

EFFECTS OF ADRENORECEPTOR ACTIVATION AND AGING ON SKELETAL MUSCLE
ARTERIOLES AT REST AND DURING RAPID ONSET VASODILATION

Alex W. Moore
Dr. Steven S. Segal, Dissertation Supervisor

ABSTRACT

Sympathetic nerve activity (SNA) induces arteriolar vasoconstriction via α -adrenoreceptor (α AR) activation. Whether α AR activation affects the spread of rapid onset vasodilation (ROV) in contracting muscle is unknown. Differential α AR distribution in vascular smooth muscle has been proposed to mediate functional sympatholysis, however the α AR subtype distribution in locomotor muscle is undefined. This dissertation determined: 1) the effects of constitutive α AR activation on the spread of ROV within contracting muscle, 2) the functional α AR distribution in locomotor muscle of the mouse, and 3) the influence of α AR on ROV during aging. In arterioles of the gluteus maximus muscle (GM), I tested the hypotheses that: 1) adrenoreceptor subtype distribution is heterogeneous and 2) adrenoreceptor activation modulates the spread of ROV. The left GM of young (3-month) anesthetized C57BL/6 mice were studied using intravital microscopy. Distinct anastomotic, 1A, 2A, and 3A arterioles were studied at rest and following single muscle contraction in the presence or absence of topical α AR agonists and antagonists. Functional α AR distribution differed between proximal and distal arterioles. Constitutive α AR activation inhibited the spread of ROV between regions of the GM. It also reduced the amount of ROV seen in old (~20-month) versus young male mice. I conclude that functional α AR are heterogeneously distributed in arteriolar networks and serve to modulate regional vasodilation.