Uptake of gold nanoparticles in Daphnia magna in the presence and absence of food using electron microscopy

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WE176 Uptake of gold nanoparticles in Daphnia magna in the presence and absence of food using electron microscopyL.M. Skjolding, DTU / DTU Environment; S.N. Sørensen, DTU Environment / Environmental Engineering; A. Thit Jensen, Roskilde University / ENSPAC; C. Kobler, K. Molhave, DTU / Department of Micro and Nanotechnology; A. Baun, Technical University of Denmark / Department of Environmental Engineering. The rapid increase in the use of engineered nanoparticles during the past decade underlines the importance of evaluating not only the acute toxicity of nanoparticles, but also their uptake and translocation in organisms. Transmission Electron Microscopy (TEM) is a well-established technique for imaging of biological samples e.g. for identification of changes to cellular structures and TEM is also widely used as a tool for identifying and characterizing nanoparticles In the present study the freshwater crustacean *Daphnia magna* was exposed for 24h to 0.4 mg Au/L citrate coated gold nanoparticles (Au NPs, 10 nm) in either the presence or absence of food (green algae, *Pseudokirchneriella subcapitata*). The uptake into gut lumen and internalization into epithelial cells of exposed *D. magna* was examined by light microscopy, TEM and FIB-SEM (Focused Ion Beam Scanning Electron Microscopy). No apparent disruption of gut cells was observed. The majority of Au NPs observed in the *D. magna* gut was located in the gut lumen both as single nanoparticles similar to stock solution and agglomerates/aggregates for both exposure scenarios. However, in the presence of food the amount of Au NPs in the gut-lumen seemed to decrease compared to treatment with absence of food. Few AuNPs were observed across the peritrophic membrane compared to in the gut-lumen. This suggests that the peritrophic membrane of the gut form a barrier with low permeability of the Au NPs. Only a few AuNPs were observed to have crossed the peritrophic membrane compared to the amount recovered in the gut-lumen. Occasionally, Au NPs were found inside gut epithelial cells indicating internalization. These results suggest that Au NPs are available for uptake into the gut-lumen both in the presence and absence of food. Additionally, it was found that the Au NPs can pass the PTM and to limit extend enter gut epithelial cells.