the Plaintiff had the highest concentrations of particles in the lung that they had ever seen, and that the majority of these particles were physically and chemically consistent with aluminum welding fume. A biopsy of lung tissue was described as having a "burnished" appearance. After reviewing the medical records and published literature, it was demonstrated that the Plaintiff's pulmonary problems were primarily obstructive lung disease due to his long history of cigarette smoking, and that the Plaintiff's development of a "barrel chest" (hyper-expansion of the lungs secondary to emphysema) confirms that aluminum welding fume (like iron welding fume) does not cause pulmonary scar formation to an extent that results in restriction of lung expansion.

Consulting and/or testifying expert in several cases alleging various adverse health effects due to exposure to various metals and mineral dusts. Plaintiffs included railroad workers (taconite dust) welders/foundry workers (fumes from molten steel), and residents in a community located downwind from a commercial facility that recycled automotive batteries (lead).

Testifying expert in several cases alleging hematological cancers and related disorders associated with workplace exposures to benzene. After reviewing the medical records in these cases, it became apparent that the Plaintiff's either did not have a type of cancer associated with benzene, or did not have a preceding history of severe benzene intoxication that is necessary for the development of Acute Myelogenous Leukemia (the type of cancer associated with benzene).

Testifying expert in a case involving seven men who were killed in an explosion during a snubbing operation at a natural gas well. Based upon a review of autopsy records and other documents, it was clear that the men were killed outright by the pressure wave of the explosion. All of the victims suffered extensive third and fourth degree burns on their bodies (postmortem). However, there was no increase in the carboxyhemoglobin concentration in the blood and no evidence of soot or thermal injury in the lower respiratory tract, indicating that they had ceased breathing before being burned and therefore did not experience pain and suffering. One individual (a non-smoker) showed elevated carboxyhemoglobin levels, but no evidence of soot or thermal injury in the trachea; this was because the victim had been eviscerated by the shock wave created by the blast, allowing carbon monoxide to diffuse through the exposed peritoneal membrane and to bind to hemoglobin (postmortem).

Consultant to a major U.S. pipeline company concerning the risks to their operations from possible chemical/biological/radiological attack following the events of 9-11 and the subsequent anthrax scare. Addressed issues ranging from intentional adulteration of transported products, which would then be sold to and used by the general public, to potential attacks on operation centers and personnel in order to disrupt energy flow in the United States.

Testifying expert in several cases concerning the evolving understanding of the adverse health effects associated with various forms of asbestos (i.e., the state of the knowledge) and the level of understanding that would have been expected of a small insulation installer.

Testifying expert in a case involving a painter/sandblaster who developed progressive, debilitating lung dysfunction (diagnosed as silicosis because of his work history, but overlying COPD associated with smoking). This diagnosis led him to sue his previous employers. Upon his death, his attorney hired a pathologist to conduct an autopsy. The pathologist reported finding needle-shaped crystals consistent with silica and concluded that the gross and microscopic changes seen were consistent with silicosis, which he listed as the cause of death. The pathologist was apparently not told that this man had pulmonary tuberculosis as a young man, and had at least two recurrences of his TB documented in the medical records. It was surprising therefore, that no tissue evidence of chronic tuberculosis was mentioned in the autopsy report. In addition, the sand used for blasting purposes comprises spherical particles that fracture when impacted at high velocity against a hard surface, forming small, sharp-edged chips that are capable of injuring the delicate tissues of the lung (i.e., producing the changes of silicosis). It is not clear what the "needle-shaped crystals" seen by the pathologist are, but they are not found in sandblasting, and the patient most likely died of a pulmonary infection secondary to his chronic lung injuries sustained as a result of repeated infections by tuberculosis and as a result of his long smoking history.

Consulting expert in a case involving the exacerbation of porphyria in a teacher exposed to an organophosphate insecticide that had been sprayed in her classroom by maintenance personnel. The issue in this case was whether her treating physicians should have recognized her symptoms and initiated treatment before her disease became debilitating. The published literature indicates that the organophosphate used at the school inhibits a certain porphyrin-metabolizing enzyme that results in the specific biochemical form of porphyria she developed.

Testifying expert in a case heard in the High Court of New Zealand involving a farmer who sued the New Zealand Air Force for contaminating his groundwater and causing the illness and death of livestock and wild animals on his property, as well as numerous health effects in his family. The primary toxic agent suggested as being responsible was a neurotoxic additive in jet turbine oil that was burned in open pits at the base. However, that chemical is poorly soluble in water, adsorbs tightly to soil particles, and is therefore unlikely to have migrated over 3,000 meters to the farmer's property. In addition, the particular symptoms and necropsy findings seen in the animals were consistent with common veterinary diseases seen in New Zealand, especially in the unusually wet conditions that were extant at the time. Specifically the neurological and other findings were more likely explained by the animals' ingestion of mold and associated mycotoxins. Based on the presented evidence, the Court ruled in favor of the Air Force.

