When wood is burned, a smoke is formed that contains fine particulate matter, which can enter the lungs and impair lung function. This can affect a wide variety of the population, from those who use a wood burning stove, to first responders to wildfires and communities who are exposed to them. My research question examined whether there was an inflammatory response in the airways of human volunteers exposed to controlled wood smoke exposure.
Healthy adult subjects (11 subjects, 2 male and 9 female) entered the wood smoke chamber (500ug/m3) in the EPA study facility and alternated between exercise on a stationary cycle for 15 minutes and 15 minutes of rest for 2 hours. One such way the subjects' inflammatory responses were monitored was to see if there was an increase in sputum neutrophils (PMNs) by 10 percentage points 4 hours and 24 hours after the initial exposure. Their sputum was collected and processed before they entered the woodsmoke chamber (baseline recording), and 4 and 24 hours later. A Meso Scale Assay was performed to detect and assess the concentration of four pro-inflammatory cytokines in the cell-free sputum supernatants: IL-1β, IL-6, IL-8, and TNF-α. All cytokines were detected, but at varying concentrations depending on time of exposure. Several samples detecting TNF-α concentration were not conclusive and therefore were not within the detectable range of the standard curve. The highest cytokine levels, indicating higher levels of inflammation, occurred 4 hours post- wood smoke exposure for all cytokines except IL-8. The MSD assay shows that participants generally have a higher concentration of pro-inflammatory cytokines 4hr post-exposure. IL-8 was the only cytokine that persisted 24hr post exposure and this tracks with persistent PMN response that had been observed. Future MSD assays should be run reassessing samples that were non-detectable, specifically focusing on TNF-α due to decreased detection across all samples. The next step would be assessing the effectiveness of anti-inflammatory treatment options and running another assay to measure the cytokine concentrations after treatment.