

## **2014-2015 Distinguished Lecturer Series Presentation**

**May 20, 2015** Virginia A. Rauh, Sc.D. Columbia University

Dr. Virginia Rauh, ScD, is Professor of Population and Family Health at the Mailman School of Public Health, Columbia University, and Deputy Director of the Columbia Center for Children's Environmental Health. She received her B.A. from Middlebury College, M.S.W. from Smith College, and Sc.D. from Harvard University School of Public Health before joining the Columbia faculty. Trained in perinatal epidemiology, her postdoctoral work in psychiatric epidemiology was supported by NIMH, and a career development award from NICHD. For the past 15 years, she has studied the longitudinal effects of toxic environmental exposures on neurodevelopment. Her current work focuses on the brain and behavioral effects of exposure to air pollutants, including polycyclic aromatic hydrocarbons, second-hand smoke and pesticides, and the susceptibility of individuals and disadvantaged populations to environmental hazards. Dr. Rauh has been principal investigator on numerous major research projects, including studies of the impact of organophosphorus insecticides and secondhand smoke on child neurodevelopment and brain abnormalities (MRI, fMRI), a randomized intervention trial for low birth weight infants, a multi-site study of lifestyles in pregnancy, a study of developmental outcomes of children born to inner-city adolescent mothers, a multi-level analysis of the impact of Head Start on New York City school children, a study of the effects of ambient air pollutants on pregnant women and their children, and a study of links between race, stressors, and preterm birth. She has served on numerous national committees including the Scientific Advisory Board for the Environmental Protection Agency, NIH study sections, and expert panels for EPA, NIEHS, NIMH, and NICHD.

### **Brain and Behavioral Effects of Early Exposure to a Neurotoxicant**

This presentation addresses the impact of prenatal exposure to a common neurotoxicant on brain structure and neuropsychological function in an inner-city cohort of minority children. The toxic chemical, an organophosphate insecticide (chlorpyrifos), has been banned for indoor residential use in the U.S. since 2001, but continues to have widespread application for agricultural purposes. The identification of neurotoxic effects in animal studies at exposure levels well below the threshold for systemic toxicity caused by cholinesterase inhibition in the brain prompted a prospective cohort study to investigate possible long-term human effects at levels of exposure that are commonly found in many areas of the country. Possible noncholinergic mechanisms involve disruption of neural cell development and neurotransmitter systems, including the formation and activity of synapses in different brain regions. This presentation examines the evidence for long-term effects of prenatal chlorpyrifos exposure on neuropsychological profiles and brain morphology as measured by MRI. Highly exposed children show a unique neuropsychological profile, with significant deficits in auditory attention and fine motor performance, but no deficits on more complex visual attention and inhibitory control tasks. These findings are consistent with abnormalities in morphological measures of the cortical surface, including the posterior temporal region, sub-serving attention and receptive language. Results suggest that prenatal pesticide exposure, at relatively modest doses common in agricultural regions of the U.S., results in a signature pattern of neuropsychological deficits, accompanied by disturbances in brain morphology by MRI, persisting into the early school years.