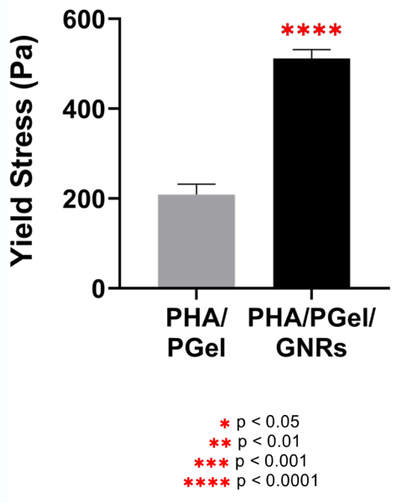
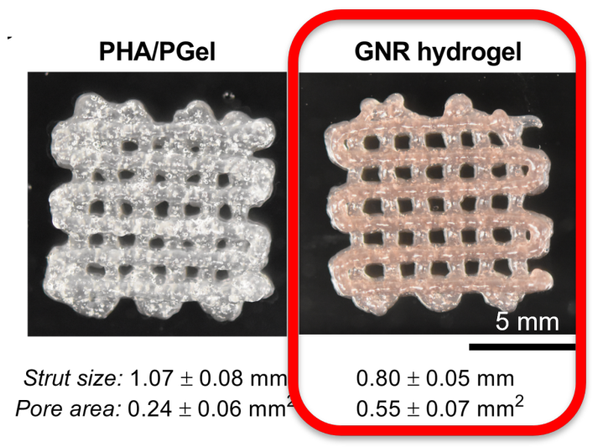
DEPARTMENT OF BIOMEDICAL ENGINEERING &
INSTITUTE FOR ENGINEERING-DRIVEN MEDICINE

2021 – 2022 Seminar Series

Paste-like Biomaterials for Regenerative Medicine





Michael Detamore
Director & Professor
Stephenson School of Biomedical Engineering
The University of Oklahoma
Norman, OK

Bioinks for bioprinting and injectable biomaterials share a common thread in fluid mechanics (rheology), where the flow properties of the material are crucial to its successful application. Beyond shear-thinning behavior, properties including yield stress and storage modulus recovery are important, and speak to the 'paste-like' quality of the material.

In cartilage injury, oftentimes the defects are irregularly-shaped and would benefit from an injectable material capable of crosslinking into a hydrogel. The challenge is to make sure the injected liquid does not leak from the defect (fluid mechanics) and then to have the integrity to allow weight-bearing activity after crosslinking (solid mechanics). Our team has developed materials based on cartilage matrix that possess a paste-like behavior prior to crosslinking, transitioning into high-stiffness gels after crosslinking, and with the advantage of potential bioactivity to induce cartilage regeneration of a patient's own bone marrow-derived stem cells.

Transitioning to spinal cord injury (SCI), contusion injuries are far more common than complete transection injuries, so an injectable biomaterial may be preferred over an already-formed scaffold biomaterial. In particular, we look to paste-like biomaterials to enhance rehabilitation strategies that have shown some degree of promise, in particular those that include electrical stimulation of the spinal cord. Our team has developed paste-like biomaterials that are electrically conductive and that appear to be safe in a rat SCI model.

Collectively, the injectable biomaterials in these vastly different clinical applications have gleaned lessons in rheology from the bioink field, which ultimately may facilitate the translation of these technologies to the clinic to improve patient quality of life.

Wednesday, September 1st @ 11:45AM

Zoom

Stony Brook University

Faculty Host: Yi-Xian Qin