Researchers at Columbia University Mailman School of Public Health and the Lamont-Doherty Earth Observatory published the results of a pilot study in the January 2010 issue of the journal *Environmental Research*, outlining a preliminary assessment of health risks associated with exposure to airborne particulate matter in the New York subway system. While air quality issues do not pose a major concern for commuters because of their limited exposure, subway workers, particularly those who spend a considerable part of their working days on the tracks, were the focus of this most recent investigation.

Underground concentrations of several metals – specifically, iron, manganese and chromium – were measured in previous studies at levels approximately 100 times higher than in outdoor air. These particles are primarily produced by the friction between the train wheels and tracks and are most concentrated in stations as a result of trains braking as they near the platforms. Given their chemical makeup, subway particles comprised of soluble transition metals have been shown through *in vitro* studies to cause more oxidative stress, inflammatory response and DNA damage than those found in street-level air.

In response to concerns raised by earlier findings, researchers conducted a pilot study using 39 subway workers in an attempt to determine if they exhibited biomarkers indicating exposure to subway particles compared with control groups of unexposed bus drivers and office workers who do not commute via subway. The study was the first to combine the use of personal monitoring systems (designed with worker safety in mind) (continued on page 3)
WE ACT’s lead campaign is back on the front burner even though lead poisoning has decreased in most communities and is no longer on the Health Department’s priority list. The media is no longer particularly interested in disseminating related stories given the common belief that the problem has been mostly remediated and no longer presents a controversy. However, despite less attention, the issue remains a serious health concern, especially for children living in public housing. And lead safety information needs to be publicized to reach the broadest possible population, including new immigrants who may not be aware of the dangers.

Children of recent immigrants are approximately five times more likely to be lead poisoned than those born to American parents. This could be a symptom of the fact that immigrants are sometimes reluctant to report poor housing conditions, which are often associated with lead paint issues. In addition, immigrant communities tend to use products with imported materials that often contain unsafe levels of lead. WE ACT leads outreach programs to increase awareness in both the United States and immigrants’ home countries, informing people of their rights under local laws and the responsibilities of landlords to ensure that children are not placed at risk of lead poisoning.

Another initiative spearheaded by WE ACT is pediatrician training for doctors serving the target at-risk immigrant communities. As part of this program, parents can have their children tested for lead exposure. And with further training for doctors, misdiagnoses of ADHD and other behavioral problems can be avoided.

There is no safe level of lead exposure for a developing child, although most municipalities will not act to remediate until levels exceed 10 micrograms per deciliter of blood (the CDC’s threshold). However, children with smaller exposures (0 to 9 micrograms per deciliter) might still be in danger of developing lead-related negative health effects, and WE ACT is pressuring New York to consider lowering the “safe” level to 5 micrograms per deciliter.

The Healthy Homes Initiative is another WE ACT project focused on safely and effectively dealing with garbage, pests and pesticides. Tenant patrols and neighborhood street teams have been established to ensure that garbage is properly packaged and picked up regularly, and successes include a reprimand for a neighborhood business that was illegally disposing of chemicals in the street.

The rat issue in Manhattan has been exacerbated by a cultural practice in many developing countries of feeding cats that many people perpetuate after coming to New York—but this food instead attracts rats. WE ACT has put up signs in many neighborhoods warning people to discontinue leaving food for animals. The organization is also distributing garbage liners and encouraging local businesses to “adopt a garbage can” to guard against overflow and leakage during storms, which eventually clogs the drains and contributes to street flooding.

To learn more about these and other WE ACT initiatives, please visit: http://www.weact.org/
Dr. Tomás R. Guilarte was appointed Chair of the Department of Environmental Health Sciences and will succeed Acting Chair Dr. Joseph Graziano on April 1, 2010. His research focuses on mechanism-based neuroscience and neurotoxicology using behavioral, cellular and molecular approaches that range from studies employing primary culture of neural cells to the application of brain imaging technologies. His laboratory is a pioneer in the application of state-of-the-art molecular imaging in neurotoxicology to investigate the beneficial and detrimental effects of the living environment on the central nervous system.

