Effect of Particulate Matter Air Pollution on Vascular Function in Chronic Obstructive Pulmonary Disease

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PM Pollution and Cardiovascular Function in Health and COPD

PM$_{2.5}$

↑Inflammation  
↑Free Radicals  
↑Oxidative Stress

↓Nitric Oxide

↓CV Function
1. Is the cardiovascular system of patients with COPD more severely affected by PM air pollution than age-matched controls?

2. Does oxidative stress cause the adverse cardiovascular effects of PM air pollution?
PM$_{2.5}$ in Salt Lake City during Winter 2013-2014

Methods:
General Design

### 24 Hour Mean PM$_{2.5}$ (µg/cm$^3$)

- **Polluted Air Experiments**
- **Clean Air Experiments**
# Methods

**Experimental Protocol:** Controls: N=3  COPD: N=5

<table>
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<tr>
<th>Pulmonary Function</th>
<th>Blood Draw</th>
<th>Vascular Function Assessments</th>
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<tbody>
<tr>
<td>FVC</td>
<td>Inflammatory Markers</td>
<td><strong>Flow Mediated Dilation (FMD)</strong></td>
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<tr>
<td>FEV₁</td>
<td>Oxidative Stress Markers</td>
<td></td>
</tr>
<tr>
<td>FEV₁/FVC</td>
<td>NO Bioavailability</td>
<td><strong>Passive Limb Movement (PLM)</strong></td>
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- **Flow Mediated Dilation (FMD)**
- **Passive Limb Movement (PLM)**
Preliminary Results:
Pulmonary Function

![Graph showing FEV1 (% Predicted) for Control and COPD groups. The graph indicates a significant decrease in FEV1 for the COPD group compared to the control group.]
Preliminary Results:
Vascular Function: Flow Mediated Dilation

Graph showing FMD (% Dilation) for Control and COPD groups, comparing Clean Air, Polluted #1, and Polluted #2 conditions.
Preliminary Results:
Vascular Function: Passive Limb Movement

Controls

COPD
Preliminary Results: Summary

$PM_{2.5}$ → Lungs → CV Function
1. Continue the study next winter
2. Preventative Treatments?
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References