Testifying expert in a case involving a short-duration release of sulfur dioxide into the air during a process upset at a refinery in Texas City. Sulfur dioxide (SO<sub>2</sub>) dissolves in water to form sulfurous acid. Approximately, 4400 residents filed suit alleging that they suffered skin and eye irritation, as well as respiratory symptoms and other effects because of their exposures to the plume of SO<sub>2</sub>. Case is ongoing, but available meteorological data indicated that the plume most likely traveled across only a small corner of the city and out to the Gulf of Mexico, and that most of the plaintiffs in this case were not at locations where they could have been exposed to SO<sub>2</sub> (all but c. 125 plaintiffs have been dismissed from this case). While some of the alleged symptoms are consistent with those associated with acute SO<sub>2</sub> exposure, they occur in a time sequence and combinations that are inconsistent with the facts of this release, and it is telling that none of the plaintiffs in this case sought medical attention in the days following the incident.

Testifying expert in a case involving long-term water damage to a church in Texas, leading to blossoming of toxic mold, and rendering the church facilities unusable in their present condition. The jury was educated about mold exposures, and why the only exposure pathway of concern in this case was inhalation of mold and mold by-products. By evaluating bioaerosol data collected by other experts in this case it was shown that the mold in the Church buildings were of the types commonly found in indoor air, and that these molds were generally present at airborne concentrations found in most buildings. Increased airborne concentrations were seen in only a few areas with evidence of ongoing water intrusion. Remedial action of these few areas would address the concerns of the congregation. Complete destruction of the buildings, from a health point-of-view, was unnecessary.

#### *Risk Assessment and Regulatory Negotiation*

Project Manager for risk-based prioritization of 48 waste management areas (including identification of media and chemicals of concern) at a major chemical plant in Texas. This was part of a proactive regulatory strategy that allowed the client to maintain control of how and where its technical and financial resources would be spent at the plant.

Managed the development of the Baseline Risk Assessment for the Waite Park Superfund Site in Minnesota. This 200-acre site comprised eight waste management areas and the risk assessment identified the Chemicals of Concern (COCs) for each area, defined the boundaries of impact by these COCs, confirmed that the patterns of impact were consistent with the presumed source, and developed site-appropriate cleanup target concentrations. The risk assessment report and conclusions were an important factor in the negotiations with the regulatory agency and resulted in significant savings to the clients.

Invited by both the Texas Water Commission (now the Texas Commission for Environmental Quality, TCEQ) and the Texas Chemical Council to review the development of the State's Risk Reduction Rules for expediting the voluntary remediation/cleanup of contaminated sites.

Principal-in-Charge for developing risk-based cleanup concentrations at an organophosphate pesticide formulation plant in Texas. Demonstrated that according to draft state guidelines, only

certain areas of surface soil would require remedial attention (approximately 15% of the soil volume proposed by previous consultant). At this facility it was demonstrated that no remedial activities or post-closure care would be required for subsurface soils, ground water, or surface water.

Principal-in-Charge for a project which initially was intended to utilize risk assessment to close a large impoundment basin at a major petrochemical complex -- considered to be a key step in a large wastewater management program. During the data analysis stage, it became clear that the proposed risk-based closure of the basin might be unnecessary. Regulatory and risk-based arguments were developed that were ultimately accepted by the state regulatory agency. Approximate client savings were \$17 million and as much as one year in time.

Managed risk assessment task seeking to close a borrow pit containing metal-based catalysts (nickel and molybdenum) and various organic chemicals. Using the TNRCC Risk Reduction Rules, it was demonstrated that current conditions justified closing the borrow pit without remedial action. Approximate savings to client were \$9 million.

Project Principal for risk-based closure of a former foundry. The sale of the property as a site for a multi-million dollar apartment development in Texas was predicated on obtaining TNRCC's concurrence that conditions at the site did not pose an unacceptable risk to health. The chemicals of concern were primarily heavy metals in the soil (including lead and arsenic). Innovative statistical analysis of available analytical data established that the chemical concentrations were consistent with site-specific background concentrations, and that the conditions at the facility would meet the TNRCC Risk Reduction Rule guidelines for residential land use. The results of this evaluation were presented to senior TNRCC staff who subsequently issued a letter to the client concurring with the conclusions of the analysis. The sale was then finalized.

Developed three-day course at request of the Secretary of the Louisiana Department of Environmental Quality to familiarize DEQ staff with the comprehensive risk assessment procedures used in the regulatory permitting process for hazardous waste combustion facilities.

