Bioavailability of particle-associated silver, cadmium, and zinc to the estuarine amphipod, Leptocheirus plumulosus, through dietary ingestion

Schlekat, Christian E., Alan W. Decho, G. Thomas Chandler

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ABSTRACT: We conducted experiments to determine effects of particle type on assimilatory metal bioavailability to *Leptocheirus plumulosus*, an infaunal, estuarine amphipod that is commonly used in sediment toxicity tests. The following particles were used to represent natural food items encountered by this surface-deposit and suspension-feeding amphipod: bacterial exopolymeric sediment coatings, polymeric coatings made from *Spartina alterniflora* extract, amorphous iron oxide coatings, the diatom *Phaeodactylum tricornutum*, the chlorophyte *Dunaliella tertiolecta*, processed estuarine sediment, and fresh estuarine sediment. Bioavailability of the gamma-emitting radioisotopes ^{110m}Ag, ^{109}Cd, and ^{65}Zn was measured as the efficiency with which *L. plumulosus* assimilated metals from particles using pulse-chase methods. Ag and Cd assimilation efficiencies were highest from bacterial exopolymeric coatings. Zn assimilation efficiency exhibited considerable interexperimental variation; the highest Zn assimilation efficiencies were measured from phytoplankton and processed sediment. In general, Ag and Cd assimilation efficiencies from phytoplankton were low and not related to the proportion of metal associated with cell cytosol or cytoplasm, a phenomenon reported for other particle-ingesting invertebrates. Amphipod digestive processes explain differences in Ag and Cd assimilation efficiencies between exopolymeric coatings and phytoplankton. Results highlight the importance of labile polymeric organic carbon sediment coatings in dietary metals uptake by this benthic invertebrate, rather than recalcitrant organic carbon, mineralogical features such as iron oxides, or phytoplankton.