PS 1242g Replacing Diesel Fuel with Biodiesel: For Better or for Worse?

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Employment of sustainable resources for fuel manufacture has recently gained worldwide trends to limit usage of fossil oils while providing less atmospheric greenhouse gas effects and reducing air pollution. Biodiesel (BD) fuels and biodiesel petroleum blends are used for large truck engines and small, single-cylinder basic piston operating engines. BD produced by transesterification of vegetable oil into fatty acid methyl esters is a renewable energy source. Considering BD fuel is mainly composed of unsaturated fatty acids, we hypothesize that BD exhaust particles could induce pronounced adverse outcomes, due to their ability to readily oxidize fatty acid residues interacting with biological system. We compared the effects of particulate matter (PM) generated by combustion in an engine fueled by corn-based BD to that of petroleum-based diesel (D) after pulmonary exposure of mice by pharyngeal aspiration. We demonstrated that pulmonary exposure to BD PM caused pulmonary inflammation and damage, enhanced release of inflammatory mediators found in BAL and lung tissue causing oxidative stress. Biomarkers of tissue damage, oxidative-stress and inflammation were significantly elevated in lungs of mice exposed to BD compared to those found in mice treated with D. The up-regulation of inflammatory cytokines/chemokines was also higher in lungs of mice treated with BD. Histological evaluation of mouse lungs indicated presence of lymphocytic infiltrate and impaired clearance with prolonged retention of BD PM in pigment laden macrophages. Future studies on the detailed analysis of combustion products from BD and specific mechanism of interactions of these emissions related to found inflammation, oxidative-stress and impaired clearance is underway.

PS 1242h Mutagenic Potential of Biodiesel Exhaust Particles and Effect of Engine Operating Conditions

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Approximately 28,000 underground miners are potentially exposed to relatively high concentrations of diesel particulate matter (PM) in the mining industry. Changing fuel supply from diesel (ULSD) to biodiesel and its blends is considered to be a viable option for controlling exposures to PM but the potential for adverse health effect has yet to be addressed. This study was conducted to investigate the mutagenic potential of diesel engine emissions from neat (B100) and blended (B50) soy-based fatty acid methyl ester (FAME) biodiesel in comparison with ULSD PM using different engine operating conditions and exhaust aftertreatment configurations. The exhaust samples were collected for engine equipped with either a standard muffler or a combination of the muffler and diesel oxidation catalytic converter (DOC) that was operated at four different steady-state modes. Bacterial gene mutation activity of exhaust PM was tested on the organic solvent extracts using the Ames Salmonella assay. The mutagenic activity was strongly affected by fuels, engine operating conditions, and exhaust aftertreatment systems. The mutagenicity was increased with the fraction of biodiesel in the fuel. While the mutagenic activity was observed in B50 and B100 samples collected from both light- and heavy-load operating conditions, the ULSD samples were only mutagenic at light-load conditions. The presence of DOC in the exhaust system resulted in decreased mutagenicity when engine was fueled with B100 and B50 and operated at light-load conditions. This was not the case with ULSD. Heavy-load operating condition in the presence of DOC resulted in a decrease of mutagenicity only when engine was fueled with B50, but not B100 or ULSD. Therefore, the results indicate that PM from neat or blended biodiesel has a higher mutagenic potency than ULSD. Further research is needed to investigate the health effects of biodiesel as well as efficiency of DOC or other exhaust aftertreatment systems.

PS 1242i Reactive Oxygen Species and Inflammatory Response of Monocytes to Ambient Particles Varies by Highway Proximity

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Epidemiological studies have demonstrated associations of respiratory disease with near-roadway traffic related pollutant exposure, effects which are independent of those of regional air pollutants. However, there has been limited study of potential mechanisms for near-roadway effects. We examined the in vitro effects of respirable particulate matter (PM) collected adjacent to a major Los Angeles freeway and at an urban background location. PM was collected on filters during two consecutive fifteen day periods. Oxidative stress and inflammatory response (intracellular reactive oxygen species (ROS), IL-1β, IL-6, IL-8 and TNFα) to PM aqueous extract was assessed in THP-1 cells, a model for evaluating monocyte/macrophage lineage cell responses. Near-roadway PM induced statistically significantly higher levels of IL-6, IL-8 and TNFα ($P<0.01$) but not of IL-1β ($P=0.06$) or of ROS ($P=0.17$). PM stimulation enhanced activity of extracellular signal-regulated kinase (ERK) and c-Jun N-terminal kinase (JNK). Pre-treatment of THP-1 cells with kinase inhibitors or antioxidant reduced PM-induced cytokine expression. Contrast between urban background and near-roadway PM-induced inflammatory cytokines was similar in magnitude to differences between collection periods. We conclude that near-roadway PM had greater inflammatory activity than urban background PM, a finding consistent with epidemiologic findings, in pathways regulated by ROS and the MAPK pathways including ERK and JNK. THP-1 cells are a potential model for development of biologically relevant metrics of long-term spatial variation in exposure for study of disease.

PS 1243 The Role of Zinc in Altering the Detrimental Effects of World Trade Center Particulate Matter on Human Pulmonary Fibroblasts

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Particulate matter from the World Trade Center (WTC) tragedy of 9-11 is linked to increased respiratory problems and emergence of World Trade Center Cough. High levels of Zinc (Zn) have been identified among the many heavy metals found in WTC dust. It has been indicated that some synergistic effects among several chemicals might be contributing to respiratory illness. The toxicity and apoptotic ability of WTC dust from the Market Street sample were carried out on MRC-5 human lung cells. The combination treatment of Zn to WTC dust mimicked the ratio of Zn identified in the total dust. Similar studies were performed to show reduction in toxicity either Lead (Pb) or Cadmium (Cd). Measurements utilizing 96 well plates were read in a Bio-Tech Synergy 2 multi plate reader . In all experiments heavy metals known to be highly damaging to human lung cells were modified by the presence of Zn. Modification of deleterious effects were noted in cells exposed to WTC dust and Zn. Without the addition of unusual high levels of Zn, both Pb, Cd, and WTC dust alone, would be more damaging to those exposed to WTC dust. These experiments suggest that the high levels of Zn found in the particulate matter at the WTC site might possibly serve as a reward in disguise to WTC victims.

PS 1244 Evaluation of Zinc and Metallothioneins in the Skin Injured after an Experimental Surgery

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Previous studies have shown that Zn and MT are essential for tissue repair, however there are few studies that show the changes of Zn and MT in the different stages in the healing process. Therefore the aim of this study was to evaluate the changes of Zn and MTs during phases of inflammation, proliferation and maturation in the injury produced by an experimental surgery. Male NUDE rats weighing 100 to 150 g were used as a model, which underwent an abdominal incision of 3 cm. Groups of 5 animals were sacrificed at 6, 12, 24, 48 h, 7 and 28 days after surgery. Each animal skin samples were taken from the injured area, and as control skin, an

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