

Evaluation (BASE) database has been used extensively for comparative background values for indoor air in commercial buildings for risk assessments and soil vapor intrusion assessments. EPA's BASE study sampled 100 buildings with a total of 298 sample sets. For this comparative study we collected indoor air samples from 137 sites and compared these data to the background values found in the BASE study. We collected a total of 794 indoor air sample sets that were analyzed for volatile organic compounds using EPA Method TO-14A and TO-15. The BASE study used a combination of two sample collection methods: 6 liter SUMMA canisters and multi-sorbent tubes. This study utilized only SUMMA canisters and all samples were sent to an approved laboratory for analysis. The BASE method reporting limits ranged from 0.2 to 7.0  $\mu\text{g}/\text{m}^3$ . Our data set was then compared to the minimum, maximum, means and the 25th, 50th, 75th, 90th, 95th and 99th percentile values in the BASE data set. Our results show that although similar to the background dataset there were enough differences to conclude that the "background" dataset is limited and should be expanded to include additional data. This additional data is readily available through State programs that have been collecting indoor air samples through a variety of programs including soil vapor intrusion assessments. This expanded dataset would be more reflective of actual background; allowing further evaluation of the data sets for more accurate risk assessment of the human population that it is being applied to.

**PS 2234f Videographic Methodology for Quantification of Dermal Contact with Water During Recreational Beach Use**

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When ocean water contaminants threaten the shoreline, risk to public health from contaminant exposure during recreational beach use must be evaluated and managed. This risk depends in large part upon the extent of contact with water by beach users, including both skin surface area exposed and duration of contact. Currently, there are almost no data of this type available. The objective of this project is to determine the extent of water contact by the public during recreational beach use and how contact is influenced by weather and water conditions. Permanently mounted, high resolution video cameras are used to capture subject behavior on a public beach in Florida following an IRB approved protocol. Because the study involves passive observation of individuals in public, consent of subjects is not required. Video files are evaluated by an analyst post-hoc (i.e., not in real time). Potential subjects are restricted to those who spend their entire time on the beach within the field of view of the cameras so that the full extent of water contact during the day can be measured. Subjects are classified by gender and approximate age (adult, child, toddler) based upon appearance and are assigned a subject number. From the group of potential subjects identified for each study day, a subset is randomly selected for quantitative analysis. For each subject, the approximate extent and time of immersion are determined in time steps from the video files. The skin surface area exposed is assumed based upon age/gender classification and median body weight and surface area data from NHANES. An exposure time and average skin surface area in contact with water for the day is calculated for each subject. Ambient air and water temperatures are also recorded and will be used in a later phase of the study to develop a predictive model of water exposure on the beach as a function of weather conditions. Information derived from this study will be of value in risk assessment for estimating exposure to water borne contaminants on public beaches.

**PS 2234g Plasma Hydroxylated Polybrominated Diphenyl Ethers (HO-PBDEs) in Californian Women of High Risk for Birthing an Autistic Child**

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Exposure to the polybrominated diphenyl ethers flame retardants (PBDEs) causes concern for carcinogenicity, neurotoxicity, reproductive toxicity, and thyroid toxicity. Hydroxylated PBDE metabolites (HO-PBDEs) are of increasing toxicological interest because of their greater biological activity compared to parent compounds. Little is known about the extent and patterns of HO-PBDEs during pregnancy, especially in populations susceptible to heritable neurodevelopmental disorders. We measured plasma HO-PBDE levels using LC/MS-MS in Californian women enrolled in MARBLES (Markers of Autism Risk in Babies-Learning Early Signs), who are at high risk for birthing an autistic child. Twelve HO-PBDEs were measured in plasma from 79 women collected during each trimester and at delivery (194 samples total). HO-PBDEs were extracted by solid phase extraction and derivatized by dansyl chloride to enhance the detection sensitivity of LC/MS-MS. Compared to other studies, women enrolled in MARBLES had significantly higher mean concentrations of 4'-HO-BDE17 (1.02 ng/g lipid versus not detected), 2'-HO-BDE28 (0.2 ng/g lipid versus not detected), 3-HO-BDE47 (1.59 versus 0.1 ng/g lipid) and 6-HO-BDE47 (0.92 versus 0.3 ng/g lipid). Plasma HO-PBDEs increased with

