

Association between size-segregated particles in ambient air and acute respiratory inflammation in elderly with pre-diabetes

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Considering the pathological process of diabetes in systemic inflammation and endothelial dysfunction, people with pre-diabetes might be more susceptible to air pollutants in terms of cardiovascular impact.

We recruited 120 non-smoking 50-65 years old individuals from Peking University. Hourly mean concentrations of PM_{2.5}, BC, CO, SO₂, NO_x, O₃, and particle size distribution were monitored in PKU campus, PM_{2.5} filter samples were collected 24 hours every day. Participants were invited for the clinical visits four times a year, up to 6 visits in total. Serum, plasma, exhaled breath condensate (EBC) and urine were collected during each visit. Biomarkers included: cell counting, biochemistry endpoints and cytokines in blood; FENO, pH values and cytokines of EBC; MDA in urine; endothelial function related endpoints; HRV. Linear mixed-effect models were fitted to estimate the associations between biomarkers and air pollutants, with the exposure window lagged up to 14 days.

We found the associations of particles were significant with increased FENO, White blood cells (WBC), while insignificant with HRV and biochemistry endpoints in serum. The association of FENO and WBC was the strongest with number concentration of particles with size of 100-200 nm. The associations of particles with size of 100-200 nm were significant with FENO and WBC from lag 1 hour and throughout the 14 days, while the significance was shorter for the particles with smaller and larger sizes.

The association between acute respiratory and systemic inflammation with PM concentration of fine particulates depended on particle size. Association of FENO and WBC with size segregated particles showed different lag patterns, suggesting the mechanism of the particle-induced health effect might be independent by the particle size.