



Using micro and nanotechnologies to direct mesenchymal stromal cell fate for tissue regeneration

A/Prof Jess Frith

Department of Materials Science and Engineering, Monash University
ARC Training Centre for Cell and Tissue Engineering Technologies, Monash University

11:00am, 16/03/2023

At the Melbourne Centre for Nanofabrication Boardroom

151 Wellington Road, Clayton, 3168

Zoom link: [click here](#)

Meeting ID: 843 6652 4045 and passcode: 870817



Using micro and nanotechnologies to direct mesenchymal stromal cell fate for tissue regeneration

A/Prof Jess Frith

Materials Science and Engineering, Monash University
ARC Training Centre for Cell and Tissue Engineering Technologies,
Monash University

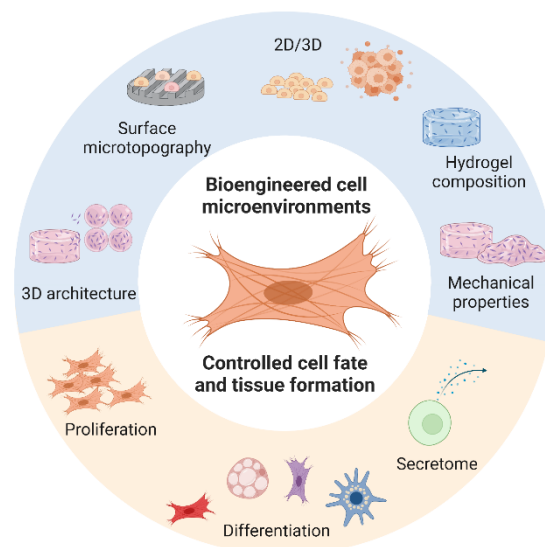
E: jessica.frith@monash.edu

W: <https://frithlab.com/>



Abstract:

Mesenchymal stromal cells (MSCs) show great promise for a wide range of applications including treating graft-vs-host disease, rheumatoid arthritis and cardiovascular diseases, as well as in tissue-engineering. This can be attributed to the direct differentiation of MSCs into the cells that form tissues such as bone or cartilage, or the activity of the factors that MSCs secrete which can have powerful regenerative properties. MSC properties are tightly regulated by cues from their surrounding microenvironment, including physical cues such as substrate mechanical properties, ligand presentation and architecture. Bioengineered systems therefore have a huge role to play in building essential understanding of how the cells respond to different physical cues, as well as in developing new technologies that harness these effects to promote tissue repair. Our research investigates the effects of physical stimuli on the properties and function of MSCs, including effects of substrate mechanical properties, surface micro and nano-topography and changes from 2D to 3D. We then apply this knowledge to improve the design of systems for MSC differentiation and tissue formation, for example, by delivering microRNA:nanoparticle complexes to modulate mechanosensitive signalling pathways in MSCs encapsulated in hydrogels and promote osteogenesis for bone tissue engineering.



Dr Jess Frith is an Associate Professor in the Department of Materials Science and Engineering at Monash University. She completed her PhD at the University of York (UK) in 2009 before joining the Australian Institute for Bioengineering and Nanotechnology at UQ where she broadened her skillset across biomaterials and tissue-engineering. In 2013 she was awarded an ARC DECRA and in 2017 received a Young Tall Poppy Science Award from the Australian Institute of Policy and Science. She has been at Monash University since 2015, where her interdisciplinary research group spans stem cell biology and tissue-engineering, using bioengineering approaches to understand how stem cells respond to the physical world around them and then apply this to regenerate damaged body tissues.