HANDWIPES AS PREDICTORS OF PBDE SERUM CONCENTRATIONS: FIRST RESULTS FROM THE FLaRE STUDY COMPARING PALMS AND BACKS OF HANDS WITH IMPLICATIONS FOR EXPOSURE PATHWAYS

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Introduction

The indoor environment is an important route of exposure to PBDEs and may provide a model for exposure to alternative flame retardants and some other semi-volatile organic compounds.[1,2,3] We previously showed associations between PentaBDEs in serum and handwipes, as well as associations between the latter and indoor dust.[4-6] Handwipe levels also depended on hand washing frequency.[4] We hypothesize that such associations are due to hand-to-mouth exposure to PentaBDEs in dust and surface films, but dermal exposure to dust/surface films or absorption directly from air are also possible. The association between handwipes and serum is also theoretically consistent with excretion of PBDEs by skin. Here we further examine these relationships by modifying our protocol to separately collect handwipes from the palms and backs of hands.

Materials and methods

The FLaRE (FLame Retardant Exposure) study is a longitudinal study of 50 adult office workers in the Boston area. Blood, urine, handwipes, dust, indoor air and questionnaire data (e.g., hand washing) were collected three times at 6 month intervals in several microenvironments (home, office, vehicle). We collected handwipes by separately wiping the palms and backs of hands (combining left and right) using sterile gauze pads immersed in isopropyl alcohol.[7] Serum and handwipes sampled in offices (reported here) were analyzed for PBDEs using GC/MS.[7,8]

Results and discussion

We report here on BDE47 from 25 participants for round 1, sampled in early 2010 and above LODs in all samples. The geometric mean (GM) concentration of BDE47 in serum was 10.7 ng/g lipid. The GM level on the palms of hands was 20.8 ng, about 50% higher than on the backs of hands (13.7 ng). The sum is similar to total handwipes (palms + backs of hands), 32.8 ng, that we reported earlier for a similar population sampled in 2009.[4] Levels on palms and backs of hands were moderately correlated, r=0.65. Serum concentrations were slightly more strongly correlated with levels on the backs of hands (r=0.51) than the palms of hands (r=0.41), but both were significant. Neither typical hand washing frequency nor time since last hand wash predicted serum concentrations when analyzed along with handwipe levels in multivariate models. Both hand washing variables predicted BDE47 on the back of hands ($p<0.01$) but not the palms of hands ($p>0.5$).

In sum, serum BDE 47 concentrations were predicted by wipes of both palms and backs of hands, but the association was slightly stronger for the latter. Hand washing behavior predicted levels on the backs of hands but not the palms. It is possible that wipes of palms may reflect more recent and more variable exposure. However, we cannot rule out secretion of lipids by skin carrying BDE47. Additional data may help us better distinguish between possible exposure pathways and the difference between wipes of palms and backs of hands.

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