



## 25 Years of Research, Teaching, and Service



EOHSI is a joint Institute of  
UMDNJ-Robert Wood Johnson Medical School and Rutgers, The State University of New Jersey



## **THE ENVIRONMENTAL AND OCCUPATIONAL HEALTH SCIENCES INSTITUTE (EOHSI)**

With its broad and multidisciplinary faculty expertise, the Environmental and Occupational Health Sciences Institute is an international resource that supports basic and clinical research in environmental health sciences and exposure assessment and fosters associated programs in environmental health education and public policy.

Established in 1986, EOHSI is jointly sponsored by the University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School and Rutgers, The State University of New Jersey. Its major objectives are to:

- ❖ *Advance the understanding of the mechanisms by which environmental and occupational chemical exposures impact human health*
- ❖ *Identify and measure human environmental and occupational chemical exposures*
- ❖ *Treat populations adversely affected by chemical exposures*
- ❖ *Develop educational tools describing relative risks of chemical exposures*
- ❖ *Develop public policies related to environmental and occupational chemical risks*
- ❖ *Offer training programs for environmental health professionals*

The Institute also serves as an unbiased source of expertise on environmental problems for communities, employers and governments in all areas of occupational and environmental health, toxicology and risk assessment. EOHSI members are active as advisors to international, national, state and local organizations on public health issues.

### **A STATE-OF-THE-ART FACILITY**

The Institute's four-story, 78,000-square-foot building opened in 1991. It houses science laboratories, an NIEHS Center for Environmental Health Sciences, Environmental and Occupational Health Clinic, an Ozone Research Center, an Environmental Bioinformatics and Computational Toxicology Center, a Computational Chemodynamics Laboratory, and a Controlled Environment Facility for stimulating exposure to pollutants and chemicals.

### **EOHSI DIVISIONS**

#### **Clinical Research and Occupational Health**

The Division examines the consequences of environmental and occupational exposures using experimental and observational methods on human subjects in a controlled exposure facility. Division faculty are engaged in teaching, research, and service programs in the areas of occupational and environmental medicine, medical surveillance, stress management and occupational epidemiology. Its Environmental and Occupational Health Clinic provides a comprehensive program to prevent work-related illnesses, and to address worker and responders health effects suffered in the aftermath of the WTC Attack. As the state's leading facility for workplace health, the clinic physicians evaluate patients for a variety of exposures in the home, community, and workplace. The approach is multidisciplinary with a core of physicians, nurses

and psychologists who interact closely with health educators, exposure scientists, and toxicologists.

### **Environmental Epidemiology and Statistics**

The Division conducts field epidemiological and ecological studies of the public health effects of exposures to chemical and physical agents. Research within the division focuses on two general themes: effects of heavy metal poisoning on children and exposed wildlife, and environmental causes of specific diseases, particularly cancer and asthma. Division members conduct studies of dioxin, lead, heavy metals, and electromagnetic fields. Its researchers are also examining approaches to linking the study of disease clusters to exposure modeling.

### **Environmental Health Policy**

The Division conducts research related to the development of public health policies and educational programs that both improve public health and prevent disease. Research is broad in scope, ranging from a very local level, such as controlling asthma triggers in a neighborhood, to international issues such as reducing potential risk from deteriorating weapons of mass destruction or nuclear sites. The diverse faculty combine expertise to analyze the formation and exercise of public policy regarding environmental and occupational health issues.

### **Exposure Science**

The Division conducts fundamental and applied research aimed at the identification, measurement and simulation of human exposure resulting from single and multimedia environmental chemical exposures. Included are the mathematical modeling of air pollution exposures, field measurement studies of total environmental exposure to pesticides and metals, indoor air pollution detection and analysis, and exposures to the emission of organics and radiation prior to and during hazardous waste site mitigations. Working with other divisions, they study human exposure and health effects associated with ozone and fine particle aerosols, and controlled exposure and health studies in a Controlled Environment Facility. Research also maps exposure to toxic chemicals in waste, and multimedia exposure to nano materials, lead and chromium. The Division has a major role studying the environmental exposures in the National Children's Study.

### **Public Education and Risk Communication**

The division provides information to the public, school children, teachers, employees and health professionals on preventing environmental and occupational health risks. The primary goals of the division are to enhance the environmental literacy level and to evaluate risk communication and intervention strategies. By meeting the national need for accurate public information, education and training about environmental and occupational health, the division serves as a critical link between research and the application of new knowledge in the community. Its activities include environmental and occupational health outreach, training professionals engaged in occupational health and safety activities, developing school curricula for children from kindergarten through high school, and coordinating and evaluating community projects.

## **Toxicology**

The Division is devoted to research on the nature of human health effects associated with environmental and occupational chemical exposures and the mechanisms by which they occur. The research is broadly based, with areas of emphases including neurotoxicology, carcinogenesis, oxidative stress, inflammatory mechanisms, collagen matrix, development and xenobiotic metabolism. Studies in this Division seek to understand the contribution of such exposures to a variety of human diseases, such as cancer, birth defects and other adverse reproductive outcomes, neurodegenerative and neurodevelopmental diseases, pulmonary dysfunction and endocrine disorders. The faculty utilize a wide range of analytical and experimental approaches and are assisted in these efforts by the availability of a variety of EOHSI Core Facilities.

### **CENTERS WITHIN EOHSI**

The broad range of expertise at EOHSI has facilitated the formation of a range of multidisciplinary centers with faculty from across EOHSI Divisions.

**The National Institute of Environmental Health Sciences (NIEHS) Environmental Health Sciences Center** focuses on understanding, detecting, preventing and solving environmental health problems through collaborative research. The Center has provided Pilot Project funding to establish a susceptibility markers program that encompasses researchers from several Cores. The thrust of this program is to understand the role gene-environment interaction plays in susceptibility and disease manifestation. A broad range of expertise exists in neurotoxicology ranging from molecular biological to behavioral approaches and in cancer biology.

