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An Air Filter Intervention Study of Endothelial Function Among Healthy Adults in a Woodsmoke-Impacted Community.

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Abstract

RATIONALE: Particulate air pollution is associated with cardiovascular morbidity. One hypothesized mechanism involves oxidative stress, systemic inflammation, and endothelial dysfunction.

OBJECTIVES: To assess an intervention's impact on particle exposures and endothelial function among healthy adults in a woodsmoke-impacted community. We also investigated the underlying role of oxidative stress and inflammation in relation to exposure reductions.

METHODS: Portable air filters were used in a randomized crossover intervention study of 45 healthy adults exposed to consecutive 7-day periods of filtered and non-filtered air.

MEASUREMENTS AND MAIN RESULTS: Reactive hyperemia index was measured as an indicator of endothelial function via peripheral artery tonometry, and markers of inflammation (C-reactive protein, interleukin-6, and band cells) and lipid peroxidation (malondialdehyde and 8-iso-prostaglandin F_{2α}) were quantified. Air filters reduced indoor fine particle concentrations by 60%. Filtration was associated with a 9.4% (95% CI: 0.9 - 18%) increase in reactive hyperemia index and a 32.6% (4.4 - 60.9%) decrease in C-reactive protein. Decreases in particulate matter and the woodsmoke tracer levoglucosan were associated with reduced band cell counts. There was limited evidence of more pronounced effects on endothelial function and level of systemic inflammation among males, overweight participants, younger participants, and residents of wood-burning homes. No associations were noted for oxidative stress markers.

CONCLUSIONS: Air filtration was associated with improved endothelial function and decreased concentrations of inflammatory biomarkers, but not markers of oxidative stress. Our results support the hypothesis that systemic inflammation and impaired endothelial function, both predictors of cardiovascular morbidity, can be favorably influenced by reducing indoor particle concentrations.

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