

Biomechanics of soft tissue and cells and the links to tissue engineering

Abstract:

Osteoarthritis (OA) is a painful joint disease that affects one out of ten Canadians, and the incidence rate increases with age. OA patients suffer from a degraded quality of life as their mobility becomes limited by swelling and stiffness of their joints. Effective treatment of OA is lacking due to the complex nature of the disease that involves mechanical, metabolic, inflammatory and genetic factors. Degeneration of articular cartilage is thought to play a crucial role in OA, but current medical technology is unable to repair and restore the function of a degenerated cartilage. Understanding how the disease starts, and the role of structure and composition of cartilage in the onset and progression of OA may facilitate the development of targeted therapeutic strategies. One of the key components of cartilage is its cells, which are the only active members within the tissue for maintenance of healthy cartilage. In this research seminar, I will provide a glimpse of my life as a science detective in identifying the root cause of cell death during fast impact loading. From there, I will highlight the importance of understanding the biomechanics of tissue and cells in aiding the development of a promising tissue engineering approach for the repair of diseased articular cartilage.

Short bio:

Dr. Eng Kuan Moo is a trained biomedical engineer who is interested in understanding the structure-composition-function relationship and cell-tissue interaction in soft connective tissues. The soft tissues of interest are primarily articular cartilage and skeletal muscle. Dr. Moo answers his research questions through carefully designed in vitro, in situ and in vivo experiments and theoretical modelling. By understanding how mechanical forces are transduced through multiple geometric scales to the cells and how cells interact with their native environment, he hopes to apply the accumulated knowledge in the field of tissue engineering with the ultimate goal of bio-fabricating a viable and functional tissue substitute for patients who suffer from soft tissue injuries/diseases. Dr. Moo is currently a senior researcher at the University of Eastern Finland and a Marie Skłodowska-Curie fellow. His primary project at the moment is to develop a computational model to predict the growth of a tissue engineered construct.