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BIOENGINEERING

PRESENTS

Biomaterial scaffolds and stem cells for neural repair

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ABSTRACT:

Mechanical and physical forces play a significant role in regulating cell behavior and function and affect most cell types, including those of the central nervous system (CNS). Neural stem cells of the CNS differentiate into neurons, astrocytes, and oligodendrocytes, and physical forces such as substrate deformability and stretch influence the generation of these differentiated cells as well as their function. Since mechanical forces affect key CNS cells, many labs have focused on developing three dimensional deformable scaffolds that match the physical properties of CNS tissue and can be used to repair the brain and spinal cord after injury or disease. We've focused on injectable and compliant fibrin-based biomaterial scaffolds for CNS repair to modify the injured milieu and stimulate functional restoration. In recent work, we've tested combination hydrogels containing multiple biomaterials as scaffolds for human neural stem cells, with the future goal of using these scaffolds for cell transplantation since many transplanted cells die and inclusion of a scaffold can ameliorate cell death. Research from our lab and others has begun to shed light on how cells sense extracellular mechanical cues, including through the engagement of extracellular matrix binding integrins and plasma membrane stretch-activated ion channels. Deeper understanding of the effects of mechanical stimuli on neural cells will aid the further development of biomaterial scaffolds for neural repair.

BIOGRAPHY:

Dr. Lisa Flanagan is Associate Professor and Vice Chair for Research in the Department of Neurology at the University of California, Irvine (UCI), with joint appointments in Biomedical Engineering and Anatomy and Neurobiology. Dr. Flanagan's research combines neural cell biology and bioengineering to generate instructive three-dimensional scaffolds for neural stem cell transplantation and develop non-invasive methods to identify stem cell fate potential to improve the ability of these cells to repair the brain and spinal cord. Before joining UCI, Dr. Flanagan completed her Ph.D. at University of California, San Diego and post-doctoral training at Harvard Medical School in Boston, Massachusetts. She is a recipient of the National Science Foundation CAREER Award and serves on the Editorial Board for Scientific Reports.