**The Ozone Research Center** studies the causes, dynamics and effects of photochemical air pollution with special focus on issues and air quality problems affecting the Northeastern United States and in particular the State of New Jersey. The Center serves as a scientific resource for the study of tropospheric ozone and other photochemical smog components such as fine particulate matter which constitutes one of the most persistent and pervasive air pollution problems. Since its establishment, the Center has evolved into a partnership of federal, state and private sector efforts aimed at understanding this complex environmental problem.

**The Environmental Bioinformatics and Computational Toxicology Center** represents a major component of the EOHSI computational toxicology program which uses computer models to study the relationship between environmental contaminants and their potential adverse effects. It has a research partnership with the U.S. Food and Drug Administration's Center for Toxicoinformatics. Researchers employ bioinformatics-related methods and technologies to pursue a multidisciplinary "environmental systems toxicology" research approach. The objective of this effort is the development and application of a novel, consistent and integrative, framework for mechanistic assessment of human health risks associated with exposures to environmental stressors.

**The Federal Aviation Administration Center of Excellence** focuses on the health and security issues related to the passenger and crew within an airplane cabin. The current Center research projects are: exposure to ozone and secondary oxidation products formed within aircraft and subsequent health effects; exposure of the crew and passengers to pesticides; and identification of whether engine oil or its pyrolysis products leak into the airplane cabin air resulting in reportable incidents. These studies include simulation of cabin conditions in the Controlled Environment Facility to identify the specific agents responsible for the symptoms. A new wipe pesticide sampler has been developed for use on aircraft to determine dermal exposures from seats, panels and arm rests.

**The CounterACT Center of Excellence** focuses on the development of new and improved medical countermeasures against high priority chemical threats by developing drugs to treat sulfur mustard poisoning, a potent chemical warfare vesicant. Although it has been studied for more than 80 years, the mechanisms mediating its actions as a vesicant remain unknown; moreover, to date, there are no effective medical countermeasures for exposure to warfare vesicants. In collaborative studies with Battelle Memorial Institute they have identified lead compounds against sulfur mustard which are being optimized for IND-enabling studies. Studies are in progress evaluating the efficacy of these potential countermeasures in model systems of sulfur mustard toxicity. New drug formulations and methods of drug delivery are being optimized. In addition, Research and Development Projects are underway to identify specific mechanisms of action of sulfur mustard and potential new targets for therapeutic intervention in three major vesicant targets: the eye, the skin and the lung. The Center also collaborates with Lehigh University and NY Medical College.

## CORE FACILITIES

**Bionomics Research and Technologies Core (BRTC)** focuses on functional genomics and toxicogenomics with a wide array of associated capabilities including microarray services, nucleic acid services, microchemical/protein peptide assays, real-time PCR, SNP analyses and consultation in experimental design and data analyses. In addition, the Core includes some methods for proteomics, particularly 2-D gel assays. In conjunction with the EOHSI Analytical Core Laboratory, the BRTC will include future development of metabonomic analyses utilizing primarily LCMS capabilities.

**EOHSI Analytical Core Laboratory** is a state-of-the-art facility for the analyses of biological and environmental contaminants and/or their metabolites. This facility has both inorganic and organic analytical capabilities. The primary purpose of the Laboratory is to provide analytical tools for EOHSI faculty members to assist in their research endeavors, and it specifically recognizes the importance of assisting in providing preliminary data for grant proposals. In addition, collaboration with private agencies in the analysis of environmental samples is possible. The EOHSI Analytical Core Laboratory also specializes in methods development. Moreover, the Analytical Core Laboratory houses training programs for local high school students and several of the university's doctoral programs.

**Analytical Cytometry/Image Analysis Shared Resource Core** provides access to expert assistance with various techniques in flow cytometry/cell sorting, image analysis, and confocal microscopy to members of EOHSI and the Cancer Institute of New Jersey. The specific objectives of this shared resource are to provide members with a powerful array of analytical cytometry and image analysis techniques, and expert consultation in experimental design for optimization of data generation, data analysis, presentation, and publication.

**Molecular Histology Center** supports academic and industrial researchers in performing a variety of quantitative and qualitative tissue section-based assays, including *in situ* hybridization autoradiography, immunohistochemistry, stereology, densitometry, image capture and presentation, and remote assisted image processing. The dedication of this center to a defined set of challenging techniques provides for efficiency and expertise to ensure reliable results and rapid completion of projects.

## GRADUATE EDUCATION

As part of its mission to study and improve environmental and occupational health through scientific research, training and communication of research findings, EOHSI is home to three graduate programs.

### **Joint Graduate Program in Toxicology**

The program provides a broad and flexible base of education in biology and chemistry that can be applied to the study of the adverse effects of chemicals on biological systems. Master of Science and Doctor of Philosophy in Toxicology degrees are conferred jointly by the UMDNJ-Robert Wood Johnson Medical School and Rutgers, The State University of New Jersey.

### **Joint Doctoral Program in Exposure Science**

The program is a collaborative effort between UMDNJ-Robert Wood Johnson Medical School and the Graduate Program in Environmental Science at Rutgers, The State University of New Jersey. The program provides a unique opportunity for students to obtain training in human exposure assessment. A Doctor of Philosophy degree is conferred by the two universities.

### **Residency Program in Occupational and Environmental Medicine**

The residents receive a heavy emphasis on the recognition of toxic exposures in the home, community and workplace environments of their patients. The residents see patients in EOHSI's on-site Clinical Center where they have access to a wide variety of patients from high level occupational to environmental chemical exposures.

## EOHSI LEADERSHIP

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