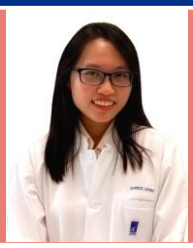
Bioprocessing Technology Institute
BTI

Macromolecular therapeutics for ischemia and infectious disease



Dr Eunice Leong
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20 January 2022, 11.00am
Host: Dr Ng Say Kong

Seminar Abstract

Stem cell transplantation has been a promising treatment for peripheral arterial diseases in the past decade. Pre-stimulated adipose-derived stem cells (ADSCs) have been proposed as potential candidates but have been met with challenges in activating their secretory activities for clinical use. For the first part of my talk, I will describe our approach to tether nanoparticles releasing tumor necrosis factor α (TNFα), named nanostimulator, on the ADSC surface to stimulate cellular secretory activity in situ. ADSCs tethered with these TNFα carriers exhibited up-regulated secretion of pro-angiogenic vascular endothelial growth factor and immunomodulatory prostaglandin E2 while decreasing secretion of anti-angiogenic pigment epithelium-derived factors. Accordingly, ADSCs tethered with nanostimulators promoted vascularization in a 3D microvascular chip and enhanced recovery of perfusion, walking, and muscle mass in a murine ischemic hindlimb compared to untreated ADSCs.

Separately, the global emergence of antibiotic resistance in pathogenic microbes is an immediate threat to human health. As antibiotic development has progressively declined over the past 20 years, there is an urgent need in seeking alternative approaches to combat these multi-drug resistant pathogens. Macromolecular antimicrobials kill bacteria and fungi through physical disruptions to the membrane or intracellular aggregation, which are difficult for microbes to gain resistance to. In the second part of this talk, I will present our findings from our study to design antimicrobial polymers that can be scaled up for their use as antiviral and antibacterial disinfectants.

About the Speaker

Eunice received her Bachelor of Engineering from the National University of Singapore and her Doctorate degree in Chemical Engineering from the University of Illinois at Urbana-Champaign. Her graduate work focused on integrating inflammatory stimuli with macromolecules to develop therapeutics for vascular-related diseases. In 2018, she joined Dr. Yiyan Yang's group at the Institute of Bioengineering and Nanotechnology to develop synthetic macromolecular therapeutics for cancer and infectious diseases. She was investigating the design requirements for anti-SARS-CoV-2 polymers before she transferred to the Animal Cell Bioprocessing group in December 2021.

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