PS 505 Exposure Factor Considerations for Risk Assessment of Modern Disposable Diapers

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Modern disposable diapers are complex products comprised of multiple layers of materials. Two important parameters considered for Exposure Based Risk Assessment are, i) frequency of diaper use & ii) Ingredient transfer from diaper to skin from a) direct skin contact materials, and b) indirect skin contact materials via migration of components from the diaper to skin via urine rewet. Frequency of use was determined from surveys in 10 countries and diary studies in the US. The mean number of diapers used per day varies by country; the US reported the highest diaper usage. The overall mean usage from the US diary studies was 4.7±1.6 diapers per day with a 95th percentile of 7.25 ± 1.25; usage was inversely proportional to the body weight. Direct transfer of ingredient from a diaper topsheet to skin (via Tegaderm tape) was evaluated using a lotion ingredient (stearyl alcohol) for varying wear times. Mean direct transfer to infant skin ranged from 4 to 6%. Indirect transfer is a measure of skin re-wetting as urine resurfaces to the topsheet of the diaper under pressure. Several factors were taken into account to develop a rewet model to simulate realistic diaper wear conditions for an average 18-24 month old. These include: i) pressure applied by an infant on the diaper under various use scenarios (sitting, lying-back/front, and plopping down), ii) urination patterns (void volume and interval between voids), iii) wear time, and iv) surface area. The mean rewet (liquid transferred from the diaper to a simulated skin surface - collagen) under diaper wearing conditions ranged from 0.35-0.75%. This rewet protocol can also be used to determine specific chemical transfers by analysis of the collagen sheet. This poster will provide details of the methods/parameters used to determine exposure factors & a general exposure model to assess exposure to diaper ingredients.

PS 506 Determination of Polybrominated Diphenyl Ethers and Polychlorinated Biphenyls in Bovine Milk

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Polybrominated diphenyl ethers (PBDEs) and polychlorinated biphenyls (PCBs) are lipophilic persistent organic pollutants (POP). Their bioaccumulation tendencies and toxicity potentials resulted in discontinuation beginning in 1976 for PCBs, and in 2003 for several PBDE mixtures, respectively. Few studies evaluated the persisting levels of PBDEs and PCBs in dairy products in the US. In this study we compared traditional liquid-liquid extraction (LLE), solid phase extraction (SPE) and QuEChERS methods for extraction, and evaluated gel permeation chromatography (GPC), silica and florisil column adsorption chromatography for sample clean-up. Fourteen PBDE and 19 PCB congeners were measured in eight brands of commercial milk products available in central and northern California by gas chromatography coupled with triple quadruple mass spectrometry (GC-MS/MS). The QuEChERS method followed by GPC clean-up was selected as the sample preparation protocol due to the highest recovery. The average recoveries of targeted PBDE and PCB congeners were 92.2% and 72.6% for skim milk, 89.6% and 64.4% for whole milk respectively. BDE-47 (18.94 ± 10.13 pg/ml), BDE-99 (12.79 ± 12.19 pg/ml), BDE-49 (6.06 ± 3.55 pg/ml) and PCB-101 (41.23 ± 53.80 pg/ml), PCB-11 (36.41 ± 51.03 pg/ml), and PCB-118 (35.63 ± 40.51 pg/ml) were the most dominant three PBDE and PCB congeners identified in the milk samples. There were no statistically significant differences ($p < 0.05$) in concentrations between skim and whole milk. This method is an accurate monitoring method for PBDEs and PCBs in dairy products. Monitoring of trace levels of PBDEs and PCBS is imperative because of their widespread occurrence in the environment and food supply. It is generally accepted that the vast majority of human exposure to POP is through the diet. This method can be used for efficient monitoring to evaluate time trends of POP persistence in dairy products and can be expanded to other food matrices. This study was supported by 1R01ES020392 NIH/NIEHS and 2P01ES011269/ RD-83543201 NIEHS/EPA.

