Microprinting of Biomaterials

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Abstract

Microfabrication approaches such as printing with micro and nanoscale resolution have dramatically changed our society through their use in diverse fields. These engineering tools are also useful for many biological applications ranging from drug delivery to DNA sequencing since they can be used to fabricate small features at a low cost and in a reproducible manner. In addition, the ability to print materials at the micro and nanoscale is potentially important for many biological and biomedical applications. Our goal is to use these techniques to better understand and manipulate cell behavior (e.g. stem cells) and to fabricate devices for high-throughput screening. This talk will describe new materials and methods developed in our lab to regulate and analyze the interaction of cells with their surroundings. To control cell migration and to restrict cell or colony size, cells and proteins were patterned using numerous printing and molding methods based on deposition of polymers. To control cell-cell contact, we have developed methods based on layer-by-layer deposition of ionic biopolymers to generate patterned co-cultures. In addition, we have developed microfluidic-based approaches to synthesize novel materials and to interface cells inside microdevices.

Author Biography

Ali Khademhosseini is an Assistant Professor of Medicine and Health Sciences and Technology at Harvard-MIT's Division of Health Sciences and Technology and the Harvard Medical School. His research is based on developing micro- and nanoscale technologies to control cellular behavior with particular emphasis in developing microscale biomaterials and engineering systems for tissue engineering and drug delivery. He has published over 50 peer reviewed papers, 60 abstracts and 13 issued or pending patents. He has received multiple awards including the Coulter Foundation Early Career (2006), Outstanding undergraduate research mentor at MIT (2004), outstanding researcher in polymer science by OMNOVA / MIT (2005) and outstanding graduate student by Biomedical Engineering Society (2005). He received his Ph.D. in bioengineering from MIT (2005), and MASc (2001) and BASc (1999) degrees from University of Toronto both in chemical engineering..