3403 E-Cigarette and Cannabis: Assessment of Passive Exposure

A. Berthet[1], M. De Cesare[2], V. Varlet[3], B. Favrat[4], C. Giroud[3], M. Augsburger[3], N. Concha-Lozano[1] and A. Thomas[3]. *[1]Institute for Work and Health, Epalinges, Switzerland; [2]Unita di Medicina e Psicologia del Traffic, Lugano, Switzerland; [3]Forensic Toxicology and Chemistry Unit, University Centre of Legal Medicine, Lausanne, Switzerland and [4]Psychology and Traffic Medicine Unit, University Centre of Legal Med, Lausanne, Switzerland.*

Recreational use of e-cigarette (e-cig) for consuming cannabis is increasing. One recent method is "cannabis vaping". It consists of inhaling concentrated cannabis in butane hash oil (BHO) diluted in e-liquid or propylene glycol (PG). An e-cig with clearomizer temperature (≈ 150°C) is sufficient to decarboxylate the tetrahydrocannabinol (THC) precursor; tetrahydrocannabinolic acid (THC-A). Passive exposure to cannabis vapors from e-cig might thus be possible. Biomonitoring can be used to assess toxicological risk and medical-legal interpretation bias. Passive THC exposure was assessed in cannabis abstinent and non-smoker volunteers (n=9) using an unventilated exposure chamber (15.6-m3). Passive smoke was generated with a three-channel linear piston-like smoking machine, and three e-cigs were activated consecutively with a 20-second delay between two puffs (puff length of 3 seconds). E-cigs were filled with nicotine-free e-liquids (DEA Calliope, Dea Flavour S.R.L) for the placebo exposure, and with 10% BHO in PG for the verum condition. Volunteers were exposed for 1 h. Blood, hair, saliva, sebum, and urine samples were collected before and immediately at the end of exposure. Urine was sampled 6h and 24h after exposure, blood 24h post-exposure, and hair after 1 month. Cannabinoids, THC and its two main metabolites: 11-OH-THC and THC-COOH were quantified in the matrices for both exposures. Our results showed, no or very low cannabinoids, THC, THC-COOH and 11-OH-THC concentrations in all studied matrices. Passive exposures to cannabis in 10% BHO dilution in e-cig may be present; however, concentrations are negligible compared to joint use.

3404 Polybrominated Diphenyl Ethers (PBDE) and Their Hydroxlyated and Methoxylated Derivatives in Blood from E-waste Recyclers, Commercial Fisherman and Office Workers in the Puget Sound, Washington Region

I. Schultz, S. Cade and L.-J. Kuo. *Pacific NW National Lab, Sequim, WA.*

Synthetic polybrominated diphenyl ethers (PBDEs) have been widely used as flame retardants in many consumer products including electronic devices. Important routes of human exposure are 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). Humans can metabolize some PBDEs into the OH-PBDE derivative, which is a concern due to greater health risks associated with OH-PBDEs. However, 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 compared approximately 30 different PBDE, OH-PBDEs and MeO-PBDEs in household / workplace dust and blood plasma samples provided by 114 volunteers living in the Puget Sound region of Washington State and working in the commercial fishing, electronic recycling (E-waste) or non-specific office occupations. Prior to blood sampling, a two-week food consumption diary is obtained from each volunteer. Results indicate the sum PBDE levels varied between < 30 and up to 3000 ng/ml ww. The OH-PBDEs were detected in all volunteers varying between < 5 - 800 ng/ml ww. The MeO-PBDEs were detected in most, but not all volunteers varying between 0 - 1000 ng/ml ww. For the large majority of volunteers, the sum PBDE levels exceeded the combined OH-PBDE and MeO-PBDEs. Exceptions to this observation were individuals that consumed the highest amounts of seafood (more than 5 and up to 18 servings / week). Electronic waste recyclers generally consumed low amounts of seafood and had PBDE, OH-PBDE and MeO-PBDE blood levels that were intermediate between seafood consumers and non-E-waste office workers. Dust samples from E-waste sites were particularly enriched with PBDE-209 and PBDE-153 relative to non-E-waste businesses and homes. Initial plasma analysis for PBDE-209 suggest levels are near background and not different among occupations. Supported by NIOSH Grant 1R21OH010259-01A1.

