Tuesday, November 21, 2017
4:30 – 5:30 p.m.
Marquis room (Scott Hall 5201)

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Fabrication and Evaluation of Biomedical Systems with Dissolvable Polymers

Abstract: In this talk, I will describe some of the biomedical research in my laboratory. Each project involves fabrication and evaluation of active or passive biomedical devices that include different dissolvable materials.

We will first discuss creation of tissue scaffolds with biomimetic topography and vasculature. Although tissue engineering has been a very active area for at least two decades, the lack of three-dimensional vasculature and biomimetic micro-topography limits the usefulness of engineered tissues. In this work, we will specifically consider engineered skin tissue.

Second, we will focus on ultra-miniature ultra-compliant neural probes. Neural probes are a critical component of brain machine interfaces. Successful chronic application of the prevailing neural probes is hindered by the foreign-body response of the brain tissue, resulting in formation of insulating glial scarring surrounding the electrodes, thereby preventing measurement of action potentials or electrical stimulation. As demonstrate in the literature, primary drivers of the glial scarring are the large size of electrodes and the strains between the tissue and the electrode arising from brain’s micromotion. In our work, towards addressing these critical issues, we developed a fabrication technique to create ultra-compliant ultra-miniature CMU probes, which are delivered using dissolvable microneedles. I will describe the fabrication of the probes and various assessments we have completed.

Third, I will discuss our work on transdermal bioactive-cargo delivery using dissolvable microneedle arrays (dMNAs). MNAs provide significant advantages over other routes of administrations of biocargo for a range of applications. We will first describe our patented process for fabrication of dMNAs and associated assessment on accuracy and reproducibility. Next, we will overview a number of different projects that use dMNAs for creating unique functionality.