Public Abstract

First Name:Shenghua

Middle Name:Yuan

Last Name:Sinkler

Adviser's First Name:Steven

Adviser's Last Name:Segal

Co-Adviser's First Name:

Co-Adviser's Last Name:

Graduation Term:SP 2016

Department:Physiology (Medicine)

Degree:PhD

Title:ATTENUATION OF RAPID ONSET VASODILATION WITH ADVANCED AGE: ROLES OF ADRENERGIC AND ENDOTHELIAL SIGNALING

Rapid onset vasodilation (ROV) occurs immediately in response to skeletal muscle contraction and initiates a prompt increase in blood flow and oxygen delivery that facilitate the transition to exercise. Muscle blood flow is attenuated during aging which limits physical activity. Understanding the mechanisms that attenuate ROV requires invasive measurements that cannot be performed in human subjects. Published studies indicate that the effects of aging on muscle blood flow are similar in mice and in humans. Using our established mouse model to study the actual blood vessels that control blood flow in living skeletal muscle, the focus of my research is to understand where and how aging affects ROV in light of enhanced sympathetic nerve activity and endothelium dysfunction. A mouse was anesthetized and a skeletal muscle was prepared for studying individual microvessels using a microscope. The muscle was stimulated to contract with the amount and speed of vessel opening (vasodilation) recorded. I used selective interventions to modulate sympathetic or endothelial function and compared ROV for each vessel branch between Young (4 months) and Old (24 months) mice to resolve the effects of aging. I found that sympathetic activation attenuates ROV and that endothelium is integral to ROV. Thus, enhanced sympathetic nerve activity and endothelium dysfunction with aging attenuates ROV. These effects are greater effects in larger upstream vessels, which can restrict blood flow into active muscles. My research provides new insight for improving muscle blood flow, thereby promoting physical activity to improve the quality of life for aging individuals.