Abstract

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Coastal marine sediments often become sinks for organic particle-associated pollutants, and benthic organisms may be exposed to high concentrations. From an ecotoxicological stand-point knowledge of fate of hydrophobic organic contaminants, HOCs, in marine sediments is valuable both to be able to protect the sediment community but also to make predictions about the importance of benthic macrofauna as vectors for HOCs to other trophic levels in the food web.

This thesis is focused on the fate of HOCs in marine sediments and the key questions have been: How fast can the pollutants be buried in the sediment? How much HOCs does the macrofauna bioaccumulate? How efficiently are they metabolised by the sediment-living macrofauna?

Three pollutants were studied: benzo(a)pyrene, (B(a)P), tetrabromo diphenyl ether (BDE-47) and polychlorinated biphenyls (PCBs). The B(a)P was found to be efficiently metabolised by the blue mussel (*Mytilus edulis*) to both water soluble metabolites and metabolites forming macromolecular adducts. The half-life of the pollutant was 15 to 17 days and seemed to be independent of food concentration.. BDE-47 was also found to be metabolised to water-soluble metabolites by a number of benthic macrofauna species. This was surprising since the metabolism of halogenated HOCs by invertebrates generally is low.

Bioaccumulation was measured in benthic macrofauna that had been exposed to BDE-47 in the laboratory, or to PCBs in the field . Large differences where found both between the two compounds and also between different species. When comparing congeners of similar hydrophobicity the polybrominated diphenyl ether had bioaccumulated significantly more than PCBs in several species. Since HOCs have affinity for lipids it is often presumed that partitioning of pollutants between sediment particles and the organism should be governed by an amount of lipids in the animals. We found that differences in lipid content explained some, but far from all interspecific differences in bioaccumulation of BDE-47 and PCB. Feeding strategy was found to be the most important factor and accumulation was higher for surface deposit feeders than for predators and subsurface deposit feeders.

In addition to fate studies a number of bioassays were run on whole sediments, pore water and sediment extracts from the Skagerrak and Kattegat and correlated to chemical analyses. The assays showed that these sediments were more toxic than the reference sediment from a less polluted site outside the Faroe Islands.

Key words: bioavailability, bioaccumulation, biomagnification, biotransformation, metabolism, bioturbation, benthic macrofauna, sediment, PBDE, B(a)P, PCB