Bioaccumulation of AgNPs of Different Sizes and Coatings Along the Aquatic Food Chain

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The accumulation of silver nanoparticles (AgNPs) along the aquatic food chain is understudied, with available studies mainly focused on the accumulation of nanoparticles in a single aquatic organism or under direct water phase exposure. The influence of the characteristics of AgNPs on the accumulation is also not investigated. To better understand the influence of Ag characteristics under different aquatic exposures, this study assessed how distinct characteristics (different sizes and surface coatings) of AgNPs affect their accumulation along a food chain comprising of Escherichia coli (E.coli) and Tetrahymena thermophila (T.tetrahymena). Ag accumulation was measured after the initial intake in E.coli and then intake in T.tetrahymena through water phase exposure, food phase exposure, as well as food and water phase exposure. The research found that for different types of aquatic organisms, the impact of sizes and surface coatings varied greatly. For Ag accumulation in E.coli, surface coating is the main driver; sizes have a more significant effect on Ag accumulation in T.tetrahymena. In addition, results suggest high intake ratio for Ag accumulation along the food chain which indicates the high environmental risk of AgNPs. It is also discovered that the trophic transfer factor (TTF) is approximately one, indicating AgNPs may bioaccumulate in ecological systems via food chain, potentially triggering associated risks. These results highlighted the environmental risk AgNPs could have on the environment. Therefore, AgNPs should be carefully managed and applied in daily life to avoid possible environmental risks, and such possible risks should be carefully evaluated during the design.

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