



AN HONORS UNIVERSITY IN MARYLAND

Department of Mechanical Engineering

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Role of Fiber Architecture of Electrospun Scaffolds in Modulating Cellular Response

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Abstract

Biomimicking native tissue has been a strategy for developing constructs for tissue engineering. The first step in the process begins by creating scaffolds that mimic the extracellular matrix (ECM). The ECM is composed of fibrillar structures that are typically in the submicron range. Electrospinning is a simple process of generating continuous nanofibers that are in the same dimensional range of the ECM fibers. This has led to the popularity of the process for tissue engineering applications. While a wide range of natural and synthetic materials have been electrospun to serve as scaffolds for a wide variety of tissue engineering applications from skin to nerve, the exact role of fiber architecture in cellular function has not been elucidated. One of the possible reasons is the lack of control in the electrospinning process that is used to obtain the fibers. In the current presentation we have carefully characterized the fiber diameter distribution by varying important electrospinning process parameters. We have chose polycaprolactone (PCL) as the biomaterial substrate of choice and obtained continuous fibers in the range from 400-1600 nm. We have then carefully studies the adhesion, proliferation and ECM generation capabilities of fibroblasts as a function of fiber diameter in order to optimize scaffolds for various wound healing applications. Our studies have shown a significant difference in cellular adhesion and proliferation kinetics as a function of fiber diameter. By developing abilities to pattern substrates constructed of electrospun fibers at the submicron scale, we shall be able to control cellular response and therefore modulate tissue engineering at the macroscale.

Biographical Sketch

Dr. Sankha Bhowmick is an Assistant Professor in the Department of Mechanical Engineering at University of Massachusetts Dartmouth. He receives his BS from Jadavpur University, India in 1992, his MS from Villanova University in 1996 and his Ph. D from University of Minnesota in 2000, all in Mechanical Engineering. He was a post doctoral fellow at the Center for Engineering at Massachusetts General Hospital/Harvard Medical School and currently holds a Research Associate position over there. His research interests are broadly in transport aspects in biological systems. He has a strong interest in developing bioengineering curriculum at both the undergraduate and graduate levels. He was the co-director of the University of Massachusetts Intercampus Bioengineering and Biotechnology program.

Refreshments will be served

Host: Dr. L. Zhu