Endocrine disrupting chemicals: Relationship between their content in products, emissions, indoor levels and exposure

Simona Rozárka Jílková

Masaryk University, Research Centre for Toxic Compounds in the Environment (RECETOX), Kamenice 753/5, 625 00 Brno, Czech Republic

Endocrine disrupting chemicals are a broad spectrum of compounds, which influence the hormonal system of organisms. Some, like flame retardants (FRs), polychlorinated biphenyls (PCBs), organochlorine pesticides (OCPs) and polycyclic aromatic hydrocarbons (PAHs) are consistently found in both indoor and outdoor environments. There are many possible matrices for measurement of these compounds (e.g. indoor dust, air – passive and active air samples or wipes from human hands), but all methods have limitations, like the heterogeneous distribution of indoor dust, or noisy and expensive active air sampler. The following three studies are focused on the possibilities and limitations of indoor matrices and sampling methods.

The first study focused on indoor dust, which is often used to evaluate levels of organic compounds indoors. Yet there are uncertainties about the type of information that can be obtained from indoor dust. The main objectives of the study were (1) to identify the differences in FR profiles and levels by comparing two common sampling methods (wet wipes and vacuuming), (2) to identify the range of concentrations within individual rooms and thus identify what effect the choice of sampling location may have on reported concentrations, and (3) to determine the extent to which concentrations are influenced by room type and proximity to room elements (electronics, furnishings, different usage of the space, etc.), and identify whether greater heterogeneity in room furnishings and use leads to greater heterogeneity in indoor dust.

The second study was focused on a possible matrix for indoor air screening – filters from building-wide heating, ventilation and air conditioning (HVAC) units. The advantages of this matrix are (1) sampling homogeneity, as the whole building is sampled through one filter unit and (2) samples are easy and cheap to collect. The disadvantages are (1) broad aggregation of data, e.g., individual rooms and time points cannot be isolated, and (2) HVAC filters are not designed for analytical chemistry and thus can present a challenge during laboratory processing and instrumental analysis. The objectives of this study were (1) to evaluate whether this method is feasible for screening of organic compounds levels in indoor and near-building outdoor environments and (2) to identify differences between contaminant levels in indoor and outdoor air.

The third study was focused on human exposure to halogenated flame retardants (HFRs) in indoor environments. HFRs were measured in floor dust, air and surface wipes of electronic devices, and wipes of participants hands in 51 Canadian homes. Ancillary data on house characteristics, participant lifestyle and electronic products were also collected. The objectives were to: (1) evaluate the relationship between HFR levels in the various indoor matrices; (2) identify differences in distributions and patterns of legacy (e.g., PBDEs) vs. their replacement NFRs; (3) evaluate associations between measured indoor levels and information on housing characteristics and consumer product use; and (4) to assess exposure routes of HFRs to humans.