Mechanistic models for studying nanomaterial safety, using high throughput and high content screening in zebrafish embryos

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I will discuss the use of our high throughput and high content discovery tools at the nano/bio interface to understand the relationship between engineered nanomaterial (ENM) properties and adverse biological outcomes, with particular emphasis on the development of predictive toxicological modeling for environmental applications. UC CEIN have embarked on hazard ranking and generation of structure-activity relationships to investigate large categories of materials such as metals, metal oxides, carbon nanotubes, silica, rare earth oxides, cationic nanomaterials and materials with a long aspect ratio (LAR). I will briefly review the principal screening tools, nanomaterial libraries, toxicological pathways and *in silico* tools that we have developed to establish structure-activity relationships, and toxicological modeling. This includes the use of zebrafish embryos and larvae for toxicological analysis of about material categories, from which I will select metal dissolution and a LAR paradigm to demonstrate environmental toxicological analysis. I will demonstrate the utility of this information in a wastewater simulation system to perform a comparative analysis of the change of the toxicological properties of commercial ionic, nano and micro-size Cu materials in the effluent. I will also briefly describe bacterial HTS for hazard ranking and predictive toxicological modeling in terrestrial ecosystems.