

Gene-Environment Interactions 101

Date: April 24, 2013

Time: 2:30-3:30 p.m. ET

Please register at: http://bit.ly/PEPH_GEI

(registration required)

Description: Understanding the interplay between nature (genetic factors) and nurture (environment) is critical for understanding complex human diseases. NIEHS is particularly interested in the ways in which genetic background and environmental exposures can influence a person's susceptibility to a wide range of disease outcomes. Recent advances in genomics, epigenomics, and exposure biology in the "omics" era have provided new opportunities for exploring gene-environment interactions in genetic epidemiology studies. However, analytical, statistical, and study design methods are still being developed to take full advantage of these opportunities. More interdisciplinary research that integrates molecular and cellular biology, environmental sciences, epidemiology, bioinformatics, and statistical biology is needed to advance this field.

Introduction – Kim McAllister, Ph.D., National Institute of Environmental Health Sciences



Dr. McAllister oversees much of the genetic epidemiology portfolio—as well as projects related to genetic susceptibility to environmental exposures and environmental epigenetics—in the NIEHS's Division of Extramural Research and Training. She will introduce the concept of gene and environment interactions and will discuss some of the emerging issues related to this field, as well as some of the challenges of implementing these studies.

Identifying Agents that Cause Neurodegeneration in Humans: Insights Gained from Studying Gene-Environment Interactions – Beate Ritz, M.D., Ph.D., University of California – Los Angeles



Human genetic variations likely cause some individuals to be more vulnerable to the neurotoxic effects of environmental agents. Identifying populations that are exposed and vulnerable due to their susceptibility to certain toxins will ultimately allow us to protect humans from such insults and to develop therapeutics that target these mechanisms and biologic pathways. Epidemiologic and some animal and cell-based studies suggest that pesticide exposures increase the risk of developing Parkinson's Disease. However, most human studies rely on self-reports and recall of chemicals—bias-prone methods that make it hard or impossible to point out specific agents or mechanisms for the action of a toxin—while experimental models are always just that: better or worse attempts to model a human disease. In this presentation, Dr. Ritz will discuss how she and her colleagues used a unique geographic information system-based exposure assessment that incorporated land use maps and agricultural pesticide application records in order to examine long-term human exposures and to assess neurodegeneration due to interactions between specific pesticides and genetic factors for increased susceptibility (or resilience) to these environmental toxins.

"Environmental Epigenetics: New Tools to Identify Lifetime Programming of Health and Disease"

Andrea Baccarelli M.D., Ph.D, Harvard School of Public Health



Epigenetics investigates heritable changes in gene expression that occur without changes in DNA sequence. Several epigenetic mechanisms, including DNA methylation and histone modifications, can change genome function under exogenous influence. Results obtained from animal models indicate that *in utero* or early-life environmental exposures produce effects that can be inherited transgenerationally and are accompanied by epigenetic alterations. The search for human equivalents of the epigenetic mechanisms identified in animal models is in progress. Dr. Baccarelli will present evidence from human environmental studies

indicating that epigenetic alterations may mediate effects caused by exposure to environmental toxicants. In these investigations, he and his colleagues have shown that environmental exposures—including air pollution, lead, arsenic, nickel, and PAHs—are associated with altered methylation of human repetitive elements or genes. In recent preliminary studies, they have shown alterations of histone modifications and miRNAs in subjects exposed to metal-rich airborne particles. Dr. Baccarelli will present original data demonstrating that altered DNA methylation in blood and other tissues is associated with environmentally induced disease, such as cardiovascular disease and asthma. On the basis of current evidence, he will propose possible models for the interplay between environmental toxicants and the human epigenome.



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If you have any questions about this webinar or future webinars, please contact Liam O'Fallon (ofallon@niehs.nih.gov, 919-541-7733).

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Upcoming Webinar Topics:

- Communication Research (May 23)

