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Scaffolds for tissue regeneration

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Despite major advancements, tissue transplantation suffers from many complications including the severe shortage of donors, and the complexity of harvesting organs and delivering them to the recipient. Promising tissue regenerativeapproaches to restore, maintain, or enhance tissue function or a whole organ uses biodegradable structures onto which cells attach, populate, and synthesize new tissue. The biodegradable structures from various animal tissues such as skin, bladder, fat and intestine have seen clinical usage due to the advantage of premade architecture, which is conducive for tissue regeneration. However, manipulating these architectures to grow other tissues has shown many obstacles. Hence, synthesizing matrixes using various materials and processes such as electrospinning, freeze drying, 3D printing, and salt leaching techniques have been considered. Natural polymers such as chitosan, collagen (or gelatin) and silk fibroin have been investigated for utilization. Alternatively, many synthetic polymers such as poly (lactic acid), and poly (caprolactone) are explored in forming biodegradable structures. Our efforts in using variety of processing techniques to form scaffolds have given many insights into understanding their critical properties and limitations. This presentation is focused on comparing the advantages and disadvantages of various techniques.

Biography

Sundararajan V. Madihally is an Associate Professor (with tenure), Graduate Program Coordinator at Oklahoma State University and holds Edward Joullian Chairin Engineering. He received his Ph.D. from Wayne State University and held a research fellow position at Massachusetts General Hospital/Harvard Medical School/Shriners Hospital for Children. His research interests are in tissue regeneration and delivery options for therapeutic agents (oral, or transdermal). In particular, his research is focused on *in vitro* functional tissue engineering by mimicking *in vivo* microenvironments and understanding the cellular behavior (stem cells, co-cultures) in three-dimensional porous structure. He uses a number of polymers to form scaffolds, delivering growth factors using nanoparticles, and bioreactor designs. He is the author of the textbook "Principles of Biomedical Engineering" and currently writing another textbook on Tissue Engineering. He has published 55 peer-reviewed articles, 30 conference proceedings and presented more than 170 times (invited and conference). He served as a member of the International Editorial Board of Biomaterials Journal and on the Editorial Board of many other open access journals. He has served as reviewer for more than 75 journals and various organizations. He has organized more than 35 sessions in national and International conferences including one in the 2004 World Biomaterials Congress. He has received numerous awards including Undergraduate Student Teacher of the Year in School of Chemical Engineering, Advisor of the Year from College of Engineering Architecture and Technology, Advisor of the year from Oklahoma State University, and Advisor of the Year from National American Institute of Chemical Engineers Organization.

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