

Examination of Acute Pulmonary Responses to Various Cookstove Exhaust Emissions

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Air pollution is a global public health problem, to which the emissions from rudimentary cooking devices has been estimated to contribute significantly through the burning of various types of biomass. Notably, exposure to cookstove emissions (CE) has been linked to increases in morbidity and mortality causing an estimated 4 million deaths which most frequently impact women and children. Current efforts to reduce CE have led to the development of several new cookstove (CS) designs. Although some studies have characterized improvements in the overall release of specific pollutants from modern CS, there is less information regarding the potential health benefits that may be derived from their usage. In this study, current models representing 4 different CS types, 3-Stone (3S), Forced Draft (FD), Natural Draft (ND), and Propane (PR), were used under the same cooking conditions for two consecutive cooking cycles. Exhaust emissions from each stove were characterized, and young adult female CD-1 mice were simultaneously exposed for a 3 hr period. Various endpoints examined at 0, 4, and 24 hr post-exposure (PE) included lung inflammation and changes in redox status/antioxidant capacity. Of these endpoints, CS emissions were observed to most significantly affect the pulmonary redox status of exposed animals via the oxidation of cellular glutathione. As compared to filtered air controls, lung homogenates from CE-exposed mice had consistently decreased levels of reduced glutathione (GSH), with corresponding increases in disulfide glutathione (GSSG), at 0 and 24 hr PE for all 4 CS. While no significant increases in pulmonary inflammation were observed in CE-exposed animals, macrophages from 3S and ND-exposed mice had a visible particle burden 24 hours PE, as compared to air controls. Together, these data support the need for a continued assessment of the health effects resultant from prolonged exposure to the exhaust emissions of modern CS. (Does not necessarily reflect USEPA policy)