Bioaccumulation of PCBs across Concentration Gradients in Sediments

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Sediment bioaccumulation tests with *Lumbriculus variegatus* quantify the relationships between the chemical residues in sediments and benthic invertebrates, and these relationships are expressed as biota-sediment accumulation factors (BSAF). At some field sites, BSAFs decrease slightly with increasing concentrations of the chemicals in the sediment, and this behavior has been attributed to the presence of black carbon in the sediment. In this study, 28-day sediment bioaccumulation tests were performed with PCB contaminated sediment samples from Fox, Hudson, and Grasse Rivers Superfund sites. Sediments tested had widely varying total PCB concentrations (0.5 to 150 ppm), total organic carbon contents (0.5 to 25%), black carbon contents (0.1 to 4.4%), and freely dissolved chemical concentrations (measured using polyoxymethylene (POM) coupons) in the sediment interstitial water (0.02 to 65 ng/L).

For PCB 118 (2,3',4,4',5-pentachlorobiphenyl), the slopes of geometric mean regressions of the log transformed concentration in the *L. variegatus* (µg/g lipid) against log transformed concentration in the sediment (µg/g organic carbon) were 0.87 (±0.16, n=10) and 1.10 (±0.14, n=10) for the Fox and Hudson Rivers, respectively, and neither slope was significantly different from 1.0 (α=5%). Slopes less than 1.0 imply that the BSAF decreases with increasing concentration in the sediment. Similarly, the slopes of geometric mean regressions of the log transformed concentration in the *L. variegatus* (µg/g lipid) against log transformed concentration in the sediment interstitial water were 0.99 (±0.07, n=10) and 0.78 (±0.06, n=10) for the Fox and Hudson Rivers, respectively, and only the slope of the Hudson River regression was significantly different from 1.0 (α=5%). Slopes less than 1.0 imply less accumulation in the *L. variegatus* with increasing concentration in the interstitial water. The BSAFs for PCB 118 ranged from 1.3 to 11.7 and from 0.8 to 2.7 for the Fox and Hudson Rivers, respectively. Assuming $K_{lipid} = K_{ow}$, prediction of residues in the *L. variegatus* from the measured concentrations in the interstitial water resulted in a median ratio of 0.11 predicted to measured residues for tri- through hepta-PCB congeners (n=801). Potential influences of black carbon on accumulation are discussed, along with the implications of this study for predicting chemical residues in the *L. variegatus*.

This abstract does not necessarily reflect U.S. EPA policy.