

DEVELOPMENT OF A NANOMATERIAL-TISSUE PATCH FOR VASCULAR AND CARDIAC RECONSTRUCTION

Allison M. Ostdiek

Dr. Sheila Grant, Dissertation Supervisor

ABSTRACT

It is a universally acknowledged truth that biomaterials are an essential part of current medical therapies. Biomaterials comprised of decellularized tissue mimic natural tissue by providing a natural extracellular matrix. Gold nanoparticles have been shown to improve wound healing by decreasing free radicals at the site and hinder collagenase binding sites, thus improving the durability of the material. This dissertation examines decellularized porcine arterial tissue conjugated with gold nanoparticles for use as a vascular and cardiac repair. The material was characterized through numerous *in vitro* tests. It was further investigated through two *in vivo* studies allowing for closer examination of the body's interaction with the material. The results of these tests show a material that is comparable to natural tissue with regard to biocompatibility and mechanical strength. The material is feasible in a vascular environment and shows better *in vivo* biocompatibility and superior cell reintegration when compared with current biomaterials used in vascular repair. Further studies are needed to evaluate the patch in a diseased environment to better understand the role of the gold nanoparticles. This material has the potential to create a new class of biomaterials for use in cardiovascular work.