PARTICULATE AIR POLLUTION AND INFLAMMATORY MARKERS

Duanping Liao, Penn State University College of Medicine, USA
Fan He, Penn State University College of Medicine, USA
Michele L. Shaffer, Penn State University College of Medicine, USA
Sol M. Rodriguez-Colon, Penn State University College of Medicine, USA
Jeff D. Yanosky, Penn State University College of Medicine, USA
Edwards O. Bixler, Penn State University College of Medicine, USA
Willard Freeman, Penn State University College of Medicine, USA
Alexandros N. Vgontzas, Penn State University College of Medicine, USA

Background and Aims: The inflammatory effect of fine particulate matter (PM$_{2.5}$) is one of the potential mechanisms linking PM pollution and cardiopulmonary outcomes. We examined the association between individual level 24-hour PM$_{2.5}$ concentration and blood inflammatory markers in a community dwelling sample.

Methods: We used a Personal DataRam (pDR) to measure 24-hour individual-level real-time PM$_{2.5}$ exposures in 105 middle-aged nonsmokers. Two blood samples were collected from each participant, one immediately before and one immediately after the 24-hour study period. Concentrations of several inflammation markers were assessed and averaged. Linear regression models were used to assess the association between mean 24-hour PM$_{2.5}$ exposure and the mean inflammation markers. Age, race, gender, relative humidity, temperature, and participant’s chronic disease status were adjusted for in the regression models.

Results: The participants (mean [SD] age: 56 [8] years) tended to be female (60%) and white (74%). The 24-hour mean (SD) personal PM$_{2.5}$ concentration was 14.33 (14.60) µg/m$^3$. We did not observe significant associations between 24-hour mean PM$_{2.5}$ exposure and mean inflammation markers. The regression coefficients (SE) per 10 µg/m$^3$ increases in PM$_{2.5}$ were: -0.02 (0.02) g/dL for albumin, 81 (217) ng/mL for C-reactive protein (CRP), -0.56 (0.30) pg/mL for interleukin-1α (IL-1α), -1.66 (5.37) pg/mL for tumor necrosis factor-α (TNFα), 100 (73) pg/mL for tumor necrosis factor soluble receptor I (TNFsRI), and 0.02 (0.09) x 10$^3$/mm$^3$ for white blood cell count (WBC), respectively (all p-values > 0.05).

Conclusion: Currently low levels of 24-hour mean PM$_{2.5}$ exposure are not associated with blood inflammation markers. More studies on the chronic exposure and inflammatory responses are needed to elucidate the sub-acute and chronic effects of PM on systemic inflammation as a mechanistic link between PM and cardiopulmonary disease.