

AIRWAY AND CIRCULATORY PRO-INFLAMMATORY EFFECTS OBSERVED IN HEALTHY VOLUNTEERS AFTER AMBIENT AIR POLLUTION EXPOSURE: RAPTES HEALTH EFFECT ASSESSMENT

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Background and aims: Despite the large amount of data available on the adverse health effects of ambient particulate matter (PM) there is limited information on the influence of which PM characteristics mainly drive these effects. The aim of RAPTES (Risk of Airborne Particles: Toxicological-Epidemiological hybrid Study) is to investigate which PM characteristics contribute to effects on the respiratory and circulatory system.

Methods: Thirty healthy volunteers were exposed to ambient air pollution at five different sites in the Netherlands: two traffic sites, an underground train station, a farm, and an urban background site. Sampling took place on 30 days from March-October 2009. Each subject visited at least 3 sites and was exposed for 5h per visit. Air pollution was characterized during this 5h-period, including measurements of PM₁₀ and PM_{2.5} mass and elemental composition, particle number concentration (PNC), PM oxidative potential (OP) and PM₁₀ endotoxin content. Pro-inflammatory parameters were measured before and at 2h and 18h post-exposure, including cytokines and differential cell counts in nasal lavage (NAL) and blood.

Results: PM₁₀ endotoxin content was associated with elevated NAL cytokine levels. Two hours post-exposure, we observed a significant increase over baseline in IL-6 and IL-8 (3.2% and 1.5% per endotoxin unit respectively), as well as 18h post-exposure (1.7% IL-6). PM₁₀, PM_{2.5} mass concentration, PNC and OP were not associated with NAL cytokine levels. Furthermore, no changes in NAL differential cell counts were observed after ambient PM exposure. In blood, PM characteristics were not associated with IL-6 (IL-8 not measured). A significant increase (15%) of leukocytes was observed 2h post-exposure followed by a significant decrease 18h post-exposure (10%). This was predominately characterized by an increase in neutrophils, especially in relation to PM₁₀ and PM_{2.5} mass, organic and elemental carbon.

Conclusions: Increased expression of pro-inflammatory airway and circulatory markers was observed in healthy volunteers after five-hour exposure to ambient air pollution. These effects were particularly associated with endotoxin and organic carbon.