DEVELOPMENT OF GOLD NANOPARTICLE CONJUGATED POLYETHYLENE TEREPHTHALATE FOR IMPROVED BIOCOMPATIBILITY IN HERNIA REPAIR MATERIALS

Ona Whelove
Dr. Sheila Grant, Thesis Supervisor

ABSTRACT

Synthetic biomaterials are currently a popular choice for use in many surgical soft tissue repair applications. Polyethylene terephthalate (PET) is an example of such material that has been used, more specifically, for hernia repair. PET mesh is one of the top choices for hernia repair due to its flexibility, porosity, mechanical strength, and relative inertness; however, explanted PET hernia meshes have shown signs of degradation, which can cause complications with tissue compatibility and increase the chance for recurrence when used as a biomaterial implant for extended periods of time. In this study, the effects of modifying the PET surface, through chemical functionalization and gold nanoparticle (AuNP) conjugation, were investigated. Fourier transform infrared spectroscopy (FT-IR), scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), and differential scanning calorimetry (DSC) were used to characterize the modified PET in comparison to pristine PET. Results from these studies showed that the PET mesh surface could be successfully functionalized and cross-linked with AuNPs while maintaining the physical and thermal properties of pristine PET. Cell culture assays, including WST-1 cell proliferation assays, reactive oxygen species (ROS) assays, and antimicrobial studies, were performed to investigate in vitro performances of the modified PET mesh.