Public Abstract

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Title:DEVELOPMENT OF A COMPOSITE ACELLULAR TISSUE GRAFT FOR MUSCULOSKELETAL TISSUE ENGINEERING

The focus of this dissertation is on the development of grafts for use in anterior cruciate ligament (ACL) reconstruction. The ACL is a ligament in the knee that is commonly torn in sports-related injuries. It is most often replaced with a replacement tissue called a graft, from the patient's own body, or from a donor. Although these grafts are commonly used they often fail due to poor biological incorporation of the graft. Gold nanoparticles and hydroxyapatite nanoparticles attached to human-derived grafts have been developed to promote biological incorporation. Grafts were tested in the lab to observe the interaction between grafts and cells. Results demonstrate positive cell responses to the grafts. Two animal studies were conducted to investigate the performance of the grafts in green fluorescent protein (GFP) pigs and in rabbits. GFP pigs are pigs that have been genetically modified to glow green which can create a contrast between the fluorescent GFP pig tissue and a non-fluorescent implanted graft. The pigs were used to evaluate the overall reaction of the pig tissue to the grafts as well as to evaluate the GFP pig as a new method to visualize graft healing. Results demonstrate a positive response to the grafts and the benefit of using a GFP pig to evaluate graft healing. Rabbits were used as a model to replace the ACL with the grafts and to evaluate the extent of biological incorporation of the grafts. Results demonstrate successful replacement of ACLs by the grafts and improved biological incorporation from the use of nanoparticles. Overall, studies demonstrate the success of using grafts with nanoparticles for ACL reconstruction and the potential for further clinical applications.