Project Title: Multifunctional 3D Woven Scaffolds for Osteochondral Repair

Project Acronym: Osteochon3D

Principal Investigator: Guilak Farshid, Ph.D.
Duke University Medical Center

Co – Investigator

Abstract
The goal of this project is to use a custom-designed 3D woven scaffold that possess biomimetic properties of articular cartilage to develop a composite scaffold that will promote the differentiation of two tissue layers (cartilage and bone) from one population of stem cells using locally functionalized growth factors. The basis of this scaffold is a woven matrix structure that recreates the mechanical properties of native articular cartilage and supports cell growth and differentiation. The scaffold is a reinforced 3D meshwork of resorbable fibers, which is infiltrated with mesenchymal stem cells (MSCs). The scaffold provides tensile, compressive, and shear properties similar to those of native cartilage, prior to cell seeding. The design is highly versatile and can be customized using virtually any combination of fibers and matrix gel. Furthermore, the individual fibers can be functionalized with specific growth factors that induce the differentiation of adult stem cells into bone or cartilage lineages, and thus it is proposed that a bi-layered construct be created from a single stem cell population coupled with a “smart” scaffold.