

Particulate Matter Exposure Assessment



RTI International has been a leader in exposure assessment with a focus on particulate matter. The synergistic research program adds capabilities for determining the relationships among the physical and chemical properties of aerosols, toxic gases, other environmental factors, and a person's behaviors that determine their exposure. Our resources provide a broad perspective that is essential to understanding the exposures in occupational and non-occupational environments that cause adverse health outcomes, especially among susceptible cohorts.

Our world is a complex mixture of aerosols and gases that affect people differently according to their genetics, age, health status, and social factors. Particulate matter exposure is one key facet of the environmental contaminants that induce acute and chronic health effects. Aerosol exposures, other pollutant exposures, social, and psychological factors must be considered jointly. Making this complex link requires a fundamental understanding of the emissions-exposure-health paradigm and its application to public and occupational health.

RTI's scientists and engineers provide the knowledge to design, conduct, and interpret environmental exposure and epidemiology studies to identify causal agents linked to a specific acute or chronic health outcome. We develop cutting-edge instrumentation and analytical procedures to provide the high-quality data required to identify the link between pollutant exposure and adverse health outcome. Our particulate matter exposure research areas cover development of sample collection methods, characterization of sources and routes of exposure, development of analytical methods, assessment of pollutant toxicology, and modeling the spatio-temporal variability and source contributions of different particulate matter species.

Areas of Expertise

RTI personnel have experience planning, conducting, and interpreting complex exposure studies. Our staff includes aerosol physicists, aerosol chemists, environmental health scientists, epidemiologists, and biostatisticians to address all aspects of exposure assessment. RTI's laboratories and equipment are designed for both field- and laboratory-based particulate matter exposure research, with capabilities including the following:

- Laboratories dedicated to exposure study sample preparation and logistics support—These facilities serve as the staging area where instrumentation is maintained and calibrated, samples are loaded into instrumentation, and shipments are arranged and received.
- Laboratories dedicated to exposure research—RTI has multiple room-sized, environmentally controlled chambers for investigating inhalation and dermal exposures. RTI also has small, benchtop chambers for particulate matter instrumentation development and characterization.

Particulate Matter Exposure Assessment

- Temporary field offices—RTI has the ability to staff and furnish temporary field offices to provide on-site technical support.

Project Highlights

RTI has developed sample collection instruments and analytical methods to provide representative personal exposure data in public and occupational environments. These tools include the MicroPEM, a small, lightweight, battery-operated instrument that provides real-time and integrated particulate matter concentrations, accelerometer data, and full quality control diagnostics for personal exposure studies, as well as macro- and micro-scale instruments for ambient conditions. A robust set of analytical methods has been developed that supports and facilitates the exposure analysis. Representative methods include the following:

- Procedures to measure low-level particulate matter exposures—RTI's capabilities include isolated chambers and associated methods for precision measurement of key components: gravimetric concentration for filters with less than 10 mg of mass; quantitative secondhand smoke and black carbon mass; and semi-quantitative brown carbon mass on membrane filters.
- Methods to improve understanding of chronic, low-concentration inhalation exposure to particle-based pollutants, including asbestos and heavy metals—A recent study using this instrumentation showed modeled exposures to zinc and cadmium emitted from disturbed soil had a much stronger correlation with experimental breathing zone concentrations than soil grab samples.

Children's Health After the Storms (CHATS)

RTI is conducting this ambispective environmental exposure and epidemiology study to understand the past and current health effects in children that resided in Federal Emergency Management Agency (FEMA)-provided temporary housing after Hurricanes Katrina and Rita. This multimedia exposure study is an integrated effort across multiple disciplines, including environmental exposure assessment, epidemiology,



RTI's MicroPEM™ for assessing particulate matter exposure

survey research, and statistics. The prospective portion of the project has a significant particulate matter exposure component based upon the RTI MicroPEM and associated analytical methods. This research is an innovative, probability-based assessment of children's exposure to factors that cause respiratory disease.

Detroit Exposure and Aerosol Research Study (DEARS)

RTI performed this Environmental Protection Agency (EPA)-funded particulate matter personal exposure study, the largest of its kind ever conducted by EPA. DEARS measured particulate matter and toxic gas exposures and lifestyle factors that affected these exposures for 120 participants over 3 years. RTI was responsible for all aspects of the study: study design, human subjects approval, participant recruitment and retention, sample and data collection, database preparation, data analysis, and reporting. This research allowed RTI to assist EPA in understanding how personal exposure levels relate to concentrations at fixed-monitoring sites.

More Information

Michele Ostraat
Senior Director, Center for Aerosol and Nanomaterials Engineering
919.541.5830
mostraat@rti.org
RTI International
3040 Cornwallis Road, PO Box 12194
Research Triangle Park, NC 27709-2194 USA

RTI 7842 1111



RTI International is one of the world's leading research institutes, dedicated to improving the human condition by turning knowledge into practice. Our staff of more than 2,800 provides research and technical services to governments and businesses in more than 40 countries in the areas of health and pharmaceuticals, education and training, surveys and statistics, advanced technology, international development, economic and social policy, energy and the environment, and laboratory testing and chemical analysis. For more information, visit www.rti.org.

RTI International is a trade name of Research Triangle Institute.

