

IMPACT OF DUST FROM MULTIPLE MICROENVIRONMENTS AND DIET ON PENTA-BDE BODY BURDEN

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Background and Aims: Polybrominated diphenyl ethers (PBDEs) have been widely used as flame retardants in consumer products and are ubiquitous in residential indoor air and dust. Biological measurements of PentaBDEs have been shown to be associated with concentrations in house dust and dietary intake of animal fat. However, little is known about exposure to dust in other microenvironments. Our objectives were to determine relative contributions of diet and dust exposure from multiple microenvironments to PentaBDE body burden, and to explore the role of handwipes as a measure of personal exposure to PentaBDEs.

Methods: We collected serum, dust (office, main living area, bedroom, vehicle) and handwipe samples from 31 participants. A food frequency questionnaire was administered to collect dietary information.

Results: Geometric mean concentrations of PentaBDE in dust from offices, main living areas, bedrooms, and vehicles were 2,167 ng/g, 1,691 ng/g, 1,378 ng/g, and 2,607 ng/g respectively. The geometric mean of PentaBDEs in handwipes and serum were 70 ng and 27.7 ng/g lipid respectively. PentaBDEs in handwipes collected in the office environment were correlated with dust collected from offices ($r=0.35$, $p=0.06$) and bedrooms ($r=0.39$, $p=0.04$), but not with dust from main living areas ($r=-0.05$, $p=0.77$) or vehicles ($r=0.17$, $p=0.47$). PentaBDEs in serum were correlated with dust from main living areas ($r=0.42$, $p=0.02$) and bedrooms ($r=0.49$, $p=0.008$), but not with dust from offices ($r=0.22$, $p=0.25$) or vehicles ($r=0.20$, $p=0.41$). The final regression model included variables for main living area dust and handwipes, and predicted 55 percent of the variation in serum PentaBDE concentrations ($p=0.0004$). Diet variables were not significant predictors of PentaBDEs in serum.

Conclusions: Our research suggests that exposure to dust in the home environment may be the most important factor in predicting PentaBDE body burden in humans, and potential exposure pathways may involve PBDE residues on hands.