Abstract # 1544

Urinary Pesticide Concentrations and Their Relationship to Air and Dust Concentrations and Household Predictors

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Methods: Biomonitoring data provide critical information about pesticide exposures, and combined with measurements in environmental media provide insight into exposure sources and pathways. We collected urine samples from 120 women living in Cape Cod, Massachusetts, a semi-rural coastal area; and US CDC analyzed the samples for 13 pesticides or pesticide metabolites. In addition, we measured concentrations of 40 pesticides in air and 39 pesticides in dust and collected self-reported information about pesticide use. We detected 12 pesticides in urine, 26 in air, and 28 in dust in at least one sample. Data tended to be left censored due to detection limits from the laboratory analysis. With high levels of censoring Pearson and Spearman correlation coefficients calculated with substitution of arbitrary values (DL/2 or DL/sqrt(2)) for censored data have been shown to be poor measures of actual correlation. Instead, either maximum likelihood estimates or Kendall's tau rank correlations with adjustment for ties have been shown to be more accurate, although, in general, Kendall's tau estimates tend to be lower in magnitude than corresponding Pearson or Spearman correlations. In this study, Kendall's tau rank correlation coefficients, adjusted for censored data, were calculated to explore within and between media relationships, with p-values obtained from 10,000 bootstrap replications.

Results: Urine compounds with the strongest positive correlation include 3,5,6-trichloro-2-pyridinol and 2,4,6-trichlorophenol (tau=0.72), a relationship also observed in the NHANES dataset; and 3,5,6-trichloro-2-pyridinol and 4-nitrophenol (tau=0.20). These relationships have not been reported before and are not predicted based on known common sources or metabolic pathways for these compounds. Pesticides with the strongest, significant ($p<0.05$) positive correlations within air include gamma-chlordane and alpha-chlordane with heptachlor (tau=0.69 and 0.66; respectively), which were formerly used together in a technical chlordane mix, followed by pentachlorophenol with o-phenylphenol (tau=0.37). Pesticides with the strongest positive correlation within dust include methoxychlor and DDT (tau=0.38), both previously used organochlorines, followed by propoxur and piperonyl butoxide (tau=0.33), both used currently in insecticide formulations. In contrast to the urinary phthalate metabolites in this population, the urinary pesticide metabolites did not show strong and significant correlations with their known parent pesticides in air and dust and were not strongly correlated with any other pesticides in air and dust. Potential relationships between urinary pesticides and self-reported pesticide use were determined using Wilcoxon tests with binary predictors. Urinary concentrations of 2,5-dichlorophenol were marginally significantly higher ($p=0.094$) in women living in homes treated for insects in the past year. Urinary concentrations of 1-napthol, a metabolite of carbaryl, were marginally significantly higher ($p=0.10$) in women whose lawns were treated in the past year. Urinary concentrations of 2,4,6-trichlorophenol were significantly higher ($p=0.03$) in women with pets and marginally significantly higher ($p=0.06$) for women with pets treated for fleas.

Conclusions: While we observed some expected correlations within media and some relationships between urinary metabolites and self-reported pesticide use within the residence, we did not observe correlations between urinary pesticide metabolites and pesticides in indoor air and house dust for this set of pesticides.