

BME Spring 2024 Seminar Series

Bioengineering strategies to reprogram cells in vivo

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Abstract: My lab designs and deploys bioengineering strategies – including nanomedicines and gene therapies – to reprogram cell identity and/or cellular responses in living organisms. In this seminar, I will share examples of two distinct cell reprogramming directions pursued in my lab. First, I will present our most recent data that demonstrates that on and off expression of stemness-related transcription factors induces partial reprogramming of cardiac myocytes to a rejuvenated state. In a mouse model of heart failure, reprogramming the biological age of cardiac myocytes to a youthful state resulted in significant improvement of cardiac function. In the second example, I will focus on a nanomedicine approach to reprogram immune cells in the context of cancer immunotherapy. Here, we were able to demonstrate that a magnetic nanoparticle-based vaccine, including a model antigen and danger signal, induces a significant anti-tumor immune response both in vitro and in vivo, in mice.

Biography: Irene is an Assistant Professor of Biomedical Engineering at NYU Tandon School of Engineering and leads the NanoBioengineering for Tissue Reprogramming and Regeneration laboratory. Before joining NYU, she obtained a 5-year degree in Pharmacy at the University of Alcalá (Madrid, Spain) for which she received a National Award to the Excellence in Academic Performance (Spanish Ministry of Education, 2009), among several other honors. She then went to complete postgraduate studies in the UK, including an MSc in Drug Delivery and a PhD in Regenerative Medicine, both from the School of Pharmacy at University College London (UCL). Irene conducted postdoctoral training in Regenerative Therapeutics (2015-17) at The University of Manchester (UK) and in Bioengineering (2018-21) at Harvard University and the Wyss Institute for Biologically Inspired Engineering (USA), advised by Prof. David Mooney. She was appointed Research Associate at Harvard and the Wyss in 2021.

She has contributed to more than 30 publications in high impact journals including Nature Materials, Nature Nanotechnology, Science Translational Medicine, ACS Nano and Biomaterials, and secured research funding from Hong Kong University, LaCaixa Foundation, the Royal College of Surgeons of Edinburgh and the Engineering and Physical Sciences Research Council (EPSRC) of the UK. Irene has received several awards and prizes including prestigious Ramon y Cajal and Ikerbasque fellowships. She has been named a 2024 Emerging Investigator by the Nanoscale Journal (The Royal Society) and by the Cells, Organs, Tissues Journal.