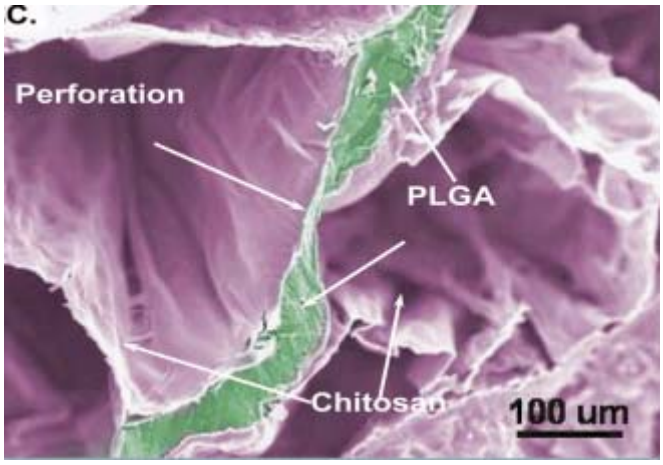
Synthetic Scaffolds for Bladder Regeneration (PCA3):

About 400 million people worldwide suffer from one or other type of bladder disease. When conservative therapies are not effective, bladder augmentation or urinary diversions are recommended as alternative therapeutics. Apart from the shortage of available donors, there are many disadvantages of autografts. Small intestinal submucosa (SIS), a natural biodegradable matrix, has shown significant success in bladder regeneration. However, it is a natural matrix and large-scale preparations are hindered by various physicochemical properties which affect the quality and reliability of the tissue regeneration in the clinical settings. The goal of the Madihally laboratroy is to develop a synthetic matrix mimicking the characteristics of the SIS. The underlying hypothesis is that blends of synthetic and natural matrices can be optimized by altering their proportions and configurations in the matrix. Dr. Madihally and his group are working to tailor the mechanical and degradation properties using synthetic polymers while the biological response will be regulated by natural polymers such as gelatin. For this purpose, scaffolds of two distinct configurations with amorphous 50:50 poly-lactide- co-glycolide (PLGA) or semi-crystalline ploycaprolactine (PCL) will be combined with chitosan and gelatin in different proportions. However, synthetic scaffolds do not have growth factors to influence cell colonization in addition to blood vessel-like structures unlike SIS. To address this, Dr. Madihally utilizes novel ***nanotechnology*** to prepare and characterize chitosan ***nanoparticles*** containing basic fibroblast growth factor (bFGF) and Transforming growth factor (TGF)- beta on bladder regeneration in vitro and evaluate the quality of the regenerated tissue. Successful completion of this project will establish a ground work for new therapeutic strategies to improve large pieces of full-thickness bladder augmentation/reconstruction for patients who require surgical restoration of bladder function. Furthermore, demonstrating the utility of controlled delivery of growth factors using ***nanoparticles*** and the efficacy of combining natural matrices with synthetic matrices will pave the way for regenerating other tissues.



Multilayer Composite Scaffolds with Mechanical Properties Similar to Small Intestinal Submucosa. Lawrence BJ, Maase EL, Lin HK, Madihally SV. School of Chemical Engineering, Oklahoma State University, Stillwater, Oklahoma 74078. *J Biomed Mater Res A.* 2009 Mar 1;88(3):634-43

The current work is supported by NIDDK Pilot and Feasibility grant 1-R21-DK074858-01A2.