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APERG Research Presentation

**Assessment of personal exposure levels and composition of particulate matter
and their associated health impacts in individuals traveling to selected global
Megacities from New York City**

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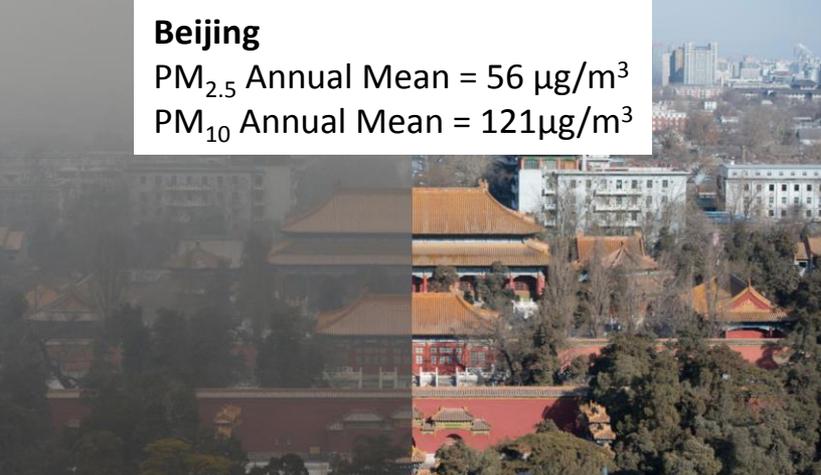
Background

- Different cities in the world have different air pollution concentrations and profiles
- Students who have traveled abroad, staff who have gone to work in Shanghai and other cities have complained of throat irritation, cough and wheeze upon arriving at these cities
- This thesis project takes advantage of a natural test scenario where pollutant concentrations and composition varies within a matter of hours

Beijing

PM_{2.5} Annual Mean = 56 µg/m³

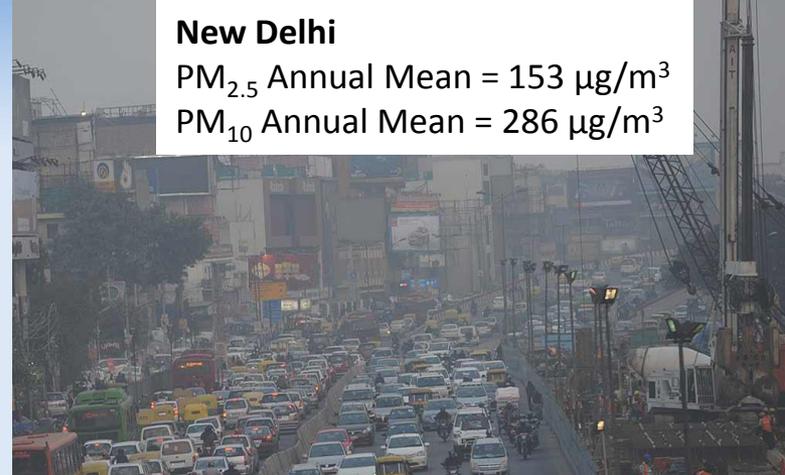
PM₁₀ Annual Mean = 121µg/m³



New Delhi

PM_{2.5} Annual Mean = 153 µg/m³

PM₁₀ Annual Mean = 286 µg/m³



NYC

PM_{2.5} Annual Mean = 14 µg/m³

PM₁₀ Annual Mean = 23 µg/m³

London

PM_{2.5} Annual Mean = 16 µg/m³

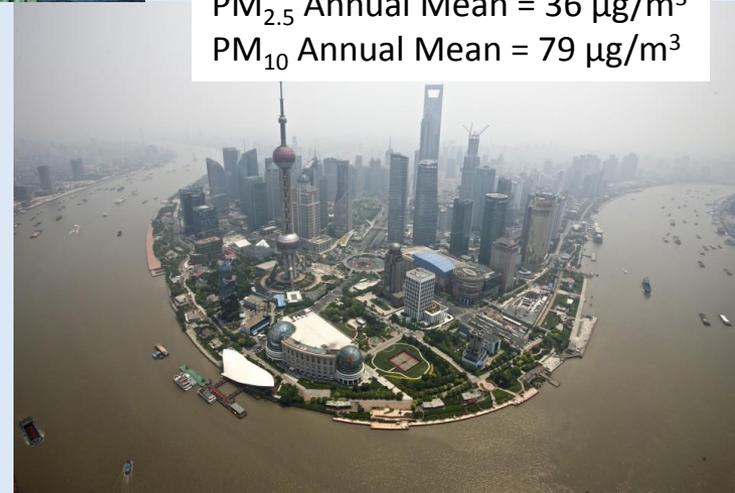
PM₁₀ Annual Mean = 22 µg/m³



Shanghai

PM_{2.5} Annual Mean = 36 µg/m³

PM₁₀ Annual Mean = 79 µg/m³



Aim and Design

- Main hypothesis: Exposure to varying levels of inhaled PM adversely impacts the cardiopulmonary system in individuals who travel abroad.
- Overall Design
 - 50 non-smoking study subjects
 - Traveling from NY/ NJ city area to selected cities abroad: London, Shanghai, Beijing, Prague + (New Delhi, Mexico City)
 - Cities chosen based on pollution levels, frequency of travel/number of travelers from NYC to the respective city
 - Personal exposures and health endpoints measured
 - Questionnaire and notes to record symptoms and special events
 - Airbeams were pre-calibrated using CAPS

