Spotlight: Exposure Assessment Facility Core

The Exposure Assessment Facility Core plays a critical part in expanding the research initiatives undertaken by CEHNM investigators by offering unique expertise in support of exposure monitoring. Its activities include:

1. Development of exposure assessment studies
2. Development of analytical methods
3. Design and development of new samplers and sampling equipment
4. Analysis of environmental samples for mass, black carbon, trace elements, isotope ratios, allergens, molds, gas concentrations, and trace organics
5. Train and mentor CEHNM staff, students, fellows, and community partners

Three laboratories and a study design leader together, provide these capabilities:

1. The **Environmental Geochemistry Laboratory** directed by Dr. Steven Chillrud at the Lamont Doherty Earth Observatory (LDEO) oversees the maintenance and storage of sampling equipment as well as carries out gravimetric, optical and inorganic analyses (elemental and isotope ratios) on environmental samples.
2. The **Allergen Laboratory** directed by Dr. Matthew Perzanowski at the Mailman School of Public Health (MSPH) oversees the collection of dust and air samples and measurement of allergens. It also oversees the collection of serum and exhaled breath and measurement of allergy related biomarkers in these samples.
3. The **Trace Organics Laboratory (LDEO)**, a recent expansion, is directed by Dr. Beizhan Yan. It can extract, isolate, and identify organic contaminants and biomarkers in environmental and biological samples.
4. **Exposure Assessment Study Design** is led by Dr. Patrick Kinney (MSPH). With over 30 years of experience in environmental exposure assessment and respiratory health epidemiology, he provides support to CEHNM members on the design of exposure assessment methodology in research projects.

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WE ACT Update

In April 2012 the Northern Manhattan CARE Collaborative hosted two training workshops for supers, maintenance staff and building management. The workshops were cosponsored with West Harlem Group Assistance, Inc. a community development organization working in West Harlem since 1971. This was one of many training programs that WE ACT has supported through the Northern Manhattan CARE Collaborative. Currently the Collaborative is carrying out a number of different demonstration projects in Northern Manhattan that focus on garbage, pests and pesticide issues identified by community members. The overall aim of these workshops is to decrease the amount of waste going into the general municipal waste stream, to increase recycling rates in the buildings we are working with and increase awareness of sound management practices among building maintenance staff, management and residents.

The first workshop on April 4, 2012 focused on an introduction to managing garbage, pests and pesticides inside and outside of apartment buildings. Presenters included Ermin Siljkovic from GrowNYC’s Office of Recycling Outreach and Education; Carla Toro from the New York City Department of Health’s Division of Veterinary and Pest Control Services; and Ray Lopez from Little Sisters of the Assumption Family Health Services. Ermin Siljkovic provided information about New York City’s recycling rates while highlighting current policies about residential recycling. His presentation concluded with an engaging game to demonstrate recycling practices for residential buildings in New York City. Carla Toro provided information on the rat portal located on NYC DOHMH’s website (http://a816-dohbesp.nyc.gov/IndicatorPublic). Her expertise on controlling rats and mice in buildings through integrated pest management was helpful and confirmed many of the methods that currently are used by building maintenance staff. Finally Ray Lopez from Little Sisters of the Assumption Family Services spoke about methods to control mold and bed bugs. These presentations brought together comprehensive information that is supported by research on the effectiveness of integrated pest management. The lively discussion ended on a high note with many of the participants excited to attend the second workshop the following week.

On April 11, 2012 the second and final workshop focused on energy and water efficiency in buildings. Speakers included: Dan Rieber from Northern Manhattan Improvement Corporation; Max Joel from Solar One; and Anasa Scott from West Harlem Group Assistance and Greenproofing, Inc.. Each presentation focused on key changes and maintenance that can be made to address rising energy costs. The two workshops gave the participants comprehensive information on environmentally sound building management that will also be provided to residents in future workshops. The next step in the process is to begin charting the overall amount of solid waste and conditions in the buildings. We look forward to assessing and understanding the impact of this project on behavior through the summer.
New Career Development Awardees

Dr. Jeffrey Shaman, an assistant professor in the Department of Environmental Health Sciences, is interested in how hydrology, meteorology and climate affect infectious disease ecology and transmission dynamics. His research focuses on mosquito-borne disease transmission, and the environmental determinants of influenza transmission and seasonality.

