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Design of *In vivo* assays for study of transport, biocompatibility and toxicity of nanoparticles

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Nanomaterials possess distinctive physicochemical properties, promising a wide variety of application, ranging from design of high quality consumer products to effective disease diagnosis and therapy. However, these properties may also lead to toxic effects, potentially hindering advances in nanotechnology. This study focuses on the design of model nanomaterials and *in vivo* assays for study of transport, biocompatibility and toxicity of nanoparticles (NPs). We synthesized and purified spherical silver (Ag) NPs with diameters, ranging from 12 to 95 nm, that are stable (non-aggregated) in egg-water media (1.0 mM NaCl). We developed new imaging approaches to characterize single Ag NPs in zebrafish embryos in real-time at nanometer resolution by measuring their size-dependent localized surface plasmon resonance (LSPR) spectra and scattering intensity using dark-field optical microscopy and spectroscopy (DFOMS). We studied the dependence of transport, biocompatibility and toxicity of Ag NPs in living embryos upon various physicochemical properties (e.g., sizes and charges) of NPs and different developmental stages of embryos *in vivo* in real-time. Using Ag NPs as optical probes, we continuously imaged nano-environments of developing zebrafish embryos for hours and discovered their transport patterns through the chorion pores, and into the chorion space of the different stages of embryos. We showed that Ag NPs caused a wide variety of deformities and death of embryos, in a concentration (dose) dependent manner and in the surface-charge dependent fashion. This study demonstrates that zebrafish embryos can serve as an effective *in vivo* assay to characterize the transport, biocompatibility and toxicity of nanomaterials.

Biography

Kerry J. Lee completed her Ph.D. in Biomedical Sciences from Old Dominion University. During her Ph.D. research, she studied the design of *in vivo* assays to study the transport, biocompatibility, and toxicity of different types of nanoparticles. She has published 8 first-author papers in peer-accepted journals, including ACS Nano, has more than 150 citations, and more than 15 selected presentations and conference abstracts. Kerry is currently assistant professor at South University and has expectations to continue her research using nanoparticle technology to identify and treat diseases.

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