POLYCHLORINATED BIPHENYLS (PCBs) AND POLYBROMINATED DIPHENYL ETHERS (PBDEs) IN INDOOR ENVIRONMENTS: LEVELS AND IMPLICATIONS

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Although human exposure to POPs is widely considered to occur almost exclusively *via* the dietary pathway; the application of PCBs in building materials and PBDEs in products employed indoors (*i.e.* furniture, electronic and electrical equipment) along with the high proportion of time spent in such environments (*i.e.* typically more than 90%), highlight the potential role of contaminated indoor environments as major sources for human exposure *via* dust digestion or inhalation. To investigate levels and behaviour of PCBs and PBDEs in indoor air, PUF disk passive air samplers were deployed in 59 different indoor microenvironments including 24 homes, 24 offices and 11 private cars for sampling periods of approximately one month. Furthermore, 3 offices and 4 homes were monitored over a period of 12 months in which detailed sampling was conducted on a monthly basis in two separate rooms (*i.e.* living room and bedroom) of the same homes and the same office buildings.

ΣPCB concentrations varied from 1.2 to 99.3 (mean = 17.2) ng m^{-3}, 0.60 to 9.8 (mean = 2.6) ng m^{-3}, and 0.41 to 2.5 (mean = 1.3) ng m^{-3}) in offices, homes and cars, respectively. ΣPBDE concentrations ranged between 10 and 1,416 (mean = 166) pg m^{-3}, 4 and 168 (mean = 44) pg m^{-3}, and 11 and 8,203 (mean = 1568) pg m^{-3} in offices, homes, and cars respectively. Offices and cars were identified to be the most contaminated microenvironments within the studied locations for PCBs and PBDEs, respectively.

Comparison of target pollutants in two microenvironments of the same home/office buildings revealed statistically significant differences in ∑PCB ($p= 0.0139$) and ∑PBDE concentrations ($P=0.0002$) in the two different rooms of one home. Similar differences were observed for ∑PBDE concentrations in one of the office buildings studied ($p=0.0047$). These intra-building variations may be due to the presence of different source types and numbers in each microenvironment.

One-way variance analysis showed statistically significant seasonal variability in analyte concentrations in some locations. These include one office (highest in summer) for PCBs and one home (highest in summer) and one office for PBDEs (where concentrations fell 3-4 fold after replacement of an older PC). For the other monitoring locations, differences in pollutant concentrations were not statistically significant but the ratio of the maximum to minimum concentration over the whole monitoring period varied from 1.5 to 2.1 for PCBs and from 1.6 to 7.8 for PBDEs.
Given an average adult respiration value of 20 m^3 d^{-1}, and assuming that people spend 67.9%, 23.8%, 2.9% and 5.4% of their time at home, in the workplace, on public transport and private cars, and outdoors, respectively, mean daily exposure from inhalation of 118.9 ng day^{-1} for ΣPCB and 2.3 ng day^{-1} for ΣPBDE may be estimated. However, the wide variability of concentrations in indoor environments along with the intra-building and seasonal variability in PCB and PBDE concentrations mean that inhalation exposure could be much higher during some periods for some people.