Dr. Shaman uses various models and statistical and analytic methods to study climate and ecologic systems and their interplay on influencing influenza transmission. His recent work includes investigation of the effects of absolute humidity (AH) on survival and transmission rates of the influenza virus. If mechanisms are elucidated, the annual cycle that AH follows may explain the seasonal patterns of influenza. To this end, he seeks to understand environmental conditions that affect the survival of the virus by answering questions such as: 1) how does media salt concentration and ambient AH affect survival rates of atomized influenza virus and 2) do osmotic gradients within expelled droplets support envelope disruption under certain conditions?

In a parallel project, Dr. Shaman seeks to determine whether there are hotspots in Manhattan for influenza and other airborne respiratory pathogens. Fieldwork includes pathogen sampling from public areas such as subways, classrooms, and shopping areas and recording prevalence of influenza RNA. Further, recording environmental conditions such as AH will help understand their relation with pathogen survival in the various public settings. Ultimately, findings from his research will help inform opportunities for better control of influenza transmission.

Dr. Shaman received his M.A., M.Phil., Ph.D. from Columbia University in the Department of Earth and Environmental Sciences. He was also a postdoctoral fellow at the National Oceanic and Atmospheric Administration at Harvard University in Climate and Global Change.

Dr. Julie Herbstman, an assistant professor in the Department of Environmental Health Sciences, studies the biological basis of prenatal environmental exposures that affect neurodevelopment. A team from the Center for Disease Control and Prevention found that neurodevelopmental disorders affect 17% of the children in the U.S. under 18 years of age.

Her previous research included studying prenatal exposure to polybrominated diphenyl ethers (PBDE), a class of neurotoxicants that are found ubiquitously including in flame-retardants. She observed significant associations between prenatal PBDE exposure and adverse neurodevelopmental test scores. She has also been involved in research exploring the long-term environmental health impact of exposure to pollutants from the collapse of the World Trade Center on 9/11.

Currently, Dr. Herbstman is working on the R00 portion of her K99/R00 award studying prenatal exposure to polycyclic aromatic hydrocarbons (PAH) and neurodevelopmental deficits. Using a sibling-pair study design and genome-wide methylation patterns in cord blood samples, she is determining small but hopefully biologically-relevant alterations in DNA methylation related to prenatal PAH exposure. She plans to expand these studies to other environmental exposures such as pesticides, plasticizers and metals to better understand risk for neurodevelopmental deficits.

Her research will add to the growing knowledge on the relationship between environmental exposures and neurodevelopmental disorders that will inform preventive strategies to promote physical and mental health.

Dr. Herbstman received her Certificate in Risk Sciences and Public Policy, Sc.M. in Epidemiology, and Ph.D. in Environmental Epidemiology from Johns Hopkins University. She was also a postdoctoral fellow at the Columbia Center for Children's Environmental Health at Columbia University.
Dr. Steven Chillrud is the director of this Facility Core and collaborates with the other laboratory and study design leaders. He describes himself as an environmental geochemist interested in public health research. He conducts research on the roles of particles in the transport of chemical contaminant, their environmental fate and exposure pathways. Particles include soils, sediments, and airborne particles in indoor and outdoor air. His recent work includes the following:

