The Chinese University of Hong Kong

Department of Biomedical Engineering

Graduate Seminar – PhD Oral Defence

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Date	:	22 May 2019 (Wed)
Time	:	10:00 a.m.
Venue	:	Room 215 William MW Mong Engineering Building (ERB)

Title: Development-inspired biofunctionalization of hydrogels for guided musculoskeletal tissue regeneration

Designing the cell-laden tissue engineering scaffolds to emulate the biochemical complexity of cellular microenvironment is essential to promoting the desired cellular events and tissue regeneration. This work focuses on the biofunctionalizations of hydrogels with development-relevant cues to regulate cell behaviors. These hydrogels modified with biomimetic ligands activate the specific signaling and enable distinct manipulation of the downstream molecular events during the stem cell differentiations. Compared with the traditional direct supplementation of bioactive ligands in culture media, where ligands are diluted and can lose their bioactivities after being internalized by the cells, the biomaterial-immobilized ligands are believed to have higher local concentration and prolonged bioactivity upon ligation to the membranous receptors. Herein, we demonstrate several synthetic presentation approaches of development-inspired biomimetic ligands in the scaffolds to specifically regulate the signaling events and guide the cell lineage commitment and skeletal tissue regeneration. These hydrogels include a biomimetic self-assembly peptide hydrogel (KLD-Cad), a non-canonical Wnt 5a activating hydrogel, a hydrogel scaffold with both ‘cell-matrix’ interactions and ‘cell-cell’ interactions, and a macroscopic porous hydrogel embedded with nanoscale upconversion nanoparticle-based nanocomplex.

In summary, these biomimetic hydrogels highlight the importance of the biofunctionalization of biomaterial scaffolds with development-relevant cues in directing the cell fate and enhancing the regenerative outcome of regenerative cell-based treatments, and the findings provide valuable guidance to the development-inspired rational and biomimetic design of biomaterials for a wide array of therapeutic applications.

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

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