

TRAFFIC POLLUTION AND BIOMARKERS OF PULMONARY OXIDATIVE STRESS IN HEALTHY HUMANS

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Background. Traffic-related air pollution is associated with increased cardiopulmonary morbidity and mortality. Evidence suggests that oxidative stress may mediate these adverse effects. We hypothesized that passenger vehicle rides simulating a rush-hour commute would cause measurable acute changes in biomarkers of airway oxidative stress among healthy volunteers.

Methods. Twenty nonsmoking subjects aged 18-45 were passengers in a Ford Taurus sedan for two 2-hr car rides. The route was primarily on a major highway with heavy diesel truck traffic with the car's external air intake open. Subjects wore a powered air-purifying respirator (PAPR) ('Air-Mate,' 3M) during all car rides. In randomized order at least one week apart, each subject had one ride with, and one ride without, a HEPA filter in place in the PAPR. Subjects were blinded to the presence of the filter. In-vehicle measurements included total particle count, PM_{2.5}, nitrogen dioxide, and carbon monoxide. We collected exhaled breath condensate (EBC) with an Ecoscreen® device before and 0, 6 and 24 hr after each ride. We measured the concentration of EBC nitrite and nitrite + nitrate, markers of nitrosative stress, using chemiluminescence detection, and EBC malondialdehyde (MDA), a marker of oxidative stress, using HPLC with fluorescence detection. To date, 12 subjects have completed the protocol with samples analyzed.

Results The filter reduced particle counts by >99%. We found a significant 2-fold increase in mean nitrite+nitrate in EBC collected immediately following the car rides without HEPA filtration compared to the rides with HEPA filtration, as well as non-significant increases in nitrite and MDA. The increases did not persist at 6 hr and 24 hr after the car ride.

Conclusions These results suggest that the PM exposure during car rides in heavy diesel truck traffic causes acute increases in oxidative/nitrosative stress in the respiratory tract.