Dr. Guilarte is presently on faculty of the Bloomberg School of Public Health, Johns Hopkins University, where he serves as Professor of Environmental Health Sciences and holds a joint appointment as Professor in the Division of Human Nutrition, Department of International Health. Dr. Guilarte received a PhD in Environmental Health Sciences from Johns Hopkins University and an MS degree in Medical Physics from the University of Florida.

New Environmental Health Sciences Department Head Appointed

Health Risks of Subway Particulate Matter (Cont.)

with biological testing of the blood and urine of participants and looked for biological responses to elevated levels of the metals in question.

The good news is that the study found no conclusive evidence of a dose-response relationship between the higher levels of particulate matter in the subway system tracked by personal air monitors and biomarkers that might raise concerns about workers’ risks for lung disease. Nor was there any indication that subway workers’ exposures placed them at any higher risk for adverse health effects than the unexposed bus drivers and office workers. In addition, the personal monitoring systems demonstrated that exposures in the subway tunnels are still well below the U.S. Occupational Safety & Health Administration threshold for safety. Another positive is that this study supports previous conclusions that the New York subway is better ventilated and thus less polluted than other underground transit systems given that tunnels tend to be shallower than those in Toronto, London and Stockholm.

In a press release coinciding with publication, coauthor and Center member Dr. Steven Chirrud stated, “The results are good news, even though this was a small pilot study and not a comprehensive evaluation of potential subway-worker health risks from steel dust.”

The researchers noted that a larger study is needed to expand testing parameters, examine greater numbers of participants (including women, who were excluded from the initial work) and look into the possibility that more vulnerable populations, such as children, the elderly and those with preexisting health conditions, might be more susceptible to adverse health effects from subway particle exposure. In addition, further investigations would potentially test different biomarkers for exposure, painting a more comprehensive picture of potential overall oxidative stress levels and expanding on the initial work completed in this pilot study.
**Trace Metals Core Update: Arsenic Work Continues**

The Trace Metals Facility Core continues its work in providing CEHNM investigators the ability to obtain analyses of biological samples for a broad array of metals including: lead, mercury, arsenic, iron, manganese, cadmium, copper, zinc, chromium, sodium, cobalt, platinum, potassium and others. The Core also performs biochemical analyses that help in the assessment of the physiological status of the subjects exposed to these metals and provides for measurements of major proteins of metal metabolism in serum or plasma. Concentrations of such proteins have evolved as increasingly important biomarkers of neurodegenerative, immunologic and cancer-related disease processes.

Drs. Joseph Graziano, Habib Ahsan and Mary Gamble continue their appreciable utilization of the Core with their work on Columbia's P42 Superfund Research Program (SRP). Their studies require arsenic, manganese, selenium and lead measurements in urine, blood, and toenails; the measurement of arsenic metabolites in urine and blood; and urinary creatinine measurements. Several years ago, the Trace Metals Core developed a new method for the analysis of arsenic in blood using ICP-MS-DRC. That method allowed Center investigators to demonstrate that blood As is an extremely useful biomarker of exposure. Moreover, the method allows for the simultaneous measurement of other metals of interest that are covariates in many analyses, namely Mn, Se and Pb. During the past year, the lab has continued to provide these blood analyses to several projects.

Epidemiologic studies employing repeated blood arsenic measurements over time have the potential to answer many issues concerning the bioavailability and toxicokinetics of arsenic. Yet people in the developing world are generally reluctant to give blood samples for research purposes. For this reason, Core researchers conducted a study to assess the reliability of these analyses in small capillary blood samples obtained via fingerstick. This protocol, approved by the Columbia University IRB and by the Bangladesh Medical Research Council, compared venous and fingerstick blood As concentrations in 10 individuals with varying concentrations of As in their drinking water. The correlation between the two collection methods was 0.97, validating that researchers could reliably obtain and analyze blood samples via a fingerstick collection.

