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## **A passive sampler based on solid phase microextraction (SPME) for sediment-associated organic pollutants: Comparing freely-dissolved concentration with bioaccumulation**

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### **ABSTRACT**

The elevated occurrence of hydrophobic organic chemicals (HOCs) such as polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCBs) and legacy organochlorine pesticides (e.g. chlordane and DDT) in estuarine sediments continues to pose challenges for maintaining the health of aquatic ecosystems. Current efforts to develop and apply protective, science-based sediment quality regulations for impaired waterbodies are hampered by non-concordance between model predictions and measured bioaccumulation and toxicity. A passive sampler incorporating commercially available solid phase microextraction (SPME) fibers was employed in lab and field studies to measure the freely dissolved concentration of target HOCs ( $C_{\text{free}}$ ) and determine its suitability as a proxy for bioaccumulation. SPME deduced  $C_{\text{free}}$  for organochlorines was highly correlated with tissue concentrations ( $C_b$ ) of *Macoma* and *Nereis* spp. co-exposed in laboratory microcosms containing both spiked and naturally contaminated sediments. This positive association was also observed in situ for endemic bivalves, where SPME samplers were deployed for up to 1 month at an estuarine field site. The concordance between  $C_b$  and  $C_{\text{free}}$  for PAH was more variable, in part due to likely biotransformation by model invertebrates. These results indicate that SPME passive samplers can serve as a proxy for bioaccumulation of sediment-associated organochlorines in both lab and field studies, reducing the uncertainty associated with model predictions that do not adequately account for differential bioavailability.

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