- Development of a miniaturized, personal particulate matter monitoring device for exposure assessment of black carbon and other contaminants. The device can run for several days on a single charge and logs real-time levels of black carbon, UV-active PM (such as cigarette smoke or incense), wearing compliance and location. In addition it automatically collects a different filter archive for time spent at home vs time spent away from home. Validation studies of this and another new personal monitor for real-time PM2.5 is currently being carried out in NYC and Baltimore.
- Developing different methods for increasing the efficiency of remediating Superfund sites that have groundwater contaminated with arsenic. Methods include both studying impact of subsurface additions of chemical amendments to increase arsenic mobilization in contaminated aquifers for remediation via pump and treat techniques and developing magnetite as a new target mineral for in situ immobilization of arsenic.
- Analyzing sediments to draw a historical perspective on organic and trace metal contaminants in aquatic environments. This includes interpretations of age and depth of sediment columns using radionuclide indicators such as Cs-137, Pb-210, and Be-7 to reconstruct histories of atmospheric deposition, road runoff and impacts of government policies.

Dr. Beizhan Yan was hired by the Exposure Core in 2007 for his expertise in source apportionment and analytical methods for trace organics. His research interests lie in studying environmental processes and the fates of natural and anthropogenic organics. Through his research, he has expanded the scope of the laboratory in several ways:

- Developing methods for measuring biomarkers in exhaled breath related to inflammation and oxidative stress and testing for their associations with air pollutant exposure in NYC and in China, where pollution levels are far greater and more suited for measuring associations with disease.
- Studying the role of oxygenated polycyclic aromatic hydrocarbons on asthma-related outcomes in 5-6 year old children in Columbia’s Center for Children’s Environmental Health longitudinal birth cohort whose homes and asthma outcomes have been well characterized.
- Refining an optical method to determine multiple components including black carbon, second hand smoke, and iron oxides from archived Teflon filters of airborne aerosols.
- Tracing spilled oil in the Gulf of Mexico (GOM) and studying the weathering of the oil. Responding to the BP oil spill, Dr. Yan and his colleagues deployed a VOC analyzer in several cruises to GOM to measure VOC depth profiles in water columns close to the Macondo wellhead. This research confirmed the initial rapid phase of biodegradation of these compounds in the water column 1 month after the spill. Dr. Yan joined a consortium led by Dr. Raymond Highsmith from the University of Mississippi. The consortium was selected to receive funding of $22.5 million over the next three years. Since the majority of spilled oils have disappeared in the water column, he and his colleagues in this consortium will use hydrocarbons released from natural seeps in GOM as analogues of BP spilled oil. They will trace the transformation and ecotoxicity of hydrocarbons in the water column and explore the role of bacteria in the formation of "oil snow", which precipitates to the seabed and may cause adverse effects to living organisms, such as corals and clams.
- Collaborating with Dr. Chillrud in the development of a personal monitor for collecting particulate matter in homes; it is currently being validated for use in studies of asthma-related outcomes.
**NIEHS Core Centers Meeting at Harvard School of Public Health, March 26-29, 2012**

The annual Core Centers Meeting was hosted by the Harvard-NIEHS Center for Environmental Health, which is celebrating their 50th anniversary as a Center. Regina Santella, Center Director, Gail Garbowski, Center Administrator, Julie Herbstman, Young Investigator, and Ogonnaya Dotson-Newman, Environmental Health Director at WE ACT, attended this 3-day meeting. Dr. Linda Birnbaum, Director of the NIEHS, started the meeting with an overview of the agency’s plans to continue to fund 19-20 EHS Core Centers in FY 2013 at the same budgetary level as in the past few years. She emphasized the role of the Centers in doing cutting edge research on environmental health issues to improve health in the U.S. and globally; to fund new innovative pilot projects; to train future leaders in the field; and to translate activities and scientific findings within the community. The good news is that NIEHS will be setting aside supplemental funds for inter-Center collaborations on emerging issues, cross-training to advance goals in Career Development or Community Engagement, workshops or community forums, or multi-site Pilot Projects. The Meeting also devoted much discussion time to the recently drafted NIEHS Strategic Plan which has “Health Disparities and Global Environmental Health” as its main mission, followed by basic science, epidemiology and population-based research, communication and education for stakeholders, translational science in public health practice, exposure research (exposome), training and education of the workforce in environmental health and prevention in public health. The Meeting also devoted much discussion time to a new emerging issue focused on hydraulic fracturing of shale sedimentary rock, or “hydrofracking” as a method to collect natural gas and the potential public health impacts of using this technology. There is much opportunity for inter-Center collaboration around this and other emerging environmental issues. Finally, the Boston Center hosted a Community Forum in Dorchester, which focused on “clean air for everyone in Boston” in contrast to the high asthma rates in various neighborhoods. Many COEC members from various Centers, NIEHS staff and community residents participated in the Forum.