*Images courtesy of the Earth Institute at Columbia University*
Junior Faculty Research Profiles

Dr. Darby Jack, an assistant professor in the Environmental Health Sciences Department, is focused on issues related to climate and health, including indoor air pollution from biomass combustion and mining-related pollutants. Dr. Jack has been doing pilot work in Ghana to characterize exposures to indoor biomass burning and conduct a risk assessment related to long-term health effects. The methodology involves personal real-time exposure monitoring, which is an information-rich approach, and future work is centered around exposures during pregnancy and the neonatal period, which are believed to contribute to acute lower respiratory infections during early childhood as well as low birth weight, which can lead to numerous other health problems. The study intends to define whether there is a specific window when the developing fetus is most vulnerable to smoke exposure. The end goal of this research is to support country-level stove replacement programs and other interventions to help people use fossil fuels more efficiently, without seriously endangering their health or that of their children. It also seeks to determine if there is a “safe level” of exposure and whether changing stoves reduces exposures enough to mitigate major health issues.

Dr. Jack is also working on developing a proposal for testing lead exposures in communities near mining facilities in Peru. In that country, approximately 1.5 million people live within 5 kilometers of an ore processing or smelting facility, indicating that a large number of people have potentially been exposed to harmful lead levels. The study would incorporate more robust soil testing methodologies and incorporate mapping technology to determine the extent of potential exposures.

Dr. Beizhan Yan, a research scientist at the Lamont-Doherty Earth Observatory of Columbia University, was recruited for his expertise in the measurement of trace organic contaminants and their environmental behavior. He is hard at work on several projects, including developing methods for key exposure assessment indicators. First, he is collaborating with Dr. Matt Perzanowski to measure biomarkers in exhaled breath condensate by mass spectrometry since the simple assays were not sensitive or specific enough. Dr. Yan is also refining and extending an optical method to distinguish black carbon from environmental tobacco smoke (ETS). He is focusing on the optical methods since they are non-destructive and inexpensive. However, the current methods cannot differentiate ETS from biomass combustion emissions, and so Dr. Yan is developing the method to solve this problem. Dr. Yan notes that this work is critical for certain regions of the world that rely on biomass fuels for home heating and/or cooking purposes, and he hopes to clearly determine whether contaminants are derived from wood combustion, ETS, or other sources, and isolate the related health effects.

Additionally, Dr. Yan is studying the source apportionment and bioavailability of organic contaminants (e.g., PCBs and PAHs) in urban environments. He is also working on developing a bioremediation method involving a thermopile bacterium. Preliminary lab studies found that the enzymes can potentially be used to decompose PCBs and PAHs. Dr. Yan and his colleague are planning a small-scale pilot in-situ study to explore the effectiveness and cost of this method.
Upcoming Events and Seminars—Note Changes in Dates

**Town Hall Meeting:** Indoor Air Pollution  
*“Healthy Homes and You”*

- Save the Date  
- April 13, 2010  
- Harlem School of the Arts  
- Gathering Space  
- 645 St. Nicholas Avenue at 145th Street  
- New York, New York  
- 2:00 pm—4:00 pm  
- 6:00 pm—8:00 pm

The 2:00 to 4:00 pm afternoon session will include scientific speakers, followed by the 6:00 to 8:00 pm evening session, which will focus on community issues. Speakers and agenda will be announced shortly.

_These meetings and seminars are open to all interested students, postdocs, faculty, etc. in the Mailman community._

_To find out more or register for this event, please visit:_  

**Seminar:** DNA Repair as a Susceptibility Marker for Head and Neck Cancer  
*Speaker: Dr. Qingyi Wei, MD Anderson*

- February 11, 2010  
- Humphreys Auditorium  
- Vanderbilt Clinic 14-240  
- 622 West 168th Street  
- New York, New York  
- 12:00 pm—1:00 pm

**Seminar:** Climate Change and Global Burden of Disease  
*Speaker: Dr. Aaron Cohen, Health Effects Institute, Boston, Massachusetts*  
Jointly sponsored by the Columbia University Climate and Health Program and the NIEHS Center

- Save the Date  
- April 14, 2010  
- 1:00 pm—2:00 pm  
- Location TBA

Informational

For more information about the Center, please visit our website:  

**Reminders to Center Members**

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

_Center Meeting:_ The time for the next Center Meeting on March 4th has been changed to 12:30–2:30 pm. It will be held in Hess Commons, 722 West 168th Street, 10th Floor. Lunch will be served. If you would like to give a 20-minute presentation at the meeting, please let us know.