IN-VEHICLE POLLUTANT EXPOSURES AND ACUTE CARDIORESPIRATORY RESPONSE IN A COHORT OF HEALTHY AND ASTHMATIC CAR COMMUTERS IN THE ATLANTA COMMUTERS' EXPOSURE STUDY

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Background and Aims: Previous findings show acute cardiorespiratory response associated with very short-term exposures to traffic pollutants (McCreanor et al, 2007). It is, thus, plausible that daily car commuters comprise a vulnerable sub-population, despite limited data examining exposures during realistic commutes and health response. We conducted the Atlanta Commuters Exposures (ACE) Study to address these research needs.
Methods: Twenty healthy and 20 asthmatic subjects participated in two, 2h scripted car commutes. We measured a range of pulmonary and cardiovascular biomarkers immediately pre- and post-commute and for 3h, each hour, post-commute. We sampled in-vehicle concentrations of size-resolved particulate matter mass and number, and organic and elemental species using a novel sampling manifold. Mixed effect regression models were used to examine differences between pre- and post-commute biomarker levels.
Results: Elevated concentrations of many pollutant concentrations existed during the commutes. We observed significant ($p < 0.0001$) increases in post-commute exhaled nitric oxide (eNO) indicative of pulmonary inflammation. During the 4 post-commute measurement periods, mean eNO levels ranged from 12-16% above corresponding pre-commute levels and were typically highest at the 1h post-commute measurement period. C-reactive protein (CRP) levels, indicative of systemic inflammation, were also elevated, although not significantly, at each of the post-commute periods. CRP levels were highest (15% higher than pre-commute levels) immediately after the commute ($p = 0.07$). Associations between pre- and post-commute lung function were negligible. For these analyses, results were not significantly different by disease status.
Conclusions: Preliminary ACE study results showed significant elevations in several biomarkers of acute pulmonary and systemic inflammation following a realistic morning commute. These results provide indication that sub-clinical changes, consistent with inflammation, may be occurring in our cohort. Results examining the role of specific particle chemical components, effects on additional endpoints and potential confounding by stress and noise will also be discussed.
References: McCreanor J, Cullinan P, Nieuwenhuijsen MJ, Stewart-Evans J, Malliarou E, Jarup L, Harrington R, Svartengren M, Han I-K, Ohman-Strickland P, Chung KF, Zhang J. Respiratory effects of exposure to diesel traffic in persons with asthma. New England Journal of Medicine 2007;357(23)