PBDEs AND PCBs IN BREAST ADIPOSE TISSUE OF CALIFORNIA WOMEN

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Introduction

Concentrations of PBDEs have been documented in California residents [1] [2] [3] and wildlife [1] [4] [5] at much higher levels than the rest of the world. Even though two formulations of PBDEs (the penta- and octa- BDEs) have recently been banned or withdrawn from the market, the sheer numbers and volume of consumer products containing PBDEs that are still in use, continue to be sources of exposure. In this study we examined levels of PBDEs in breast adipose tissues of 162 women undergoing surgery for suspected breast cancer in the late 1990s.

Materials and Methods

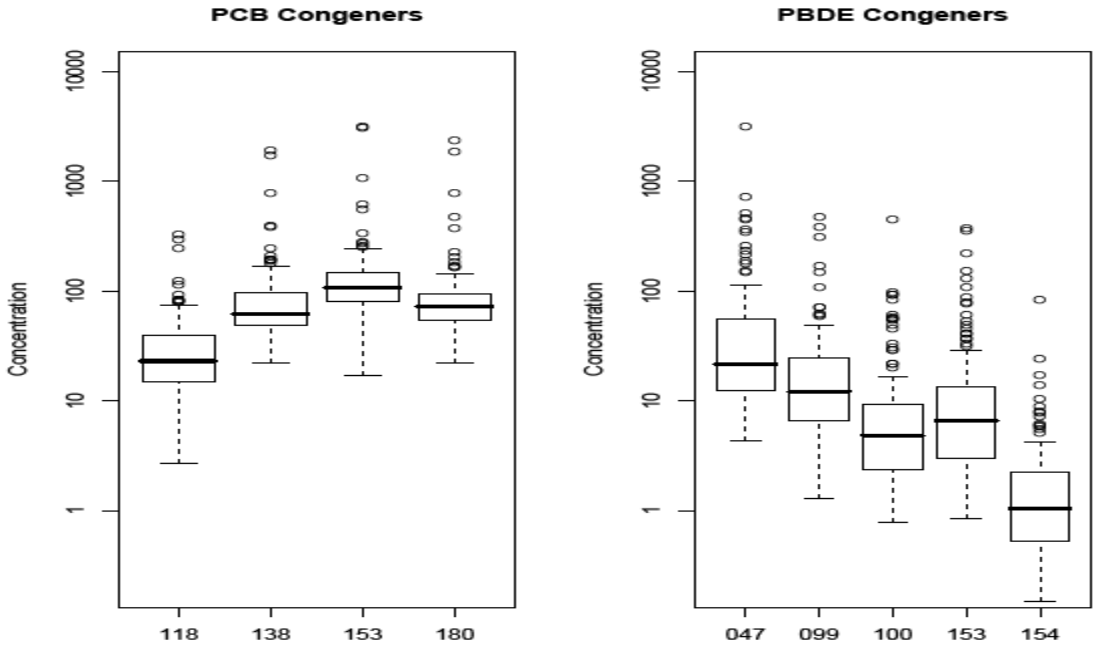
Study population:

In our earlier epidemiologic study, we studied POPs as risk factors for breast cancer [6] [7]. Patients had signed informed consent forms and were interviewed on medical and reproductive history, environmental exposures, dietary habits, and sociodemographics. As no statistically significant differences in PBDEs or PCBs were observed between cases and controls, all participants were combined for the current analysis.

Analytical methods

Specimens were kept frozen at -20 C. Samples were extracted in dichloromethane/hexane in batches of six with a reagent blank and standard reference materials (SRM 1945). Gel permeation and Florisil column chromatography were used to remove lipids. Four PCBs, PCBs -118, -138, -153, and -180; and five BDEs, BDE-47, -99, -100, -153,

Figure 1. Concentrations (ng/g fat) of PCB and PBDE congeners in breast adipose.



and -154, were measured on a Varian 3800 GC with a Varian 1200L MS. The column was a Varian VF-5ms 30 m x 0.25 mm id x 0.25 µm film. Helium at 1.0 mL/min was used as the carrier gas. The GC temperature program was: initial temperature 180°C (2 min hold); 180°C to 300°C at 10°C/min (12 min); final hold at 300°C (4 min hold) for 18 min total run time. The 1200L MS was operated in extended dynamic range mode using electron impact ionization and MS/MS detection. Ionization voltage was 70 eV; ionization current was 50 µA, collision cell (Q2) pressure was ~2.3 mTorr of argon. The limit of quantitation was 1 pg for PCBs, and 2.5 pg for PBDEs.

