

## Novel Use of $\mu$ -PET/CT Imaging to Detect Cardiopulmonary Changes in a Murine Model Following World Trade Center Particulate Matter Exposure

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**Introduction** World Trade Center (WTC) particulate matter (PM) exposure is associated with development of airway inflammation, vascular injury and obstructive airways disease. Prior literature on noninvasive quantification and distribution of acute inflammation in the lungs and heart is limited in the context of WTC-PM exposure. FDG-PET offers a valuable tool for detection and monitoring of neutrophilic metabolic activity in vivo. In this study, we aim to characterize the inflammation following WTC-PM exposure within the cardiopulmonary system in a murine model of particulate matter exposure. **Methods** C57Bl6 female mice (>12 weeks old, Jackson Laboratory, Bar Harbor, ME, USA) underwent intra-tracheal aspiration of 200  $\mu$ g of PM<sub>53</sub> (n=3) or an equal volume physiological-buffered saline (PBS) (n=3). 24 hours after exposure and overnight fasting, anesthesia was induced with 3% isoflurane, followed by maintenance anesthesia with 2% isoflurane at a rate 2 L/min. Supplemental oxygen was provided throughout. <sup>18</sup>F-FDG was injected (100-200  $\mu$ Ci of <sup>18</sup>F-FDG in 200  $\mu$ L of PBS) into the tail vein through the Harvard Apparatus PHD 2000 infusion pump at 150  $\mu$ L/min.  $\mu$ -PET/CT scanning (Siemens Inveon) of the lung and heart was performed and standardized uptake value (SUV) at a region of interest was recorded (Panel A-C). **Results** The pre-exposure mean SUV ( $\pm$  Standard Error Mean) of the lung was  $0.68 \pm 0.02$ . The mean lung SUV at 24 hours post-exposure was  $0.69 \pm 0.02$  in the PBS group and  $0.84 \pm 0.02$  in PM group,  $p < 0.01$  (Panel D). The pre-exposure mean SUV of the heart was  $2.867 \pm 0.1453$ . The mean SUV at 24 hours post-exposure  $3.3 \pm 0.06$  in PM group,  $p < 0.05$  (Panel E). Overall, the SUV measured at 24 hours was 0.1 and 0.44 units higher in the lung and heart, respectively. **Conclusions** WTC-PM exposure results in neutrophilic inflammation within the lungs as seen by elevated neutrophil counts in bronchoalveolar lavage samples 24 hours post-exposure. This study further illustrates these findings non-invasively using  $\mu$ -PET/CT showing a significant elevation in FDG uptake within the lungs and hearts. This is the first study to show the utility of  $\mu$ -PET/CT in detecting inflammation from particulate matter exposure. Future work will focus on demonstrating these findings at subsequent time points and understanding the underlying pathophysiology.