
Impact of silver nanoparticles on benthic prokaryotes in heavy metal-contaminated estuarine sediments in a tropical environment

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Abstract

Little knowledge is available about the potential impact of commercial silver nanoparticles (Ag-NPs) on estuarine microbial communities. The Hugli river estuary, India, is susceptible to heavy metals pollution through boat traffic, and there is the potential for Ag-NP exposure via effluent discharged from ongoing municipal and industrial activities located in close proximity. To monitor the spatial distribution of heavy metals as well as the impact that an accidental release of Ag-NPs may have on the associated microbial populations, surface sediments were collected using a grab sampler during low tide from five key stations along the stretch of Hugli river. This study investigated the effects of commercial Ag-NPs on native microbial communities in estuarine sediments collected from five stations, using terminal restriction fragment length polymorphism (T-RFLP) technique. An increase in the number of bacteria in consortium in sediments was observed following exposure to Ag-NPs. The Hugli river estuary provided a model system from which to measure the effect of commercial Ag-NPs on the diversity of microbial communities which have been historically exposed to heavy metal pollution, due to its susceptibility to marine pollution which are potential release sites for Ag-NPs. In general microbial communities may be resistant in estuarine systems to the antimicrobial effects of commercial Ag-NPs, but key microorganisms, such as *Pelobacter propionicus*, which plays an important role in the biogeochemical cycling in freshwater ecosystems was sensitive to the exposure to Ag-NPs. This may play an integral role in the synergistic relationships occurring in anoxic freshwater and sewage habitats and thus may be more sensitive to the antimicrobial effects of Ag-NPs and at a greater risk. Overall, this study indicated that Ag-NPs have the potential to shape estuarine sediment bacterial community structure and increase the number of bacteria in consortium in sediments.

Keywords: Microbial dynamics, Nanoparticles, Hugli estuary, Sediment, Sundarban

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