**Environmental Exposures across the Life Course Working Group**

Recent interest in characterizing exposures over the life course, and their cumulative effect on health outcomes has driven the reorganization of this Center Working Group (WG). The current approach of examining one exposure on a single outcome is naïve as individuals are exposed to many environmental substances at different points in their life. Capturing this vast quantity of data, and reducing such data to manageable constructs is a developing and cutting edge science. The overall goal of this WG is to educate members on current approaches and to encourage them to incorporate them into new grant proposals. At present, life course exposures are classified into two paradigms. The first, generally called the exposome, is based on high throughput technological measures of exogenous exposure biomarkers at a single point (or multiple points) in time. The second can be characterized as a more detailed study of exposure mixtures, accounting for both the types and timing of exposures; this is most often performed in longitudinal cohorts. Members of this WG, led by Dr. Pam Factor-Litvak, hope to incorporate both paradigm measures into ongoing and future studies. The WG has generated great interest across the medical center and the larger Columbia community with faculty participants from the Epi, EHS, Biostatistics, Sociomedical Sciences and Population and Family Health departments in the MSPH and from LDEO. The WG generally meets on the second Monday of each month at noon. If you would like to be added to the Environmental Exposures e-mail list, please contact Gail (gcg1). The next meeting is tentatively scheduled for May 14th from 12-1 (place TBD).
Spring 2012 Center Seminars and Meetings

**April 20:** “Epigenetics Working Group Meeting” 650 W. 168th Street, 16th Floor, Conference Room 16-419, 10-11am.

**April 23:** Jiyoung Son, Ph.D., Postdoctoral Associate, Yale School of Forestry & Environmental Studies, New Haven, CT; “Ambient air pollution, weather and health in Korea”; 722 W. 168th Street, 11th Floor, EHS Classroom, 12-1pm.

**April 28:** "Green Home, Safe Home: Saving Money by Going Green"; Oberia Dempsey Center, 127 W. 127th St., 3rd floor gymnasium, 9am-3:30pm; Co-sponsored by WE ACT for Environmental Justice, West Harlem Group Assistance, Inc. Councilmember Robert Jackson & State Senator Bill Perkins. Register online at www.weact.org or contact Charles Callaway at 212-961-1000 ext. 309

**May 17**: Carl-Gustaf Bornehag, Ph.D., Professor in Public Health Sciences, SP Technical Research Institute of Sweden, Karlstad University, Karlstad, Sweden; “Endocrine disrupting chemicals and chronic health effects in children. Report from two on-going epidemiological studies in Sweden, the DBH and the SELMA study”; 722 W. 168th Street, 11th Floor, EHS Conference Room, 12-1:30pm.

*Co-sponsored by the Imprints Center for Genetic and Environmental Lifecourse Studies (including the Lifecourse Cluster of the Department of Epidemiology, the Institute of Human Nutrition, and the Division of Developmental Neuroscience at NYSPI)

Next Center Retreat/External Advisory Meeting

Friday, June 29th, 9am - 4pm, Faculty House at Columbia University, 64 Morningside Drive. Breakfast and lunch will be provided.

Information

Publications: Please remember to acknowledge the Center grant number P30 ES009089 on all publications that have relevance to the goals of the Center or that have utilized the services of the Center Facility Cores.

For more information about the Center, please visit our website: http://www.mailman.hs.columbia.edu/academic-departments/centers/niehs-center-environmental-health