The Chinese University of Hong Kong

Department of Biomedical Engineering

Time: 9:30am, 29 December 2021 (Wednesday) (on Zoom)

Seminar Link: https://cuhk.zoom.us/j/96595833915?pwd=bVdzSHJsUnkwV0lzc254aFlVaVJtZz09

Tissue Engineering for Musculoskeletal Regeneration and Organs-on-chips

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Abstract

Musculoskeletal disorders are highly prevalent and represent a leading cause of physical disability. Unfortunately, there are no effective disease-modifying drugs (DMDs) available for the treatment of a variety of musculoskeletal diseases such as osteoarthritis, which afflicts over 27 million people annually in the U.S. alone. To address these huge unmet medical needs relies on our enhanced understanding of mechanisms responsible for pathogenesis and tissue regeneration. In my research, musculoskeletal tissues were engineered from stem cells and biomaterials presenting appropriate topography, mechanical strength, and biological properties for two purposes: to regenerate diseased/damaged tissues, and to establish organs-on-chips for studying disease mechanisms and developing potential DMDs. Organic and inorganic biomaterials functionalized with carbonaceous nanomaterials not only possess enhanced mechanical properties, but also promote stem cell differentiation and facilitate tissue repair. In addition, in vitro engineered tissues that emulate key characteristics of their native counterparts are integrated in a synovial join-on-a-chip (named miniJoint) system, the first human cell-derived, multi-tissue chip with the capacity to mimic both healthy and inflamed knee joints. The miniJoint recapitulates complex tissue interactions and can be used to study joint pathophysiology and test novel therapeutic interventions. Finally, by incorporating sensory neurons into the miniJoint system, an innervated joint model can be established to study pain mechanisms and develop potential pain medications.

Biography

Dr. Zhong (Alan) Li is a Research Assistant Professor at the Department of Neurobiology, University of Pittsburgh School of Medicine (UPSOM). Prior to this appointment, he was a Postdoctoral Associate at the Center for Cellular & Molecular Engineering, Department of Orthopaedic Surgery, UPSOM. Before joining UPSOM, he obtained his PhD degree in Biomedical Ceramics and worked as a Postdoctoral Research Fellow at Nanyang Technological University (NTU), Singapore from 2012 to 2017. His main research interests are in nano-biomaterials, musculoskeletal tissue engineering, and organs-on-chips for modeling joint disorders and associated pain. He spearheaded the development of a synovial joint-on-a-chip device that enables active crosstalk among four human stem cell-derived tissue components and recapitulates key

features of joint inflammation and degeneration. He is currently developing one of the first innervated joint models by incorporating sensory neurons. To date, he has published 45 journal articles, with >1400 citations and an H-index of 20 (according to Google Scholar). Among other honors, he won the 2016 Young Persons' World Lecture Competition, received the Wake Forest Institute for Regenerative Medicine (WFIRM) Young Investigator Award in 2019, and won the 3Rs Award in the Orthopaedic Research Society (ORS) 2019 Annual Meeting.

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

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