Submission for TIC by Steve Diamond, 08/17/09

Title: Effects of silver nanoparticles on Japanese medaka (*Oryzias latipes*) and *Daphnia magna*

Meeting: The Society of Environmental Toxicology and Chemistry (SETAC) North America 30th Annual Meeting, 19-23 November 2009, New Orleans, LA, USA.

Authors: Sarah Hoheisel, Amanda Brennan, Steve Diamond, and David Mount

Abstract: The introduction of nanoparticles into a variety of consumer products has raised questions about the potential effects of environmental release, and particularly whether the presence of materials at the nano-scale creates potential risks not associated with the bulk materials. Citrate-capped silver nanoparticles were prepared de novo, and characterized for particle size distribution using dynamic light scattering. Toxicity studies were conducted to determine the lethal and sublethal toxicity of these particles to Japanese medaka and the cladoceran Daphnia magna. In addition to determining effect concentrations, these studies evaluated the likelihood that the observed toxicity was attributable to nanoparticles themselves, or to silver ions associated with nano-silver synthesis and/or released from silver nanoparticles. Initial studies showed that medaka larvae had fairly low acute sensitivity to nano-silver, with LC50 values in the range of 10-30 mg/L total silver. The addition of sodium thiosulfate reduced or eliminated this toxicity, suggesting that at least some of the observed toxicity was attributable to ionic silver, as thiosulfate is known to chelate ionic silver and reduce its bioavailability. Additional tests compared the relative effects of ionic silver and silver nanoparticles on D. magna reproduction as well as larval growth and development of medaka. Comparisons of the sensitivity of fish and daphnids allow inferences to be drawn about the route of exposure and mechanism of toxicity for silver nanoparticles. *This abstract does not necessarily reflect US EPA policy.*

Impact Statement: Nanotechnology is an emerging field that will produce hundreds of new and novel substances that have the potential for biological activity not typical of their bulk forms. One such material is nano-scale silver (n-Ag), which also presents the added challenge of potentially acting through free ion toxicity as well as possible particle toxicity. We present here an approach to differentiating ion from particle toxicity. The work will be of significant value to assessors and others attempting to determine the risk of new forms of n-Ag.