University of Georgia team investigates effects of nanoparticles on environment

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A University of Georgia research team has received funding from the U.S. Environmental Protection Agency to take a close look at something 100,000 times smaller than the width of a hair that offers great promise for major advances in medicine, manufacturing, electronics and other areas of science. The $364,000 three-year project will look at the effects of zinc oxide nanoparticles, particularly how available they are in the environment, their behavior in the food chain, and any toxic effects they might have.

Manufactured zinc oxide nanoparticles are one of the most diverse classes of manufactured nanoparticles. The field of nanotechnology uses nanoparticles, which are essentially small molecules, for industrial applications in many fields including medicine, electronics, manufacturing, energy production, pollution control, and environmental remediation. Though the nanotechnology revolution may offer major advances, the potential negative impacts to the environment and human health are unknown and need to be studied. The importance of understanding the potential environmental impacts of manufactured nanoparticles is critical because the number of nanoparticle-based products is expected to increase dramatically over the next several decades and release of nanoparticles to the environment will be an unavoidable consequence.

“The focus of our proposal is to examine the uptake and toxicity of zinc oxide nanoparticles to microorganisms and small worms called nematodes that are commonly found in soil,” said Paul Bertsch of UGA’s

Department of Crop and Soil Sciences and Savannah River Ecology Lab (SREL), who is the principal investigator on the interdisciplinary project.

Bertsch said, “We also want to see if nematodes feeding on pre-exposed microorganisms bioaccumulate more or less zinc oxide compared to direct exposure. This will provide an indication if food chain transfer is an important process for manufactured nanoparticles, which may begin to establish the potential ecological and human health risks of nanoparticles released into the environment.”

There currently is little information on the bioavailability and toxicity of nanoparticles although previous work by SREL researchers provided evidence that an aluminum oxyhydroxide nanocluster is far more toxic to plants than the aluminum ion. “This was a very surprising finding,” said Bertsch, “and one that makes the outcome of the new work uncertain and exciting.”

Other members of the research team include Travis Glenn and Andrew Neal from SREL, Phil Williams from the UGA College of Public Health, and Brian Jackson from Dartmouth College. Glenn is a molecular ecologist who along with Williams and others developed a transgenic nematode that will be used to determine the cellular response of worms to the nanoparticles. Neal is an environmental microbiologist at SREL who will be overseeing the microbial work on the project. The project will utilize advanced analytical approaches including imaging. The researchers will conduct the work at SREL and at UGA and use advanced x-ray microprobes at the National Synchrotron Light Source (Brookhaven National Lab) and at the Advanced Photon Source (Argonne National Lab).

Source: University of Georgia