Sediment Toxicity Testing
Issues and Methods

Aquatic Ecotoxicology
2005
Sink and source for role in the aquatic ecosystem

- Organic, inorganic materials, cycling processes (C,N,P and S)
- Allochthonous and autochthonous decomposition
- Pesticides, PAHs, chlorinated hydrocarbons sorbed to sediment and organic material
- Effects from association with these processes
Effects from association with these processes

- Absence of or tolerance conversion of benthic communities
- Processes of decomposition and metabolic byproducts of benthos changed as a result
- Ecosystem functions of energy flow, productivity and decomposition changed
- Other indirect effects associated with cycling (ie N fixation)
- Direct effects from bottom-feeding fish on benthic inverts w/ associated pollutants (PAHs, PCB, mercury and pesticides)
Bioavailability of sediment-associated contaminants is the fraction of the total contaminant in the interstitial water and on the sediment particles that is available for bioaccumulation.
Chemical residue measures do not afford sufficient estimates of biota exposure
Feeding by benthos typically limited to the fine grain material (material that sorbs most contaminants) = greater exposure than the bulk sediment estimate
Defining Bioavailability

- Comparison of the organism- and sediment-contaminant concentrations
- Determination of the uptake clearance of sediment-associated contaminants
- Factors affecting bioavailability
- Range of bioaccumulation factors
- Nonpolar organic compounds
Properties of sediments that enhance sorption or reduce bioavailability

- Organic carbon content
- Particle size distribution
- Clay type and content
- Cation exchange capacity
- pH
Sediment Quality Assessment Procedures

- Equilibrium Partitioning
- Tissue residues
- Interstitial water toxicity
- Benthic Community Structure
- Whole-sediment toxicity and sediment spiking
- Sediment Quality Triad
- Apparent effects threshold