SEMINAR:
Biomaterial systems with regulated temporal and spatial signal presentation for controlling stem cell behavior and tissue engineering

Wednesday, Feb. 3
1034 Emerging Technologies Building
2:40 p.m.

Tissue engineering holds the promise of producing functional biologic replacements to repair damaged and diseased tissues in the body. We use the complex signals that are implicated in tissue morphogenesis, repair and homeostasis as a template for the development of innovative biomaterial systems for tissue regeneration. Through the precise temporal and spatial presentation of soluble bioactive factors, mechanical forces, and biomaterial physical and biochemical properties, we aspire to create biomaterials and microenvironments that regulate cell gene expression and new tissue formation.

During today’s talk, I will first discuss some of our work with high-density stem cell systems that has exciting clinical potential for treating diseases such as osteoarthritis. By providing defined bioactive signals from within stem cell aggregates and sheets, it is possible to enhance chondrogenesis and osteogenesis without extensive in vitro culture for repair of cartilage and bone defects. Using this approach, modular building blocks may also be assembled to form more complex tissues such as the trachea.

In the second half of my talk I will describe our efforts to control the delivery of RNAi. We have engineered three-dimensional macroscopic biopolymer scaffolds to retain and protect RNAi locally and release it in a sustained and tunable manner to prolong its gene silencing effect on transplanted cells and on cells directly at the site of interest for tissue engineering and cancer therapeutics.