NJIT New Jersey Institute of Technology

BME

Department of Biomedical Engineering
Graduate Seminar

Date	Location	Time
Wednesday, March 11th	Fenster Hall 698	11:00 AM

Valerie Tutwiler, Ph.D
Postdoctoral Research Fellow
Department of Cell and Developmental Biology
University of Pennsylvania

Subject- Blood clot structure and mechanics in health and disease

Abstract: Thrombotic conditions such as heart attacks and strokes are leading causes of death and disability worldwide. Clot contraction, which is the volume shrinkage of the blood clot, has been implicated to play a role in hemostasis, wound healing, and the restoration of blood flow past otherwise obstructive thrombi. Despite these clinical implications, clot contraction is the least studied area of the coagulation process, which can be largely attributed to a previous lack of methodology. To address this need we developed a novel optical tracking system that allows for the quantitative assessment of the kinetics of clot contraction. Coupling this technique with mathematical modeling, multi-scale imaging, and mechanical testing provides a holistic picture of the process of blood clot contraction. We determined that clot contraction is influenced by the composition of the blood and functionality the blood cells. We have shown that during the contraction process the red blood cells are compressed into the core of the blood clot forming a tessellated network whereas the platelets and fibrin redistribute to the periphery of the clot. Moreover, patients with thrombotic conditions such as ischemic stroke and venous thromboembolism have an altered extent and rate of clot contraction when compared to healthy individuals. Through the use of tensile testing we probe how the fibrin network is able to resist breakage, or embolization, a deleterious complication of thrombosis. Ultimately, once a clot has performed its physiological role it needs to be resolved through a process known as fibrinolysis. We determined that the extent of clot contraction influences the rate of both physiologic fibrinolysis and clinical lysis. Collectively, these findings provide new information about basic mechanisms of clot contraction and point to its importance with respect to thrombotic conditions. In addition, these findings have the potential to lead to the development of diagnostic assays or therapeutic targets in bleeding and thrombosis.

Light refreshments will be served.