



Biomaterials Niches for Immune/Regenerative Engineering and Therapeutic Delivery



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Abstract

New materials with tailored structural and functional characteristics can advance the ways medical interventions are delivered to treat and prevent diseases and repair damaged tissues. This seminar discusses a nanofiber-hydrogel composite concept by incorporating electrospun nanofiber fragments into a hyaluronic acid hydrogel network through interfacial bonding, to mimic the microarchitecture and mechanical properties of soft tissue extracellular matrix. This composite matrix can be tailored to modulate inflammatory response and mediate angiogenesis and regeneration of soft tissue including adipose remodeling, radiation fibrosis prevention, and fistula repair. This composite can also serve as a delivery vehicle for stem cells and extracellular vesicles, and therapeutic nanoparticles. In a separate application, this composite can be engineered with immunostimulating signals for antigen-specific T cell activation and expansion. This artificial T-cell activation matrix serves as a lymphoid tissue that recruits, retains, activates, and expands antigen-specific T cells for cancer immunotherapy.

Biography

Dr. Hai-Quan Mao is the Director of the Institute of NanoBioTechnology (INBT) and Professor of Materials Science and Engineering at the Whiting School of Engineering, Johns Hopkins University. He holds a joint appointment in the Department of Biomedical Engineering and is a core faculty of the Translational Tissue Engineering Center and at the School of Medicine. He received his B.S. degree in Chemistry and a Ph.D. in Polymer Chemistry from Wuhan University in China in 1988 and 1993, respectively. From 1995 to 1998, he pursued his postdoctoral training in the Department of Biomedical Engineering at Johns Hopkins University School of Medicine. He was a co-principal investigator at Johns Hopkins in Singapore from 1999 to 2003, prior to joining the faculty of Whiting School of Engineering at Johns Hopkins University. Dr. Mao's research focuses on developing nanofiber-hydrogel composites for soft tissue remodeling and delivery of stem cells, establishing scalable manufacturing platforms for nanotherapeutics to deliver nucleic acid and protein therapeutics, and engineering biomimetic matrix to program immune responses. Dr. Mao is an associate editor for Biomaterials and serves on the editorial boards of ACS Biomaterials Science & Engineering and Journal of Materials Chemistry B. Dr. Mao was the recipient of the National Science Foundation Faculty CAREER Award and elected a fellow of the American Institute for Medical and Biological Engineering and the National Academy of Inventors.

***** ALL ARE WELCOME *****

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