Cardiovascular and lung function in relation to outdoor and indoor exposure to fine and ultrafine particulate matter in middle-aged subjects

CARDIOVASCULAR AND LUNG FUNCTION IN RELATION TO OUTDOOR AND INDOOR EXPOSURE TO FINE AND ULTRAFINE PARTICULATE MATTER IN MIDDLE-AGED SUBJECTS

This cross-sectional study investigated the relationship between exposure to airborne indoor and outdoor particulate matter (PM) and cardiovascular and respiratory health in a population-based sample of 58 residences in Copenhagen, Denmark. Over a 2-day period indoor particle number concentrations (PNC, 10–300 nm) and PM$_{2.5}$ (aerodynamic diameter < 2.5 μm) were monitored for each of the residences in the living room, and outdoor PNC (10–280 nm), PM$_{2.5}$ and PM$_{10}$ (aerodynamic diameter < 10 μm) were monitored at an urban background station in Copenhagen. In the morning, after the 2-day monitoring period, we measured microvascular function (MVF) and lung function and collected blood samples for biomarkers related to inflammation, in 78 middle-aged residents. Bacteria, endotoxin and fungi were analyzed in material from electrostatic dust fall collectors placed in the residences for 4 weeks. Data were analyzed using linear regression with the generalized estimating equation approach. Statistically significant associations were found between indoor PNC, dominated by indoor use of candles, and lower lung function, the prediabetic marker HbA1c and systemic inflammatory markers observed as changes in leukocyte differential count and expression of adhesion markers on monocytes, whereas C-reactive protein was significantly associated with indoor PM$_{2.5}$. The presence of indoor endotoxin was associated with lower lung function and expression of adhesion markers on monocytes. An inverse association between outdoor PNC and MVF was also statistically significant. The study suggests that PNC in the outdoor environment may be associated with decreased MVF, while PNC, mainly driven by candle burning, and bioaerosols in the indoor environment may have a negative effect on lung function and markers of systemic inflammation and diabetes.

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