**Dr. Rachel Miller**

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Project Summary (Abstract)
Exposure to traffic-related air pollution is associated with asthma exacerbations among children. Symptomatic adolescents tend to develop persistent disease. Using a longitudinal approach, our group at the Columbia Center for Children's Environmental Health (CCCEH) birth cohort has made major scientific advances in the understanding of adverse respiratory health consequences for children following prenatal and postnatal exposure to air pollution. Moreover, we have made important strides in the understanding of epigenetic changes (eg. DNA methylation) that may occur in association with such exposures. Despite increasing research on the associations between short-term exposure to black carbon(BC)/diesel and metal rich particulate matter and changes in DNA methylation, previous studies have lacked accurate assessment of personal exposure and consideration of the effects of early childhood exposure. Nor have they compared changes in DNA methylation that could lead to sustained effects on gene transcription with important clinical outcomes in children. Buccal mucosal cells may be used as a sentinel population representative of cells in the airways and accessed noninvasively. We hypothesize that exposure to BC, nickel (Ni), and vanadium (V) is associated with changes in buccal DNA methylation of proinflammatory asthma genes (interleukin-4, interferon-γ, inducible nitric oxide synthases), and that such methylation changes are associated with greater airway inflammation and obstruction among urban adolescents in the CCCEH cohort. The aims are to a) Determine whether recent exposure to BC, Ni, V is associated with altered buccal DNA methylation of several asthma genes among children after controlling for multiple covariates including asthma, and b) Determine whether methylation of asthma genes is associated with greater airway inflammation (fractional exhaled nitric oxide, exhaled breath condensate pH) and airflow obstruction (both assessed twice; 5 days apart) among asthmatic children. 100 asthmatic and 80 nonasthmatic 9 to 13 year old children of African-American and Dominican ethnicity and living in Northern Manhattan and the South Bronx, areas where exposure to traffic related air pollution has been implicated in asthma and other diseases, will be recruited from the CCCEH cohort. BC levels will be measured by personal monitoring over a 24 hour period repeated 5 days apart and 6 months later. Metals will be measured by residential monitoring over 5 days, repeated 6 months later. Analyses will control for seroatopy, prenatal, previous (age 5-6 years, 9-10 years) and current environmental tobacco smoke (ETS) exposure, and previous (age 5-6, 9-10 years) PAH and BC exposure, BC exposure over the last 6 and 12 months, early residential indoor allergen levels, sex, age, early puberty (via Tanner stage), ethnicity. If the proposed aims are achieved, we will have identified constituent pollutants that may drive clinically-relevant epigenetic events. A greater understanding of the role of ambient BC, nickel and vanadium in inner city asthma exacerbations will stimulate focused intervention to reduce disease among older children.

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