ENVR 400 Seminar

Comparing the Toxicity of Fresh and Aged Diesel Exhaust Using a Newly Developed *in vitro* Exposure System

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ABSTRACT

There is an increasing interest in examining complex urban air pollution mixtures containing both particulate and gaseous components. Our previous studies have shown that atmospheric aging of gaseous pollutants modifies the chemical composition of air pollution mixtures, ultimately affecting its toxicological potential. The goal of this current project is to determine whether aging of complex gaseous and particulate mixtures, in the presence or absence of photochemistry, alters the toxicological potential of that mixture. Specifically, we wanted to determine whether aging of diesel engine emissions (DE) would alter toxicological responses compared to fresh DE emissions. A second goal was to examine the differences between multiple diesel sources; a 1980 Mercedes and a 2005 Volkswagen Passat TDI station wagon. Each freshly emitted DE sample was injected into a 120 m3 outdoor smog chamber and aged utilizing natural sunlight and humidity. Our electrostatic aerosol sampler system has the capability to expose human respiratory epithelial cells directly to particulate matter in its natural state across an air-liquid interface. We have compared the toxicity of unreacted “fresh” DE, dark-aged DE (reacting with itself in the absence ofsunlight), and photochemically aged DE. Cells were exposed to the various DE’s for 1 hour and analyzed for cytotoxicity (LDH) and inflammatory cytokine production (IL-8) 12 hours post exposure. Both fresh and aged DE from both DE sources increased LDH and IL-8 levels as compared to the clean air control, with the Mercedes engine generating a greater response. In addition, our results suggest that aging significantly enhances the responses compared to fresh DE emissions. Taken together, these results further support the importance of considering engine type and atmospheric aging when studying the toxicity of vehicle emissions.