

Toxicity, Bioaccumulation and Biotransformation of Silver Nanoparticles in Marine Organisms

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ABSTRACT

The toxicity, bioaccumulation and biotransformation of citrate and polyvinylpyrrolidone (PVP) coated silver nanoparticles (NPs) (AgNP-citrate and AgNP-PVP) in marine organisms via marine sediment exposure was investigated. Results from 7-d sediment toxicity tests indicate that AgNP-citrate and AgNP-PVP did not exhibit toxicity to the amphipod (*Ampelisca abdita*) or mysid (*Americamysis bahia*) at ≤ 75 mg/ kg dry wt. A 28-d bioaccumulation study showed that Ag was significantly accumulated in the marine polychaete (*Nereis virens*) in the AgNP-citrate, AgNP-PVP and a conventional salt (AgNO₃) treatments. Synchrotron X-ray absorption spectroscopy (XAS) results showed the distribution of Ag species in marine sediments amended with AgNP-citrate, AgNP-PVP and AgNO₃ was AgCl (50-65%) > Ag₂S (32-42%) > Ag metal (Ag⁰) (3-11%). In *N. virens*, AgCl (25-59%) and Ag₂S (10-31%) were generally decreased and, Ag metal (32-44%) increased, relative to the sediments. The patterns of speciation in the worm were different depending upon the coating of the AgNP and both types of AgNPs were different than the AgNO₃ salt. These results show that the AgNP surface capping agents influenced Ag uptake, biotransformation and/or excretion. To our knowledge, this is the first demonstration of the bioaccumulation and speciation of AgNPs in a marine organism (*N. virens*).