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MAA2-PD-10 EVALUATION OF TWO DUST SAMPLING METHODS FOR ESTIMATING PESTICIDE EXPOSURES IN A CASE-CONTROL STUDY OF CHILDHOOD LEUKEMIA

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Background: Parental reports of residential pesticide use have been associated with increased risk of childhood leukemia. However, self-reports are not adequate to identify active ingredients in pesticides and may be subject to recall bias. Carpet dust is a reservoir for pesticides because they are protected from degradation by sunlight, moisture, and microorganisms. The pesticide dose that a child receives through dermal contact and ingestion is related to the amount of dust per area of carpet and the pesticide concentration in the dust. Together, these factors determine the pesticide loading (amount of pesticide per area of carpet), which is believed to be the gold standard for assessing a child's exposure.

Methods: We conducted a population-based case-control study of childhood leukemia in 35 counties in Northern and Central California, where both interview data and carpet dust samples were collected in order to characterize home pesticide exposures. The objective of our analysis was to evaluate two methods of dust collection. Homes of residentially stable cases (225) and controls (255) less than 8 years old were eligible for collection of carpet dust using a specialized vacuum, the high volume surface sampler (HVS3). We also sampled the dust already present in the used bag of the household vacuum cleaner, a simpler sampling method. We measured 50 pesticides, including those registered for home, garden, and agricultural use, in the dust samples. While the HVS3 was specially designed to provide the capability to measure pesticide loadings, this cannot be done when samples are collected from used vacuum cleaner bags. We compared pesticide detections and concentrations measured in used bag samples from 40 homes with pesticide detections and loadings from HVS3 samples in the same homes.

Results: Based on HVS3 dust samples, 25 pesticides were detected in at least five percent of homes. The percent agreement for detections in dust from used bags and from the HVS3 was high (range 75-100%). Spearman's correlations between pesticide concentrations in used bags and pesticide loadings based on HVS3 dust ranged from 0.15 for allethrin to 1.0 for MCPA, dicamba, and propargite. Correlations were greater than 0.6 for 16 (64%) of the 25 pesticides.

Conclusions: Pesticide concentrations as determined from used vacuum bag samples may be a good surrogate for pesticide loadings for many, but not all, pesticides.

MAA2-PD-12 ASSESSMENT OF CHILDREN'S EXPOSURES TO XYLENES

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INTRODUCTION

Xylenes have been included in EPA's Voluntary Children's Chemical Evaluation Program (VCCEP) because they have been detected in the indoor air and in human blood and milk. The objective of this study was to quantify children's exposure to xylenes and use that information along with various toxicity data to characterize potential health risks to children.

METHODS

A child-centered approach was used to define exposure scenarios for children's interaction with xylenes exposure sources including environmental (ambient) sources and use of consumer products. Both typical and high-end estimates of exposure were made. The environmental background/ambient sources of exposure include indoor air, outdoor air, diet, and water. Data on xylenes concentrations in these media were obtained from the published literature. In addition to these ubiquitous sources, xylenes exposures in microenvironments from specific activities such as transportation via gasoline powered vehicles, use of consumer products containing xylenes, or living in a home where tobacco smoking occurs were also assessed. Where published data were not available, exposures were modeled using publicly available models. Chronic xylenes exposures and short-term episodic exposures were quantified and the contribution of various sources to overall xylenes exposures were assessed.

RESULTS

The exposure assessment indicated that the inhalation pathway is the primary route of chronic exposure with systemic doses at least one order of magnitude higher than those received by oral ingestion or dermal pathways, except for infant ingestion of human milk from an occupationally exposed mother. Of the inhalation sources of exposures, indoor air contributes the most to overall inhalation doses.

The short term episodic exposures to xylenes from use spray paints and mixed xylenes as a surface degreaser were calculated. One-hr TWAs ranged from 9 - 27 ppm under the typical exposure scenarios and from 30 - 46 ppm under the high end usage scenarios.

DISCUSSION

The potential health risk associated with children's exposures was assessed using the hazard quotient/index (HI) approach. When aggregated across all routes of chronic exposure, HIs ranged from 0.01 to 0.2. Additionally, short term episodic exposures to xylenes from consumer product resulted in HIs ranging from 0.07 to 0.35. As such, the quantitative risk characterization indicates that reasonably anticipated children's exposures to xylenes from the ambient background environment and specific sources such are unlikely to pose significant health risks.

MAA2-PD-13 NEUROBEHAVIORAL ENDPOINTS IN CHILDREN AFFECTED BY ENVIRONMENTAL PCBs

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Introduction: The aim of the study was to contribute to the knowledge of neurobehavioral changes in children (n = 435), 8-9 years old.

Methods: Neurobehavioral examinations: sensorimotor integration, eye-hand coordination, attention, memory and cognitive processes. General health/social questionnaire and behavior scale were filled in by parents and the behaviour at school was evaluated by teacher. Statistical analysis involved three types of data evaluation: The PCBs serum concentrations and heavy metals (Pb, Mn, Hg, in whole blood) were determined, as well.

(1) The PCBs level was positively skewed and normalized by a natural logarithmic transformation (Ln) and calculated in quartiles for descriptive purposes.

(2) Correlation coefficients were calculated between dependent neurobehavioral variables and both the exposure level of PCBs and confounding variables ($p < 0.05$).

(3) In order to test for the validity of these correlations multiple linear regression analyses were calculated to adjust for confounding.

Results: The PCB-concentrations in serum ranged from 1692.8 to 257.5 ng/g lipids; higher levels were found close to the PCBs source, a former PCB-production plant. Significantly lower sensorimotor performances were found in preliminary evaluations in children with higher PCB-levels (fourth quartile of PCB), but were no longer apparent after adjustment for school and residential areas. A higher age of children and higher maternal intelligence were associated with better performances in cognitive and some sensorimotor tests. Previous findings of an influence of pre-perinatal PCBs on neurobehavioral performances were confirmed only if study area and schools were not included in the full regression model.

The outcome of neuropsychological tests and scales of behavior were included into this analysis as dependent variables, and a selected set of covariates, including PCBs concentrations, were used as independent predictors.

Since the two areas and the schools within areas differed for both exposure and several of the outcome variables exposure-outcome associations were additionally adjusted for "schools" and "area plus schools" in the multifactor regression analysis.

The final regression models included the set of variables (Σ PCBs, neurobehavioral and social).

Discussion and conclusions: The results suggest that postnatal or concurrent exposure to PCBs does not exhibit inverse association with neurobehavior if study area is taken into consideration in the full regression model. This outcome must be compared to well established findings of neurobehavioral adversity of environmental PCB-exposure in relation to pre-natal exposure and emphasizes the higher vulnerability of the developing relative to the mature brain.