Toxicological Effects of Fresh and Aged Particulate Matter Emissions from a Wood Stove in Two Different Combustion Conditions.

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Characterization of Ambient Air Pollution Measurement Error in a Time-Series Health Study using a Geostatistical Simulation Approach. GRETCHEN GOLDMAN, James Mulholland, Armistead Russell, Katherine Gass, Matthew Strickland, Paige Tolbert, *Georgia Institute of Technology*

In recent years, geostatistical modeling has been used to inform air pollution health studies. In this study, distributions of daily ambient concentrations were modeled over space and time for 12 air pollutants and used to assess the impact of measurement error in a time-series study of emergency department visits for cardiovascular disease. Simulated pollutant fields were produced for a 6-year time period over the 20-county metropolitan Atlanta area using the Stanford Geostatistical Modeling Software (SGeMS). The simulations incorporate the temporal and spatial autocorrelation structure of ambient pollutants, as well as season and day-of-week temporal and spatial trends. Simulated monitor data were then generated by adding measurement error representative of instrument imprecision to the simulated concentrations at the locations of actual monitors. From the simulated monitor data, four exposure metrics were calculated: central monitor and unweighted, population-weighted, and area-weighted averages. For these metrics, the amount and type of error relative to the simulated pollutant fields are characterized and the impact of error on an epidemiologic time-series analysis is predicted. The amount of error, as indicated by a lack of spatial autocorrelation, is greater for primary pollutants than for secondary pollutants and is only moderately reduced by averaging across monitors; larger error amount results in reduced statistical power in the epidemiologic analysis. The type of error, as indicated by the correlations of error with the monitor data and with the true ambient, varies with exposure metric, with error in the central monitor metric more of the classical type (i.e. independent of the monitor data) and error in the spatial average metrics more of the Berkson type (i.e. independent of the true ambient). Error type affects the bias in the health risk estimate, with bias toward the null and away from the null depending on the exposure metric; population-weighting yielded the least bias.

9HA.3
Toxicological Effects of Fresh and Aged Particulate Matter Emissions from a Wood Stove in Two Different Combustion Conditions. PASI, I JALAVA, Oskari Uski, Joakim Pagels, Erik, Z Nordin, Axel Eriksson, Christoffer Boman, Robin Nyström, Jorma Jokiniemi, Maija-Riitta Hirvonen, *University of Eastern Finland, Kuopio, Finland*

We studied the toxicological effects including inflammation, cytotoxicity and genotoxicity in mouse macrophage cells, which are the primary defense cell type in the airways against the particulate exposure. RAW264.7 macrophages were exposed for 24 hrs to four doses (15, 50, 150 and 300 micrograms in milliliter) of the particles from four different biomass combustion aerosols. Emissions from "nominal" and "poor" combustion conditions in a wood stove firing birch logs were used, either fresh or aged with ozone in a chamber of 17 cubic meters in volume. The production of cytokines (TNF alpha, MIP-2), and cytotoxicity (MTT, PI-exclusion, apoptosis and cell cycle) was analyzed thereafter. Genotoxic properties of the particulate samples were investigated with the Comet assay.

Exposure to particulate samples caused marked cytotoxicity, particles from poor combustion being significantly more cytotoxic than those from nominal conditions. In both cases aging of the aerosol increased their cytotoxicity. In addition, the emissions from poor combustion conditions increased the inflammatory response in the cells when compared to nominal conditions. Aging increased the inflammatory potential of particulate sample from nominal condition, but decreased that of poor combustion sample. All the samples induced similar genotoxic responses, but aging increased substantially the response by poor combustion sample. Genotoxicity of the largest dose of poor combustion particles could not be analyzed due to large cytotoxicity.

Accordingly, both combustion conditions and atmospheric transformation processes may affect the toxicological properties of the emitted particles from small-scale wood combustion, which may have significant role in the harmfulness of the ambient particulate matter.