Principal-in-Charge of the baseline risk analysis of the health risks posed to residents of a subdivision built above former earthen tanks used in the 1920s for the temporary storage of crude oil. The project (and related litigation) was the subject of intense local and national attention both in the media and in the political arena. The risk assessment, conducted at the request of the Railroad Commission of Texas, evaluated data from all parties and demonstrated that the toxic constituents of the aged crude oil residue in soils do not exceed health-based criteria even at measured TPH levels up to 30,000 mg/kg (3%). The heavy native clays in which the tanks were constructed were shown to have prevented migration of the crude oil and its constituents beyond the original boundaries of the tanks, and to have provided effective protection for the useable ground water in the area.

Developed a two-day training course concerning Risk-Based Corrective Action (RBCA) for leaking underground petroleum storage tanks. Taught this course for TNRCC certification of Corrective Action Project Managers (CAPMs).

Served as an outside toxicology consultant to the Secretary of the Louisiana Department of Natural Resources (DNR) with regard to (i) health concerns associated with oil field wastes, (ii) development of an analytical testing program to address those concerns, and (iii) development and implementation of changes in the way DNR regulates the treatment and disposal of oil field wastes. This project was initiated by the Governor's edict following a report by CBS Sixty Minutes about a Louisiana community suffering adverse health effects due to fugitive vapors from a commercial facility that received odorous gas plant waste for land treatment. The political sensitivity of this project was such that I was one of only two people authorized to speak directly to the press (the other was the Secretary of DNR).

During this project, a local professor conducted an environmental and health survey of homes near a commercial treatment facility and reported that household dusts in those homes showed elevated levels of lead and arsenic, and that the residents exhibited adverse health effects as a result. Working with DNR staff, State health authorities, and a special ATSDR task force, a critical evaluation of the study results was completed and concluded that the community should not be concerned by the reported findings. The issues were also addressed in hearings before the environmental committees of both houses of the State Legislature. Based on the result of our toxicological evaluations and air dispersion modeling, DNR issued a revised rule for treatment of oil field wastes that is health-protective, yet reasonable in terms of its cost.

Principal-in-Charge for a project challenging TNRCC's (now TCEQ) statistical methods for determining whether quarterly groundwater monitoring data at a large refinery were such that expensive control technologies should be implemented. Successfully argued that the statistical methods originally stipulated in an Agreed Order were not appropriate, and that the increased concentrations of certain chemicals in the groundwater were within the range of statistical variability and did not warrant action at this time.

Consultant to a school district in Texas concerning the possibility that adverse health complaints reported by students and staff at one school might be related to exposures to environmental contaminants within and outside the building. The list of potential toxic agents evaluated included metals, volatile compounds (e.g., solvents), and semi-volatile compounds (e.g., pesticides).

Consultant to a fish meal/fish oil manufacturer who identified high levels of polycyclic aromatic hydrocarbons (PAHs) in the surface soils at a facility they had leased. My initial review of the analytical data suggested (because of the concentrations and sizes of the observed PAHs) that the contamination was not the result of spills of petroleum products, but more likely were associated with coal-derived bitumen. Subsequent examination of soils at the Site confirmed the presence of small tar-like particles in the surface soil samples, and a previous lessee of the property was found to be a scrap company that dismantled offshore oil platforms. The surfaces of such platforms are often coated with coal-tar enamel to minimize corrosion. The available toxicological literature shows that PAHs that are entrained within particles of tar are not available to contact biological tissues and do not pose a risk to health. Clearly in this case, there is a logical disconnect between the elevated concentrations of PAH (leading to highly stringent risk-based cleanup criteria) and the extremely low health risks at this Site due to the physical

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matrix in which the PAHs are suspended. I suggested that the high levels of PAHs seen in this case are an artifact of the standard analytical methods for determining PAHs, which use methylene chloride as the extraction solvent. Methylene chloride dissolves tar and asphalt, freeing the PAHs for chemical analysis. I therefore designed an alternative analytical procedure using n-pentane as the extraction solvent (the old name for asphalt was “pentane insolubles”), and used the modified procedure to demonstrate that the soil PAHs at this site are almost entirely entrained within the tar particles and are not extractable by n-pentane. These data also explained why previous attempts to biotreat the soils at this site failed – the PAHs in the tar particles are not accessible by n-pentane, nor by the biological solvent system (e.g., fatty acids and phytosterols) of soil microbes.

#### *Decision Analysis*

Developed multi-attribute decision analytical procedure to assist a major natural gas pipeline company to prioritize the environmental concerns associated with approximately 600 stations where mercury-containing meters had previously been utilized. This form of decision analysis allowed the client’s staff to identify the specific factors that were important in establishing priorities and to define how important each of those factors were in that decision. Importantly, the procedure quickly determined where individuals differed substantially in their understanding and/or opinions so that dialogue could be established to minimize future disagreements.