FLORIDA INTERNATIONAL UNIVERSITY
Biomedical Engineering Institute

# Biomedical Engineering

## *Lecture Series Seminar*

### Tissue Engineering of Skeletal and Cardiac Muscles

Models for bridging basic research and translational application

Thursday, May 15, 2008

3:00 PM
EC 2300


***Yen-Chih Huang, PhD***



Regenerative medicine, an interdisciplinary field, is still in the early stage of development, but holds a great promise to develop more efficient and effective therapies for current untreatable diseases such as heart failure and diabetes. And tissue engineering is the core technique in regenerative medicine. By integrating the principles and tools from biology and engineering, tissue engineering enables scientists to make the replacements in the laboratory for restoring, improving, or augmenting the functions of injured tissues and organs. In this presentation, the models of tissue engineered skeletal and cardiac muscles will be used to demonstrate their potentials in basic researches and translational applications. By taking the advantages of fibrin hydrogels with high biocompatibility and fast degradation, engineered skeletal and cardiac muscles could self-organize into three-dimensional muscle tissues in 10 days and maintain their functionality for months. From the evaluation of contractile functions, engineered muscles exhibit the characterizations of native muscles such as length-tension and force-frequency relationships, and respond to the external stimulations. Thus the effects of electrical and mechanical interventions as well as the muscle cell sources on the functions of engineered muscles will be explored. In addition, the development and application of novel biomaterials for muscle tissue engineering will be addressed. The first example is the biomimetic crosslinking of fibrin by genipin that is developed for improving the mechanical properties and controlling the degradation. Cardiac patches based on genipin crosslinked fibrin will be shown to use for *in vivo* transplantation study. The second example is to present a novel biodegradable polyester elastomer developed for musculoskeletal and cardiovascular tissue engineering. In conclusion, tissue engineered skeletal and cardiac muscles not only represent useful models to explore the underlying molecular and cellular mechanisms of muscle physiology, but also exhibit great potential to investigate the translational applications of functional engineered muscle tissues.