Effect of wildfire particulate matter on human lung epithelial cells: Impact of aging and source material

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BACKGROUND: The increasing frequency of wildfires has a substantial impact on human health through exposure to emissions. Discussed health effects include respiratory symptoms (e.g., asthma, COPD), cardiovascular events (e.g., stroke, heart attack) and an increased risk of infection. The emission plumes are also transported over long distances in the atmosphere and are exposed to photochemical and dark aging, which influences the chemical composition. The effect of aging on toxicity and the underlying cellular mechanisms are poorly understood.
OBJECTIVE: The study analyzes the effects of biomass combustion emission aging and source material on cytotoxicity and its impact on transcriptome level in human bronchial airway cells.
METHODS The experimental generated wildfire particles are collected on quartz filters and isolated by extraction with a mixture of dichlormethane and methanol. The extracts obtained are filtered and the solvent is removed by rotary evaporators. The resulting extracts are applied to the bronchial lung epithelial cell line BEAS-2B and their cytotoxic effect and influence on gene expression are examined.
RESULTS: Preliminary data suggest that even at concentrations with no effect on cell viability, extensive gene regulatory activity occurs. Although the analysis of the cytotoxic effect of the extracts doesn't show an impact of aging duration, aging-dependent genetic activations are observed, indicating an influence of aerosol aging. The source material has a significant impact on viability and gene expression in bronchial lung cells. Overall, regulation of genes associated with xenobiotic metabolism (e.g. CYP1A1) and immune activation (e.g. IL24) occurs, as well as genes not directly related to exposure to wildfire particles (SYNGAP1, CABIN1).
CONCLUSION: The study indicates that experimental aged particulate matter from wildfire emissions not only affects the viability and xenobiotic metabolism of human bronchial cells, but also potentially has broader implications for human health. The underlying mechanisms influencing the nervous system, reproduction, tumorgenesis and other impacted areas require further in-depth investigation.