Bioprocessing Technology Institute
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3D Printed Conductive Cell-Laden Hydrogel Scaffolds for Neuronal Tissue Regeneration

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14 July 2021, 10.00am
Host: Dr Steve Oh

Seminar Abstract

Injury to the nerves within the central and peripheral nervous system is common and debilitating following acute injury and chronic diseases. The resultant disability can result in various functional disorders of the nervous system that includes impaired memory, cognition, muscle coordination, sensation and neuropathic pain. Following injury, the loss of intricate architecture and orientation results in loss of appropriate cues for regeneration and functional recovery. Regeneration of both central and peripheral nervous system have limited regenerative potential. Regenerative transplantation is gaining attention as a viable option to restore form and function following tissue injury or disease. Hence, a biomimetic scaffold that provides mechanical, electrical and biochemical cues will provide a conductive and biologically active bridge across the site of injury for tissue regeneration and functional recovery. Current methodologies of 3D culture systems for generation of 3D neural tissues reported to date rely on the self-assembly of randomly distributed cells within the biomaterial. 3D bioprinting, on the other hand, provides the opportunity for precise co-printing of appropriate conductive biomaterial and neuronal cells to generate neural tissues of desired complex 3D architecture and unidirectional alignment. The novel approach would provide conductive scaffolds and hydrogels for biological applications related to tissue regeneration in neural injury and neurodegenerative diseases that can be further extended for applications in tissue engineering of innervated tissues and organs.

About the Speaker

Dr. Harish is a stem cell bioengineer and has experience in tissue engineering applications using organotypic and 3D printing systems. Dr. Harish has worked in multi-disciplinary projects with multi-cultural research groups. Dr. Harish earned PhD degree from NUS in tissue engineering of skin, epithelial and vascularized tissue models from human stem cells, which was internationally patented. After PhD, Dr. Harish worked on differentiation of human cardiomyocytes as a visiting researcher at University Health Network, Toronto, Canada. Later, Dr. Harish moved to China to lead cell therapy focused company, as a Vice president of R&D. During which Dr. Harish mentored 7-8 scientists under his supervision, filed 3 patents and worked on multiple projects on human embryonic stem cell differentiation into various lineages. In 2019 Sep, Dr. Harish joined NUS as Research Fellow and worked on developing conductive hydrogels for 3D bioprinting of neuronal tissues for nerve repair and regeneration applications. In addition, Dr. Harish has developed entrepreneurial skill sets by engaging in NUS Lean Launch Pad program in 2020. Currently at BTI-A*Star, Dr. Harish works on manufacturing of human stem cells using microcarriers and serum free media development with the focus towards large scale cell manufacturing for therapeutic applications.

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