each calendar year between 2006 and 2009. Specifically, samples collected in 2006 and 2007 had significantly lower levels ( $p < 0.05$ ) of 2'-HO-monobromodiphenyl ether (0.006 and 0.034 ng/ml), 2'-HO-2,4-dibromodiphenyl ether (0.161 and 0.171 ng/ml) and 3'-HO-2,4-dibromodiphenyl ether (0.107 and 0.200 ng/ml) compared to 2009 (0.054, 0.243 and 0.315 ng/ml, respectively). Due to the increase of total plasma lipids during gestation, HO-PBDEs expressed on ng/g lipid basis decreased with gestational stage. The determination of plasma HO-PBDE levels in MARBLES mothers suggests a substantial exposure to PBDEs. Further studies are needed to correlate maternal PBDE and HO-PBDEs exposures with neurodevelopmental toxicity.

**PS 2234h Exposure Monitoring for Natural and Anthropogenic Polybrominated Diphenyl Ethers (PBDE) and Derivatives in Puget Sound, Washington, Area Volunteers**

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Synthetic polybrominated diphenyl ethers (PBDEs) have been widely used as flame retardants in many consumer products including electronic devices. The most important routes of human exposure appear to be from contaminated food and contact with dust found in households and workplaces. Structurally related derivatives of PBDEs are the hydroxylated (OH-PBDEs) and methoxylated forms (MeO-PBDEs). Experimental evidence suggests the OH-PBDEs pose greater health risks than other forms of PBDEs. Certain OH-PBDEs and MeO-PBDEs are also marine natural products and it is unclear although likely, that marine fish and shellfish, which bioaccumulate these compounds serve as a vector for human exposures. In this study, we are measuring approximately 120 different PBDE, OH-PBDEs and MeO-PBDEs in household/workplace dust and blood plasma samples provided by human volunteers living in the Puget Sound region of Washington State and working in either the commercial fishing or recycling industries. The commercial fishing occupation is largely an outdoor activity that promotes above average seafood consumption while electronic recycling may expose workers to dust with higher than average levels of PBDEs. Thus, comparison of PBDE levels in samples associated with these occupations may provide insight on the relative importance of dust vs. food as a source of PBDEs. Initial results suggest the pattern of PBDE distribution in volunteers that consume low amounts of seafood are more comparable relative to those from volunteers consuming higher than average amounts of seafood. For example, no MeO-PBDEs were detected in volunteers consuming low amounts of seafood. Also, comparison of results from volunteers of white-European, African-American and Hispanic ethnicity suggested ethnicity was not an important variable in determining PBDE congener content of plasma relative to occupation and other lifestyle attributes. Supported by [NIOSH Grant 1R21OH010259-01A1](#).

**PS 2234i High-Throughput Modeling of Indoor Exposures to Chemicals**

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Risk due to chemical exposure is a function of chemical hazard and exposure. Proximate sources of exposure due to the presence of a chemical in consumer products are identified as key drivers of exposure and are not well quantified. The ExpoCast project is developing a model that forecasts indoor exposure to chemical additives in textiles. Flame retardant chemicals are found in flooring, upholstery, and articles of clothing. Depending on their physicochemical properties, they may bio-accumulate in the indoor environment at higher magnitudes than in the outdoor environment, which is correlated with high indoor exposure rates. Halogenated flame retardants, such as polybrominated diphenyl ethers, are semi-volatile organic compounds (SVOCs) that are potentially harmful to humans. In this study, ExpoCast predicted emissions of 74 chemicals found in 32 flooring materials for which gas phase concentrations were measured by Wilke et al. (2004).<sup>1</sup> Flooring materials include a range of natural and synthetic floor coverings, installations, and adhesives. Emissions calculations principally depend on the gas-phase concentration of the SVOC in the material as well as the surface area of that source.<sup>2</sup> A linear regression yielded R<sup>2</sup> and p values of approximately 0.3 and 2.0E-12, respectively, with logP and vapor pressure being the most significant predictors for gas-phase concentration followed by their presence in adhesives and resilient flooring. These results potentially allow for the forecasting of gas-phase concentrations of chemicals for which their analytical data in flooring materials are lacking. Data generated from high throughput exposure methods are then combined with high-throughput screening data from the ToxCast project in order to scientifically assess risk in a time and cost effective manner. As a result, comprehensive risk assessment of indoor use chemicals may be achieved. This abstract does not necessarily reflect EPA policy.

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