Nanoparticles are present in our daily lives through numerous applications. Estimates are for the nanoindustry to be worth one trillion dollars by 2015. Synthetic NPs are found in construction materials, paints, cosmetics, textiles and recreational equipment. Additionally they are utilized in many medical applications and in the electronic industry.

Nanoparticles exhibit novel reactivity arising from extremely high surface to volume ratios and associated quantum effects. While nanoparticle production is growing exponentially studies of their impact on humans, the environment, and agriculture are still in their infancy.

We focus our research on assessing nanotoxicity and transport in agriculturally relevant plants and associated beneficial microbes. In parallel, we investigate applications of nanoparticles as antimicrobial agents against human pathogens as well as the ability of nanoparticles to direct protein conformations to better understand protein conformational diseases such as Alzheimer’s and spongiform encephalopathy (e.g. mad cow disease).