Airport emission particles - DTU Orbit (23/10/2019)

**Airport emission particles: Exposure characterization and toxicity following intratracheal instillation in mice**

**Background:** Little is known about the exposure levels and adverse health effects of occupational exposure to airplane emissions. Diesel exhaust particles are classified as carcinogenic to humans and jet engines produce potentially similar soot particles. Here, we evaluated the potential occupational exposure risk by analyzing particles from a non-commercial airfield and from the apron of a commercial airport. Toxicity of the collected particles was evaluated alongside NIST standard reference diesel exhaust particles (NIST2975) in terms of acute phase response, pulmonary inflammation, and genotoxicity after single intratracheal instillation in mice. Results: Particle exposure levels were up to 1 mg/m³ at the non-commercial airfield. Particulate matter from the non-commercial airfield air consisted of primary and aggregated soot particles, whereas commercial airport sampling resulted in a more heterogeneous mixture of organic compounds including salt, pollen and soot, reflecting the complex occupational exposure at an apron. The particle contents of polycyclic aromatic hydrocarbons and metals were similar to the content in NIST2975. Mice were exposed to doses 6, 18 and 54 μg alongside carbon black (Printex 90) and NIST2975 and euthanized after 1, 28 or 90 days. Dose-dependent increases in total number of cells, neutrophils, and eosinophils in bronchoalveolar lavage fluid were observed on day 1 post-exposure for all particles. Lymphocytes were increased for all four particle types on 28 days post-exposure as well as for neutrophil influx for jet engine particles and carbon black nanoparticles. Increased Saa3 mRNA levels in lung tissue and increased SAA3 protein levels in plasma were observed on day 1 post-exposure. Increased levels of DNA strand breaks in bronchoalveolar lavage cells and liver tissue were observed for both particles, at single dose levels across doses and time points. Conclusions: Pulmonary exposure of mice to particles collected at two airports induced acute phase response, inflammation, and genotoxicity similar to standard diesel exhaust particles and carbon black nanoparticles, suggesting similar physicochemical properties and toxicity of jet engine particles and diesel exhaust particles. Given this resemblance as well as the dose-response relationship between diesel exhaust exposure and lung cancer, occupational exposure to jet engine emissions at the two airports should be minimized.

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