Results and Discussion

The profiles of PBDEs and PCBs followed the expected patterns (BDE-47>BDE-99> BDE-153>BDE-100>BDE-154 and PCB-153>PCB-180>PCB-138>PCB-118). Fig 1. shows that the distributions for PBDEs are more skewed than the PCB distributions. This PBDE skewness has been reported for other populations [8] [9] [10] and probably stems from the fact that high exposures to PBDEs originate mainly with contact with consumer products and dust in indoor microenvironments, rather than diet. Whereas PCBs tended to increase with age (Fig. 2) negative correlations were observed between each PBDE congener and age (Fig. 3), in agreement with other studies who found no

Figure 2 PCBs as a function of age.

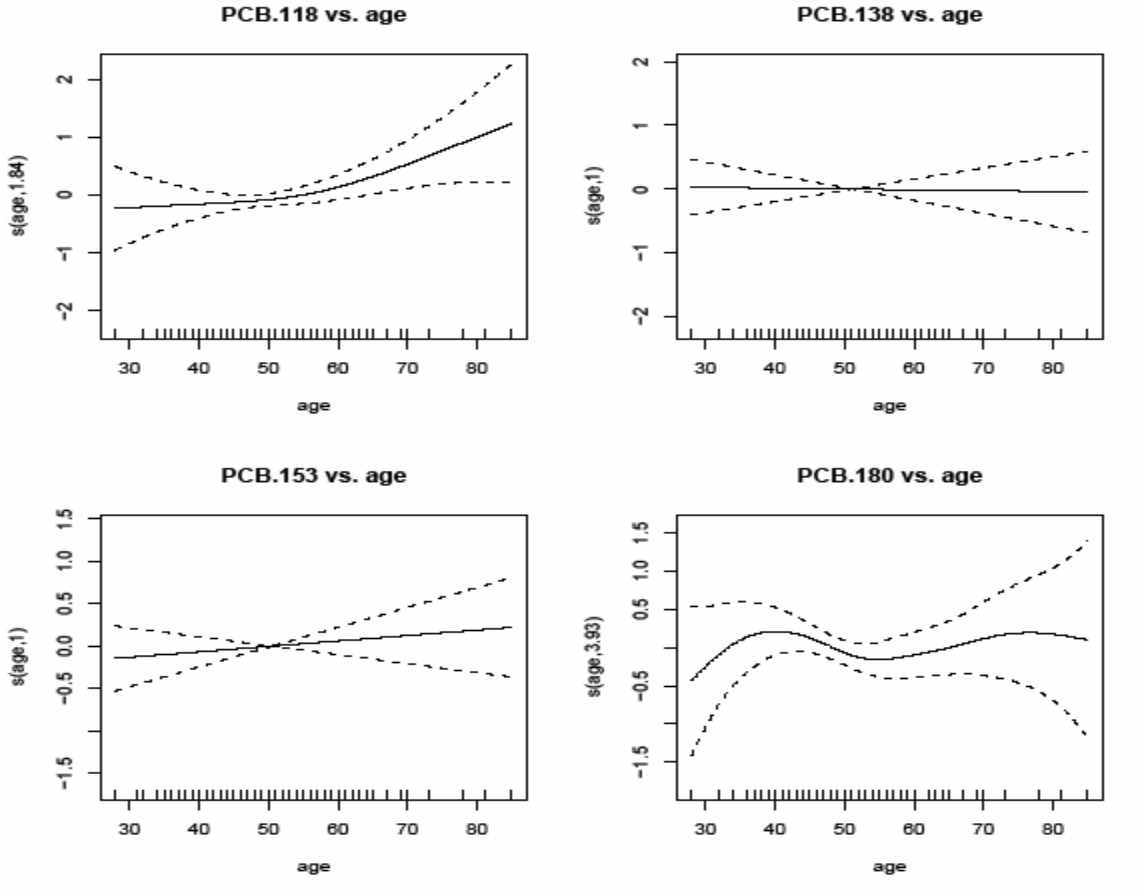
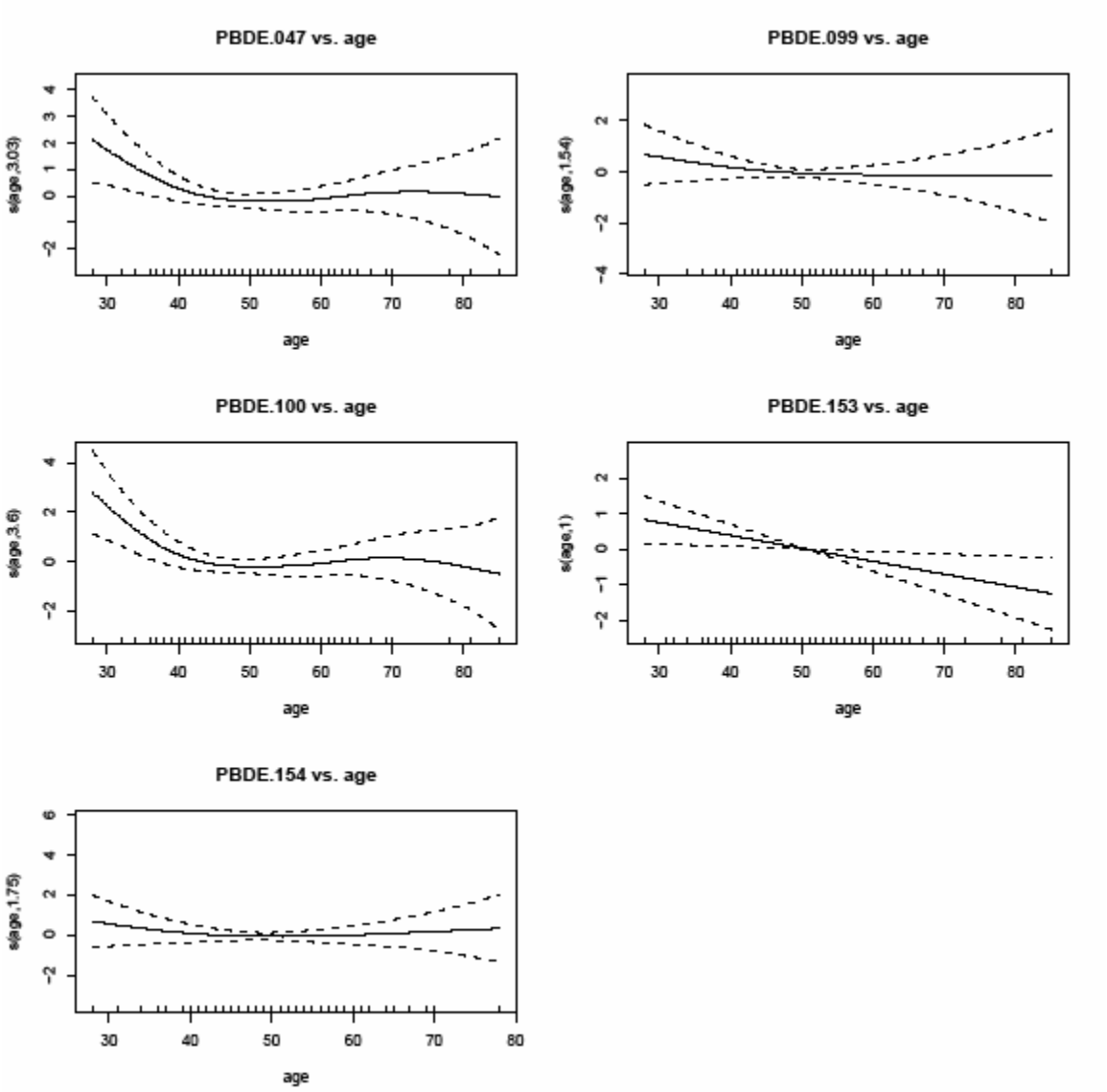


Figure 3 PBDEs as a function of age.



association with age, or higher levels in younger participants. Results of this study confirm that the levels of PBDEs in North America are higher than the rest of the world, consistent with higher use of PBDEs [11]. Our data are exceeded only by the concentrations of PBDEs in adipose tissue from a mixed population of 52 men and women from New York sampled in 2003-2004 [12].

As expected, individual PBDE congeners were highly correlated with each other (correlation coefficients ranging from 0.701 to 0.939 and $p<0.0001$) and PCB congeners were highly correlated with each other (correlation coefficients ranging from 0.502 to 0.917 and $p<0.0001$), but correlations across the two groups were low and not

always significant. This has been observed in other human populations as well, and supports the argument that exposures to PBDEs (in contrast to other POPs) come primarily from non-dietary sources, such as contact with consumer products in indoor microenvironments. Other than age, few characteristics appeared to consistently predict PCB or PBDE concentrations in our population.

Acknowledgement- Disclaimer
We thank all the women who participated in our study. The ideas and opinions expressed herein are those of the authors and do not necessarily reflect the official position of the California Department of Toxic Substances Control.

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