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Synthesis and Materials Testing of Selenium Nanoparticle-coated Bone Cement

Prosthetic joint infection (PJI) is one of the most critical complications following joint arthroplasty, causing up to 20% of arthroplasty failures. One approach to treat PJI is to embed antibiotics in bone cement. The goal of this project is to reduce the incidence of PJI by synthesizing selenium nanoparticles and embedding them into bone cement. We anticipate that, by coating bone cement with selenium nanoparticles, we may inhibit or prevent the formation of biofilms that are notoriously difficult to detect and treat. Our research plan is to first synthesize the selenium nanoparticles, characterize them, then embed them on the PMMA bone cement. We will do materials testing to examine the impact of embedding the nanoparticles, if any, on the structural integrity of the cement. We will also use a tape-adhesion test to determine the strength of adhesion of the selenium nanoparticles on the surface of bone cement. Finally, planktonic and drip-flow biofilm tests will be used to compare the bacterial growth and bacteria attachment rate on selenium-coated versus uncoated bone cement. This poster will update the progress of this project.