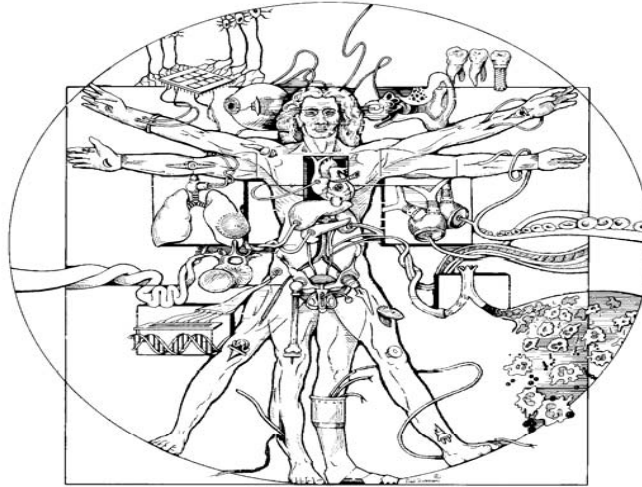


Biomedical Engineering Seminar



Doctoral Defense of
Renata Ramos, Ph.D. Candidate
University of Arizona

“Evaluation of the Effects of Cyclic Ocular Pulse on Conventional Outflow Tissues”

Abstract: *In vivo*, biomechanical stress plays an important role in tissue physiology and pathology, affecting cell and tissue behavior. Even though conventional outflow tissues are constantly exposed to dynamic changes in intraocular pressure (IOP), effects of such biomechanical stressors on outflow tissue function have not been analyzed. In particular, changes in IOP with each heartbeat have been measured in human eyes approximating 2.7 mmHg/sec. The purpose of this dissertation is to determine the effect(s) of ocular pulse on conventional outflow tissue regulation and the effect that contractility plays in this mechanical stress-mediated response. The central hypothesis directing this research is that *cyclic intraocular pulsations (i.e. ocular pulse) play a significant role in conventional outflow facility*. In order to address our hypothesis we studied the effect of biomechanical stressors on conventional outflow physiology using three different strategies: (1) by comparing conventional outflow endothelial cells to blood and lymphatic capillary endothelia, we gained a better understating of the effects of biomechanical stress on conventional outflow tissue physiology, (2) by modifying the anterior segment perfusion model, we were able to measure the effect of ocular pulse on conventional outflow facility, and (3) by exposing trabecular meshwork cell monolayers to cyclic biomechanical pressure oscillations in the presence of compounds know to affect trabecular meshwork contractility, we were able to analyze the effect of rho-kinase mediated contractility on the ocular pulse-associated response. Perfused human and porcine anterior segments showed a significant ocular pulse-mediated decrease in outflow facility; in addition, perfused trabecular meshwork monolayers showed an increase in intra-chamber pressure when exposed to cyclic pressure oscillations. This effect was blocked by Y27632 inhibition of rho-kinase-mediated contraction. In conclusion, the work shown in this dissertation demonstrates for the first time that trabecular outflow tissues are capable of responding to a physiologically-relevant cyclic biomechanical stress. This response can be observed as an increase in outflow resistance that translates to lower baselines in outflow facility of anterior segments and lower hydraulic conductivity of trabecular meshwork monolayers. In addition, we concluded that the observed ocular pulse-mediated response of trabecular meshwork cells is regulated by rho-kinase-induced contractility.

Tuesday, February 26th, 2008

1:00 p.m.

MRB 102

Host: W. Daniel Stamer, Ph.D. (626-7677)

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