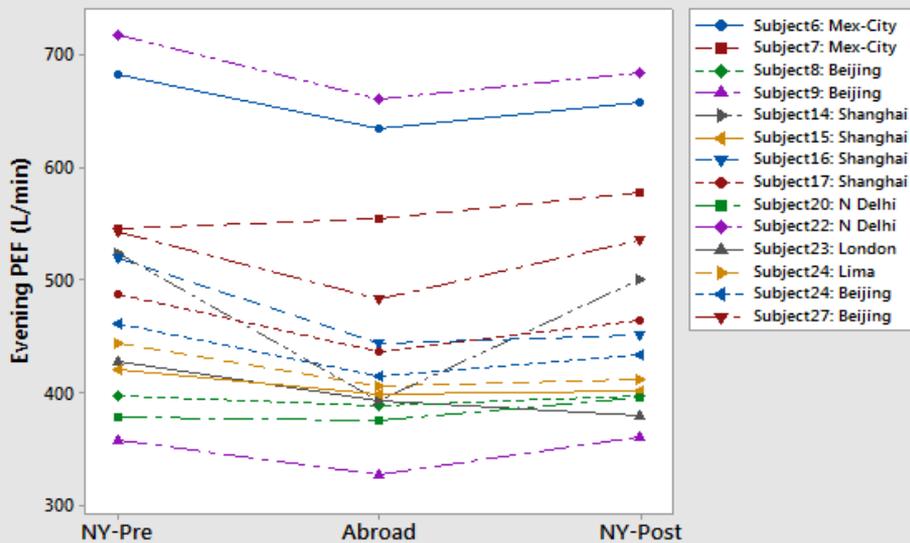
Methods

– *Methods*

- Subjects were trained to use basic pulmonary function testing equipment
- Data collection - one week prior to departure, continue during the stay abroad, and one week after arriving back in NYC
- PM Data – Airbeam, Central Monitor and gravimetric filters
- Health endpoints (morning and evening):
 - Force Expiratory Volume in 1 second (FEV₁)
 - Peak Expiratory Flow (PEF)
 - Blood Pressure
 - Heart Rate and HR variability
- Questionnaire and notes to record symptoms

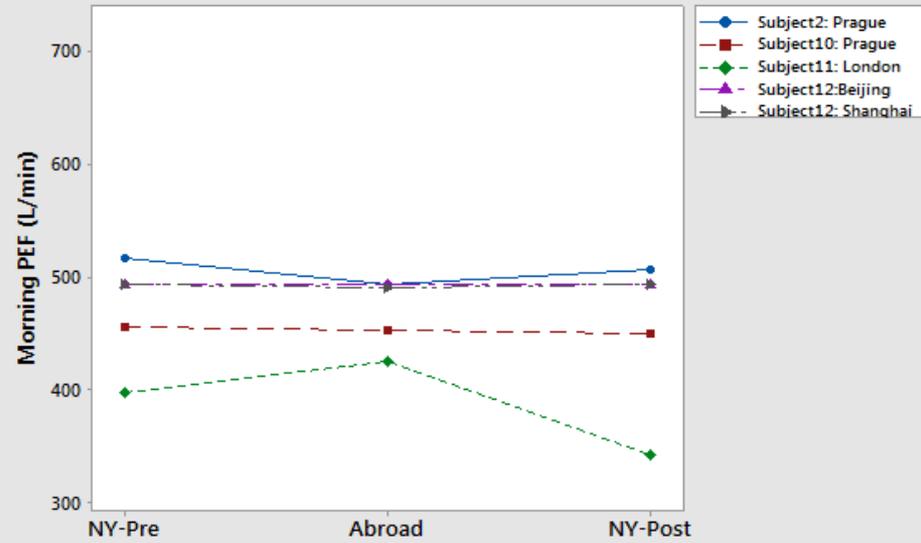
Preliminary Data

Mean PEF in participants who traveled to cities more polluted than NY



Change in mean PEF (evening) in subjects who traveled to cities that had higher PM levels than NY at the time of travel.

Mean PEF of participants who were exposed to PM levels not different from NY



Change in mean PEF (morning) in subjects who traveled to cities that had PM levels not significantly different from pre-travel NY

- The results of this pilot study indicate that travel to cities with significantly higher pollution than one's home city can have acute impacts on the cardiopulmonary system
- Future analysis of PM data from filters and BP, HRV and symptom data
- Support a concern for the potential for adverse health effects due to air pollution while traveling abroad

Issues Anticipated

- Unusually high or low levels of PM for in cities that are atypical – e.g. Very low pollution in Beijing and Shanghai during some seasons
- Weather conditions such as rain that can affect PM levels as well as subject behavior and mobility
- Subjects might be involved in other activities that might affect overall health and lung function
- Airbeam might overestimate or underestimate outdoor pollutant concentrations
- Limited PM samples and composition might not reflect a city's PM (spatial and temporal issues)