Seminar

Department of Biomedical Engineering
香港城市大學
City University of Hong Kong

Engineering biomaterial interface for vascular tissue engineering applications

Evelyn Yim

Professor, University Research Chair
Department of Chemical Engineering
University of Waterloo, Canada

Date: 19 December 2023
Time: 3:05 – 3:35 pm
Venue: LT-4, YEUNG

Abstract

Biological cell niche comprises of biochemical and biophysical signals. An ideal biomaterial application should mimic the microenvironment and present the appropriate biochemical and biophysical cues such as topographies and rigidity to regulate cellular responses. Our research group is interested in studying the interfacial interactions of cells with the extracellular substrate and how to apply this knowledge to tissue engineering applications, such as small diameter vascular graft.

Synthetic small diameter (< 6 mm internal diameter) vascular grafts (sSDVG) are used in bypass of occluded peripheral arteries. However, there is a lack of commercially available, sSDVG that provides acceptable long-term patency. To improve clinical outcomes, it is necessary to enhance *in situ* endothelialization of sSDVG. Topographical cues may be used to affect the change by influencing the behavior of endothelial cells, such as increasing their migration and proliferation capacities. Our group has fabricated tubular scaffold of poly(vinyl alcohol) (PVA), which is a biocompatible and non-thrombogenic hydrogel, as a potential off-the-shelf small diameter vascular graft. We developed a surface modification strategy using fucoidan and luminal topography to enable fast *in situ* endothelialization of PVA. In a clinically relevant rabbit carotid artery end-to-side anastomosis model, 60% *in situ* endothelialization was observed throughout the entire lumen of 1.7 mm inner diameter modified grafts, compared to 0% of unmodified graft, and the four-week graft patency also increased.

The significance of the mechanical properties in intimal hyperplasia formation and the effect of sterialization of the vascular graft will also be discussed.

Biography

Evelyn Yim is a Professor and University Research Chair in the Department of Chemical Engineering at the University of Waterloo. She received her Ph.D. in the Biomedical Engineering at the Johns Hopkins University before performing undergoing her post-doctoral training at the Johns Hopkins School of Medicine and in the Department of Biomedical Engineering at Duke University. Between 2007 and 2015 Evelyn worked in Singapore, where she held a joint appointment from the National University of Singapore, as faculty in the departments of Biomedical Engineering and Surgery, and the Mechanobiology Institute Singapore, a Research Center of Excellence supported by the National Research Foundation Singapore, as a principle investigator. Evelyn joined the Department of Chemical Engineering at the University of Waterloo in 2016. Experienced with nanofabrication technologies and stem cell culture, Evelyn and her group are interested to apply the knowledge biomaterial-stem cell interaction to direct cell behaviors for tissue engineering applications.