SELENIUM NANOCOMPOSITES: MODIFYING THE NANOROUGHNESS AND SURFACE CHEMISTRY TO PREVENT BACTERIA AND BONE CANCER ACTIVITY

Michelle Stolzoff¹ and Thomas J. Webster¹
¹Northeastern University, USA

The rise in antibiotic resistance has become a daunting concern in the last decade, including strains like methicillin-resistant *Staphylococcus aureus* (MRSA) causing significant damage in medical bills and hospital-acquired infections. It is important, then, to explore novel, non-drug antibiotics to reduce these life-threatening infections. Selenium nanoparticles (SeNP) have been seen to exhibit specific toxicity to bacteria while remaining non-toxic to healthy mammalian cells. Selenium-coated biomaterials have been shown to selectively decrease bacteria, as well as cancerous osteosarcoma[1], proliferation, while promoting the viability of healthy, non-cancerous bone and fibroblast cells. To ensure precise and consistent SeNP coverage, we aim to tabulate several relevant aspects of the particle. By adjusting the parameters of the reaction producing SeNP, a variety of data can be collected and analyzed. Characteristics that are pertinent include the nanoparticle size and coverage, which in turn affects the surface roughness and chemical reactivity. Thus, a cubic response surface model has been developed using a central composite design (CCD), to predict the SeNP coating and the resulting effect on cellular interactions. Nano-scale roughness is known to modify protein adsorption (and thus cellular response) onto the surface of a material. With this CCD model, we can predict the changes in SeNP coverage according to our synthesis parameters, and better direct the cell-material interactions that result. We have seen decreases in bacterial adherence, proliferation and deposition of biofilm while at the same time improving healthy mammalian cell growth on these SeNP surfaces.

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**References:**


**Presenting author's email:** stolzoff.m@husky.neu.edu