PS 507 Bisphenol A Metabolites Levels in Pooled Urine Specimens from Pregnant Women in Rio de Janeiro, Brazil

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The plastic monomer and plasticizer Bisphenol A (BPA) is an endocrine active compound used in the manufacture of polycarbonate plastics and epoxy resin. BPA has applications in everyday consumer products such as baby bottles, toys, dental sealants, eyeglass lenses, consumer electronics, digital media, medical equipment, food and beverage can linings and glass jar tops. Approximately 4 million tons of BPA are produced annually. Concerns about reproductive and developmental health risks of exposure to BPA among the general population are increasing. Even if regulatory agencies are concerned with BPA's potential to injury pregnant women, BPA's toxicity in human remains very discussed. BPA metabolites were measured in 276 pooled urine samples collected during the first and second half of pregnancy. Both free (unconjugated) and total (free plus conjugated) BPA concentrations were analysed by online solid-phase extraction coupled to high-performance liquid chromatography–isotope dilution tandem mass spectrometry. Descriptive statistics and nonparametric tests were conducted. Geometric mean (GM) urinary BPA concentration was 4.86 ng/mL [95% confidence interval (CI), 3.33–5.02 ng/mL], and mean excretion was 7.92 μg/day (5th population percentile, 4.65 μg/day; 95th percentile, 18.66 μg/day). GM creatinine-standardized concentrations were 2.39 μg/g (16 weeks), 2.87 μg/g (26 weeks), and 3.12 μg/g (birth). Creatinine-standardized BPA concentrations exhibited low reproducibility (ICC = 0.15). Consuming canned vegetables at least once a day was associated with higher BPA concentrations (GM = 2.92 μg/g) compared with those consuming no canned vegetables (GM = 2.95 μg/g). BPA concentrations did not vary by consumption of fresh fruits and vegetables, canned fruit, or store-bought fresh and frozen fish. These results suggest accumulation of BPA in early fetuses and significant exposure during the prenatal period, which must be considered in evaluating the potential for human exposure to endocrine-disrupting chemicals.

PS 508 24-Hour Human Urine and Serum Profiles of Bisphenol: Evidence against Significant Sublingual Absorption of BPA following Oral Exposure in Soup

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Human exposure to bisphenol A (BPA), a weakly estrogenic monomer used in the manufacture of some plastics and epoxy can liners, is virtually ubiquitous. Extensive first-pass metabolism of orally ingested BPA by gastro-intestinal tract and hepatic tissues restricts human blood concentrations bioactive BPA to less than ~0.5% of total BPA ~ picomolar concentrations, even at the upper bounds of human exposure. Absorption of ingested BPA through non-metabolizing tissues of the oral cavity, which would bypass first-pass metabolism, could lead to higher BPA blood concentrations, like those reported some human studies, but are likely due to sample contamination. We hypothesized that if absorption through non-metabolizing oral cavity tissues was significant, higher bioavailability, higher serum BPA concentrations, and faster kinetics would result from exposure in soup, compared to prior studies in solid food or capsules. Serum and urine concentrations of BPA, and metabolites, were measured in 10 adult volunteers following ingestion of 30 μg/kg BW d6-BPA in soup. Absorption of BPA was rapid and complete, with an absorption half-life of 0.45 h, and complete urinary elimination by 24 hours post-ingestion. The maximum BPA concentration in serum, 0.43 nM, was <0.3% of total BPA, and occurred 1.6 h after administration. All pharmacokinetic parameters were consistent with those reported in previous oral pharmacokinetic studies in humans and animals. Pharmacokinetic parameters and pharmacokinetic model simulations of the data were inconsistent with absorption through a nonmetabolizing tissue (below 1%). In conclusion, we found clear evidence against, and no evidence for, meaningful absorption through the oral cavity or other non-metabolizing tissues following exposure to BPA in a liquid food.

PS 509 Serum Pesticide and PCB Levels Are Associated with Peripheral Blood Leukocyte Populations in Great Lakes Anglers

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Epidemiological evidence suggests that dietary halogenated aromatic hydrocarbon (HAH) exposure alters peripheral blood NK and T cell subpopulations. This study examined leukocyte populations in the peripheral blood of The New York State Angler Cohort (NYSAC) members who were exposed to HAHs through consumption of contaminated fish from the Lake Ontario basin. The cohort was established to assess the association between past and current consumption of contaminated sport fish and wild life and short-term and long-term health effects.

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