

Distribution of Polychlorinated Biphenyls and Polycyclic Aromatic Hydrocarbons in the Food Web of Western Lake Erie.

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Two important classes of contaminants in western Lake Erie are polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs). The exposure dynamics of PCBs have been well studied because high levels are often detected in top predators, and because coplanar PCB congeners are known to be highly toxic to aquatic organisms. PAHs have not been emphasized because they are metabolized by higher organisms and thus not detected by conventional monitoring programs. However, recent evidence has shown that PAH metabolites may be responsible for elevated tumor occurrences in benthic fish species though the chemical stress to other organisms is not well known. In 1998, sediment, plankton, and benthic invertebrates were collected from western Lake Erie and analyzed for 39 PCB and 17 PAH congeners. Concentrations of SPCBs in zebra mussels, amphipods, crayfish, and plankton were 7.93, 7.83, 7.31, and 0.035 ug/g lipid respectively. SPAHs were 6.2, 2.5, 0.71, and 0.0079 ug/g lipid respectively. If chemicals are in thermodynamic equilibrium, the biota-sediment fugacity ratios for each species should equal 1. The results indicate that equilibrium dynamics are not occurring. Fugacity ratios for PCBs follow a parabolic relationship with K_{ow} whereas fugacity ratios for PAHs are inversely related to K_{ow} . For benthic invertebrates, PCB fugacity ratios range from 0.15 to 4.58 and PAH fugacity ratios range from 0.0056 to 2.1. The results demonstrate that the exposure dynamics of PCBs and PAHs are different and that future research on the risk of chemicals in aquatic ecosystems should include both persistent and non-persistent chemicals.