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## Project Information?

5K23ES025807-02

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### Abstract Text:

DESCRIPTION (provided by applicant) Air pollution and tuberculosis (TB) are public health threats of global proportion, with one-third of people worldwide infected with TB and nearly 90% of the global population living in areas where pollution exceeds safe standards set by the World Health Organization. Children in Viet Nam are exposed to concerning levels of secondhand smoke, cooking smoke, and traffic emissions, yet little is known about the effects of these pollutants on childhood TB. We therefore propose to study the clinical and immunologic effects of air pollutants on childhood TB in Viet Nam. Our overall hypothesis is that air pollution exposures will be associated with increased risk for TB infection and altered immunologic responses to Mycobacterium tuberculosis (Mtb). To test this hypothesis, we will first develop and validate a questionnaire and air pollution models that accurately predict air pollution exposures in children at risk for TB living in Viet Nam (Aim 1). I Aim 2, to evaluate air pollution exposures as risk factors for TB infection, we will first enroll 90 household contacts (children recently exposed to a household member with smear positive TB) into a cross-sectional study, measuring continuous personal PM2.5 exposures and urine cotinine levels as predictors and testing for TB infection (tuberculin skin testing) as our primary outcome. We will then follow those without TB infection at baseline in a prospective cohort study, using time to TB infection in Cox regression analysis as our longitudinal outcome. In Aim 3, those children with TB infection identified from Aim 2 will be enrolled into an additional cross sectional study to evaluate the effects of PM2.5 and urine cotinine on frequencies of IFN- $\gamma$  producing Mtb-specific CD4+ and CD8+ cells by flow cytometry. I have assembled a Mentor and Scientific Advisory Team of internationally acclaimed scientists to address this critically important hypothesis, and will leverage Drs. Nahid and Nhung's (Mentors) extensive CDC- and NIH-funded research infrastructure with funding through 2019 to carry out this research. I have also developed a comprehensive training plan through which I will refine my expertise in three areas: air pollution measurement and analysis; immunology theory and lab experience; and advanced study design, biostatistics, and TB research methodology. We have designed a research strategy by which we can substantiate observational findings through biologically relevant immunologic mechanisms in 3 distinct but related Aims. Our expected findings will impact public health through motivating further research in this area and guiding public health policy to best protect our children from the harmful effects of airborne toxins. Importantly, this K23 research and training will provide me with essential tools for a successful R01 application and to advance my career in air pollution health effects research.

### Public Health Relevance Statement:

Public Health Relevance: Air pollution and tuberculosis are public health threats of global proportion, with one-third of people worldwide infected with tuberculosis and nearly 90% of the global population living in areas where pollution exceeds safe standards set by the World Health Organization. We propose to investigate whether or not air pollution increases the risk for TB among children living in Viet Nam, and how air pollution might adversely affect the body's immune function against TB. Our findings will help guide policies and practices that make the air safe for our children to breathe.

### Project Terms:

Accounting; Address; Advisory Committees; Affect; Air; Air Pollutants; Air Pollution; ambient air pollution; Area; Automobile Driving; Biological Markers; Biometry; Breathing; burden of illness; career; CD8-Positive T-Lymphocytes; Centers for Disease Control and Prevention (U.S.); Child; Childhood; Clinical; cohort; Cohort Studies; Consult; cooking; cost; Cotinine; Country; Cross-Sectional Studies; density; Depressed mood; design; Enrollment; Environmental Risk Factor; Environmental Tobacco Smoke; environmental tobacco smoke exposure; Epidemic; Flow Cytometry; Frequencies; Funding; Future; Health; Health Policy; Household; immune function; Immunologics; Immunology; Infection; instrument; Interferon Type II; Interferons; Laboratories; laboratory experience; Life; Lung diseases; Measurement; Measures; member; Mentors; Modeling; Monitor; Mycobacterium tuberculosis; Outcome; Policies; pollutant; Pollution; Population; primary outcome; prospective; Public Health; public health relevance; Quality Control; Questionnaires; Regression Analysis; Research; Research Design; Research Infrastructure; Research Methodology; Research Training; Resources; response; Risk; Risk Factors; Scientist; Smoke; Source; Statutes and Laws; Testing; theories; time use; Tobacco; Tobacco smoke; tool; Toxin; trafficking; Training; Tuberculin Test; Tuberculosis; United States National Institutes of Health; Urine; Vietnam; Weight; World Health Organization

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