3405 Monte Carlo Analysis of Children's Risks from Chemicals in House Dust: Focus on Phthalates and Flame Retardants

G. L. Ginsberg[1], B. Toal[1] and G. Belleggia[2]. *[1]Connecticut Dept of Public Health, Hartford, CT and [2]University of Connecticut Health Center, Farmington, CT.*

Many chemicals have been detected in house dust reflecting their use in consumer products and the built environment. Young children can receive disproportionate exposure to chemicals in house dust due to their greater time spent on the floor, greater hand to mouth activity and small body size. An emerging aspect of children's health protection is the assessment of exposures and risks stemming from their contact with house dust. The current analysis has developed a house dust database for recent USA studies containing data for phthalates, flame retardants, PCBs, pesticides, and perfluorinated compounds. This exposure information is being combined with toxicology data to prioritize those house dust chemicals which pose the greatest risk and present the greatest uncertainties for children's health. The current presentation provides the analysis for 5 phthalates and 9 halogenated flame retardants. RfDs and cancer potency values were identified with updated searches focusing on toxicology and epidemiology studies that could be the basis for alternative RfDs. Rather than rely upon a single determination, a Monte Carlo approach to non-cancer assessment was used. Updated animal-based and epidemiology-based RfDs were used along with pre-existing RfDs to explore the uncertainty in the toxicology value. A Monte Carlo approach was also used to capture the variability in the house dust data while other exposure parameters (child's body weight and dust ingestion rate) were kept constant. The risk distribution that resulted was used to determine the percentile of the distribution which exceeded a hazard quotient of unity. This was used to rank house dust chemicals. A separate ranking was conducted for carcinogenic chemicals in house dust based upon the percentile of the risk distribution greater than 1 per million. Diethylhexylphthalate (DEHP) received the highest non-cancer rank with 34% of its HQ distribution exceeding unity and a maximum HQ of 38. This was based upon incorporation of the US EPA RfD for DEHP along with two alternative RfDs that are both 7 fold below US EPA's RfD. This assessment of children's risk distributions is being used to prioritize house dust components for further sampling, source identification, and risk characterization. Disclaimer: The views expressed in this abstract are those of the authors and do not represent the policy of the State of Connecticut.

3406 Estimation of Human Percutaneous Uptake for Two Novel Brominated Flame Retardants, 2-Ethylhexyl Tetrabromobenzoate (TBB) and Bis(2-Ethylhexyl) Tetrabromophthalate (TBPH) Using the Parallelogram Method

G. A. Knudsen[2], M. F. Hughes[1], J. M. Sanders[2] and L. S. Birnbaum[2]. *[1]Integrated Systems Toxicology Division, NHEERL, ORD, US EPA, Research Triangle Park, NC and [2]Laboratory of Toxicology & Toxicokinetics, National Cancer Institute, Research Triangle Park, NC.*

2-ethylhexyltetrabromobenzoate (TBB) and bis(2-ethylhexyl)tetrabromophthalate (TBPH) are novel brominated flame retardants (FRs). TBPH is used alone as a plasticizer or in mixtures alongside TBB in polyurethane foam FRs; both are contaminants in the indoor and outdoor environment. In the present study, a parallelogram approach was used predict internal doses for dermally exposed humans. Human or rat skin received 100 nmol of [14C]-TBB or [14C]-TBPH/cm2 in toluene. Treated skin was washed and tape-stripped prior to quantifying [14C]-radioactivity in dosed skin and media (*in vitro*) or excreta, tissues, and skin (*in vivo*). Human skin retained 12% of TBB while 0.2% reached the media. Rat skin was more absorptive (36%) and permeable (2%) *in vitro*, while *in vivo* dosed skin retained 10% and 13% reached systemic circulation by 24 h. TBPH was poorly absorbed, with <0.01% of *in vitro* doses recovered in perfusate. *In vivo*, dosed skin contained 8% of applied TBPH and 1.2% was in excreta or tissues. TBB was completely metabolized to tetrabromobenzoic acid by both human and rat skin; [14C]-radioactivity in TBPH-study perfusates was below the limit of detection. It is clear that TBB can be absorbed and metabolized to tetrabromobenzoic acid by the skin and dermal contact with TBB may represent an important route of systemic exposure. TBPH is less likely to be absorbed dermally. Based on these data, ~7% of TBB and ~2% of TBPH may be dermally bioavailable to humans. This work was supported by the intramural program of NCI/NIH. (This abstract does not represent US EPA policy.)

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Preface

This issue is devoted to the abstracts of the presentations for the Continuing Education courses and scientific sessions of the 55th Annual Meeting of the Society of Toxicology, held at the New Orleans Ernest N. Morial Convention Center, March 13–17, 2016.

An alphabetical Author Index, cross referencing the corresponding abstract number(s), begins on page 603.

The issue also contains a Keyword Index (by subject or chemical) of all the presentations, beginning on page 629.

The abstracts are reproduced as accepted by the Scientific Program Committee of the Society of Toxicology and appear in numerical sequence. Author names which are underlined in the author block indicate the author is a member of the Society of Toxicology. For example, J. Smith.

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