CARNEGIE MELLON UNIVERSITY
BME 2021 FALL SEMINAR SERIES

Bioengineered Synthetic Hydrogels for Regenerative Medicine

PRESENTED BY

Andrés J. García
Executive Director, Petit Institute for Bioengineering and Bioscience
Regents' Professor, Woodruff School of Mechanical Engineering
Georgia Institute of Technology

SCHEDULE

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(10:15AM-11:15AM)

Hydrogels, highly hydrated cross-linked polymer networks, have emerged as powerful synthetic analogs of extracellular matrices for basic cell studies as well as promising biomaterials for regenerative medicine applications. A critical advantage of these synthetic matrices over natural networks is that bioactive functionalities, such as cell adhesive sequences and growth factors, can be incorporated in precise densities while the substrate mechanical properties are independently controlled. We have engineered poly(ethylene glycol) [PEG]-maleimide hydrogels for local delivery of therapeutic proteins and cells in several regenerative medicine applications. For example, synthetic hydrogels with optimal biochemical and biophysical properties have been engineered to direct human stem cell-derived intestinal organoid growth and differentiation, and these biomaterials serve as injectable delivery vehicles that promote organoid engraftment and repair of intestinal wounds. In another application, hydrogels presenting immunomodulatory proteins induce immune acceptance of allogeneic pancreatic islets and reverse hyperglycemia in models of type 1 diabetes. Finally, injectable hydrogels delivering anti-microbial proteins eradicate bone-associated bacterial infections and support bone repair. These studies establish these biofunctional hydrogels as promising platforms for basic science studies and biomaterial carriers for cell delivery, engraftment and enhanced tissue repair.

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