

Assessment of Exposure to Indoor Wood-Smoke using Biomarkers in Urine

Michael C. Clark

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A class of chemicals known as Methoxyphenols has been proposed as a possible biomarker of wood smoke exposure. These organic compounds, released in both gaseous and particle fractions during the pyrolysis of lignin in wood, can be detected in urine at very low (ppb) levels using a GC-MS assay after solid phase extraction. Methoxyphenols were measured in urine samples (n=44) of individuals enrolled in the Guatemala Stove Intervention Program to determine the feasibility of using biomarkers as an exposure assessment tool. This study involved control homes (n=4) as well as intervention homes (n=6) in which cook stoves or “planchas” were used. Methoxyphenol levels in the urine were normalized by creatinine concentration and then compared to various other air monitoring data such as household PM 2.5 levels, personal and household CO measurements, and real time analysis of smoke levels using UCBs. Normalization by urinary excretion rates was also calculated and compared to creatinine normalization. An eating study was conducted to investigate the possible contribution of smoke from typical foods to Methoxyphenol levels. Further analysis was performed to determine the effects of different exposure patterns, such as peak exposure versus average daily exposure, on Methoxyphenol concentration. Urinary excretion rate was also determined and used to normalize the samples.

Urine samples were also analyzed for 8-isoprostane, a biomarker of oxidative stress that has been shown to correlate with tobacco smoking. This biomarker of response will be compared to the assortment of exposure assessment results to determine the relationship between wood smoke exposure and oxidative stress. Due to the unstable nature of 8-isoprostane in urine, the effects of sample storage at different temperatures were investigated.