



Cells in their dynamic environment – implications for cell therapy and regenerative medicine

Speaker: Alicia El Haj, FEng, FRSB, Healthcare Technology Institute, Institute of Translational Medicine, School of Chemical engineering, University of Birmingham, UK

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Where: B2.36 – B2.38, Trinity Biomedical Sciences Institute

A variety of cell types respond and adapt to their mechanical environment. These mechanical cues are responsible for maintaining homeostasis, turnover and growth of developmental and adult tissues. Connective tissues are well known for their mechanical functions and a variety of cell types within these tissues have been shown to be mechano-responsive. Less is known about the mechano-responsive nature of adult or embryonic derived stem cells and the effects of mechanical cues on development and differentiation lineages. Our single cell analysis of the biomechanical properties of chondrocytes and the effects of the surrounding matrix in integrating the biomechanical responses demonstrates the challenges for tissue engineers for mimicking natural cell matrix interactions. Our 3D studies on cell populations seeded into scaffolds has begun to define the ways we can use bioreactor growth environments combined with biomaterial release mechanisms to influence mechano-transduction pathways and ultimately cell behaviour. Our research using magnetic nanaoparticles allows us to target specific mechano-receptors and control cell behaviour remotely.

The challenge lies in translating our findings into the clinical setting – can we use biomechanical cues/receptor tagging as therapeutic treatments and if so how? Regenerative medicine gives us a route to explore ways we can define new mechano-active therapies. This presentation will identify the role of physical cues in cell behaviour and maintaining the stem cell niche. The potential for utilising these biomechanical signalling cues ultimately in cell therapy will be presented.



Professor Alicia El Haj, FEng, FRSB, FEAMBES, Interdisciplinary Professor of Cell Engineering, joined the Healthcare Technology Institute in the Institute of Translational Medicine at Birmingham University, UK in September 2018. Previously, she has been the founding Director of the Institute of Science & Technology in Medicine at Keele University Medical School. She is a leading figure in Bioengineering and Regenerative Medicine and has been involved in bringing together interdisciplinary groups within biomedicine, physical sciences and engineering interested in aspects of cell and tissue engineering and regenerative medicine to move innovative new cell based therapies to the clinic. She has published over a 200 publications in novel tissue engineering approaches such as biomechanics, bioreactors, and imaging systems for the delivery of cell therapies to the clinic with funding from EPSRC, MRC, BBSRC, AR UK and ERC in the UK. She is also Director of a spin out company MICA Biosystems, Ltd involved in translating innovative in vitro pharma screening tools and stem cell control systems into clinical use.

She is Deputy Director of the MRC UKRMP Regen Med Hub and has been a Research Director of an EPSRC Doctoral Training Centre in Regenerative Medicine, and a co-director of the EPSRC Centre for Innovative Manufacturing Centre in Regenerative Medicine as well as a partner in ARUK Centre in Tissue Engineering and Regenerative Medicine as well as multiple EU programmes. Prof. El Haj is ex-Chair of the European Council for the Tissue Engineering & Regenerative Medicine International Society (TERMIS). She was awarded with a Royal Society Merit Award in 2014 and is a Fellow of the Royal Academy of Engineering in the UK. In March 2015, she was awarded the MRC Suffrage Award for her role in leading women in STEM.