

Genomics and Molecular Epidemiology



Human growth, development, health, and temperament—these aspects are influenced by complex interactions between genetics and the environment. At RTI, our collaborative research teams draw on multidisciplinary expertise to conduct genomic studies that illuminate these interactions—from data collection, statistics, and bioinformatics to emerging technologies in proteomics and metabolomics.

RTI integrates genomic sciences into basic, epidemiological, and clinical studies to provide deeper insight. Our capabilities encompass the full range of expertise needed to conduct complex studies, enabling us to

- Co-develop proposals and plan studies
- Collect, manage, and store health data, exposure information, and biospecimens
- Conduct appropriate laboratory and statistical analyses
- Interpret findings alone and in the context of other studies
- Relate study findings to policy, ethics, education, legal, economic, and social issues
- Develop publications and disseminate results.

Genetic Epidemiology

RTI brings 50 years of successful health data collection experience to our epidemiologic studies. Our capabilities include the following:

- Conduct of multidisciplinary projects with teams working in the laboratory, field, and clinic
- Complex modeling of disease causation and transmission

- Ecotoxicity and toxicogenomic research using microarray and other functional genomics data
- Expertise in mental health, drug and alcohol abuse, violence, and maternal and child health
- Policy, ethics, education, legal, economic, and social issues in genomics and public health
- Formative research on public attitudes regarding genetic testing and disease
- Development of consensus measures for use in genome-wide association studies.

The Population Genetics Analysis Program: Immunity to Vaccines/Infections project highlights RTI's capability to conduct genetic epidemiology studies. In this project, RTI and our partners (Institute of Molecular Medicine, Centre for Population Genomics; National Institute of Cholera and Enteric Diseases, India; Duke University) are researching genetic variants and the consequent protein expression associated with response to typhoid and cholera vaccines. We are studying the vaccine immunogenicity of 1,000 people vaccinated for each disease and the association between response status and genotype or protein expression status.



Statistical Genetics

RTI researchers are experts in the basic sciences, biostatistics, clinical studies, and the management of data coordinating centers. We have leveraged these skills into genetics and functional genomic studies, with research focused in the following areas:

- Design of functional genomics studies
- Genome-wide association studies
- Gene-gene studies
- Gene-environment studies
- Genomic data analysis
- Expression analysis
- Proteomic and metabolomic analyses
- Comparative genomic hybridization
- Next-generation sequencing analysis
- Metagenomics
- Integromics/Systems biology
- Data mining and dissemination.

The *Genome-Wide Association Study of HIV-1 Host Genetics among Injection Drug Users* project is an example of RTI's work in statistical genetics. The project's goal is to identify and characterize genetic determinants of HIV-1 susceptibility and resistance in large samples of African American and European American injection drug users using genome-wide association studies.

Biomarker Discovery

RTI scientists have significant experience in the design and conduct of field studies to relate environmental exposures to health outcomes. We can lead or assist in the development and use of biomarkers for exposure, internal dose, biologically effective dose, and susceptibility, and we have participated in collaborative studies for clinical outcomes related to specific

disease areas or therapeutic treatments. Our methodologies include the following:

- Traditional analytical and enzyme assays
- Protein binding assays
- Metabolite identification
- DNA and protein adducts identification
- Methods for pharmacodynamic measurements.

RTI also has the facilities and staff to advance and apply emerging technologies to today's health challenges, including geospatial analysis, biosensors, proteomics, and metabolomics. These technologies are essential to providing markers to stage clinical disease and to developing early markers for biological effect. By integrating these markers with measures of internal dose and biologically effective dose, researchers can establish the mechanistic link to disease and provide insights for the development of interventions or therapeutics.

The *Metabolomics: Developing Preclinical and Clinical Markers of Drug-Induced Liver Injury* project* is an example of RTI's capabilities in this area. In this project, we identify urine biomarkers and determine which are useful for early clinical diagnosis and treatment of liver injury. The investigation focuses on improved non-invasive biomarkers.

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More Information

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