

Cumulative Exposures to Thyroid Hormone Disrupting Compounds (PCBs and PBDEs) in Residential House Dust

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Polybrominated diphenyl ethers (PBDEs) and polychlorinated biphenyls (PCBs) are structurally similar, persistent pollutants that disrupt thyroid hormones. Penta-BDE mixtures have been used to reduce flammability of furniture foam manufactured from the 1970s to 2004 with highest use in California due to flammability standard TB117. PCBs were used in the 1950s-1970s, primarily in industrial and electrical equipment, with some use in residential building materials. Thus, household PCB and PBDE levels are not expected to be correlated. Both chemicals have been measured in residential dust, but, few studies have considered cumulative exposures.

PBDE (-47, -99, -100) and PCB (-52, -104, -153) congeners were measured in the house dust of 270 homes at five study sites: Bolinas and Richmond, CA; Cape Cod and Roxbury, MA; and Gadsden County, FL, using similar sampling methods. For sites with detection frequencies above 30%, Kendall's tau rank correlations were used to assess correlations between PBDEs and PCBs. For each site, dust concentrations of each chemical class were ranked in quartiles and a chi square test was performed to test the independence of high PBDE and PCB homes.

PBDEs were detected more frequently and at higher concentrations than PCBs at all sites. Σ PBDE concentrations, highest in CA, ranked in the following order (95th percentile, $\mu\text{g/g}$): Richmond (120), Bolinas (72.5), Roxbury (17.6), Cape Cod (9.0), and Gadsden (6.5). Σ PCBs concentrations, highest in MA, ranked in a different order (95th percentile, $\mu\text{g/g}$): Cape Cod (4.0), Roxbury (2.7), Richmond (0.87), Gadsden (0.18), and Bolinas (0.12). PBDE and PCB concentrations were not correlated ($\tau = -0.06$ to -0.02), and high PBDE homes were independent of high PCB homes.

Health studies that use PBDE or PCB dust concentrations as exposure measures would reduce exposure misclassification by evaluating both chemical classes simultaneously since they are structurally similar and exposures are uncorrelated.