Children's exposure to flame retardants and plasticizers in preschools and homes

– a chemical and bioanalytical approach

av

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Abstract

Chemicals with plasticizing and flame-retardant properties have widespread usage in materials and products designed and produced for everyday life, therefore present in various indoor environments. Their associations with endocrine-disrupting potentials and related health concerns, particularly for children, motivated exploring children's exposure through their everyday indoor environments, which is the main objective of this thesis. Therefore, a suit of chemicals including 50 halogenated flame retardants (HFRs) and organophosphate esters (OPEs) were measured in preschool and home indoor dust (Paper I) and in children's handwipes (Paper II), along with 14 urinary plasticizer metabolites (Paper III). In addition, the endocrine activity of home and preschool dust was assessed employing cell-based bioassays (Paper IV) and compared to the results in Paper I-III. HFRs and/or OPEs were detected in all handwipe samples with higher levels related to more electronic devices and plastic toys in the premises. For most compounds the levels differed statistically significantly between municipalities, and several correlated with indoor dust levels. Hand-to-mouth dust ingestion was the predominate exposure route. However, no established reference doses (RfD) were exceeded, except for one OPE in a worst-case scenario. Urinary metabolite levels of strictly regulated plasticizers were higher if attending an older preschool. However, the levels were higher after the weekend than after a preschool day, suggesting higher exposure to banned chemicals in environments other than preschools, with human biomonitoring guidance values (HBM-GV) exceeded in three samples. Endocrine activity was detected in both home and preschool dust, which further emphasizes exposure to EDCs through the indoor environment, promoting a focus on indoor spaces to reduce children's exposure.

Keywords: Halogenated flame retardants, organophosphate esters, phthalates, bioassay, handwipe, urine, indoor dust, indoor environment