Evaluating the Potential for Metal Nanoparticles to Enter Food Webs

Supporting/Contributing Agency: U.S. EPA (STAR Grant # R833335010)

Drs. Jason Unrine, Olga Tsyusko, and Paul Bertsch of the University of Kentucky have demonstrated the potential for uptake of gold, silver, and copper nanoparticles into terrestrial food chains (Unrine, Bertsch, and Hunyadi 2008).Nano-sized gold, silver, and copper particles are among the most widely used nanomaterials, due to their novel optical, chemical, and antimicrobial properties. Little is known concerning the environmental fate and effects of these materials, including the potential that they may enter food chains. Using advanced imaging and novel chemical analysis techniques, Dr. Unrine and his colleagues have shown that soil-dwelling organisms such as earthworms can absorb nanomaterials from the soil into their cells, providing a means for nanomaterials to enter food chains. This suggests a potential route of exposure for humans and other organisms. Image 4.x shows the distribution of gold nanoparticles in a cross-section of an exposed earthworm and gold nanoparticles inside of an earthworm intestinal cell (inset).

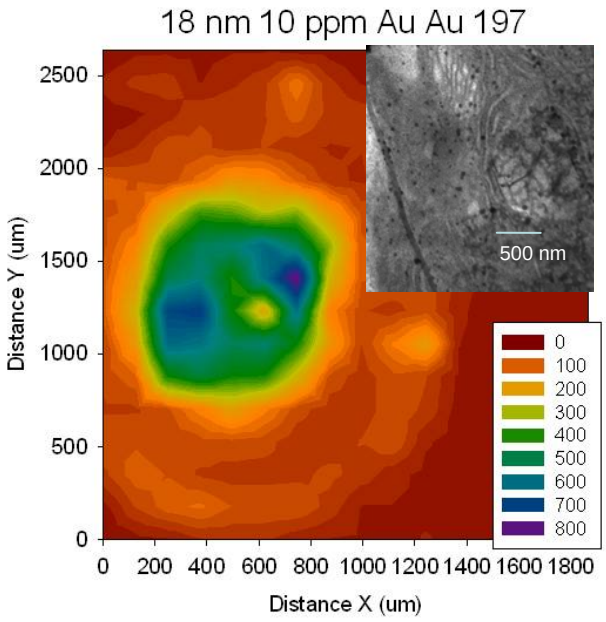

Figure. *Caption*.

Unrine and his colleagues have observed that the size and composition of metal nanoparticles can affect their absorption by terrestrial organisms and their stability in soil. They have also produced some evidence of adverse effects on gene expression and reproduction in earthworms, which could have adverse impacts on soil ecosystems.

References/Publications

Unrine, J., P. Bertsch, and S. Hunyadi. 2008. Bioavailability, trophic transfer and toxicity of manufactured metal and metal oxide nanoparticles in terrestrial environments. In V.H. Grassian, ed., *Nanoscience and nanotechnology: Environmental and health impacts*, pp345-360. Hoboken, NJ: John Wiley & Sons, Inc.