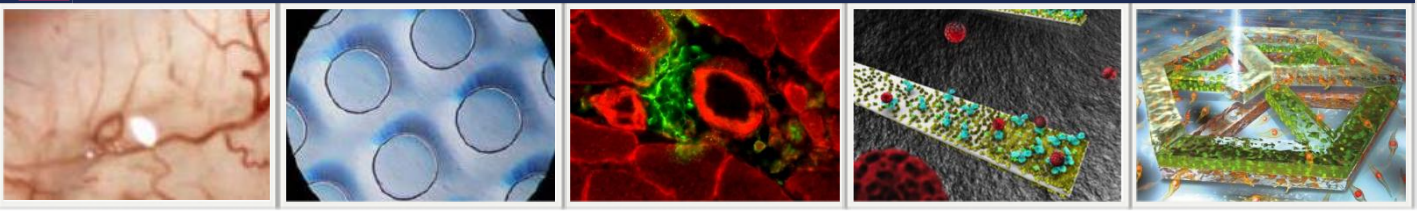
BioNanotechnology Seminar Series

Spring 2012



Mesenchymal Stem Cells Contribute to Vascular Growth in Skeletal Muscle in Response to Eccentric Exercise

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Date: **Tuesday, February 21, 2012**

Time: **12:00 – 12:30 p.m. CST (10:00 – 10:30 a.m. PST)**

Location: **1000 MNTL at Illinois (SSM 150 at UC Merced)**

Abstract:

Tissue health is critically dependent on vascularization to support growth and function following injury. In addition to multiple implications in the regenerative potential of other tissues, mesenchymal stem cells have been shown to promote vessel formation both *in vivo* and *in vitro*. Our recent work has established that transgenic overexpression of the α7 integrin in skeletal muscle (α7Tg) can enhance the presence of Sca-1^{+}CD45^{-} mesenchymal stem cells (mMSCs) which facilitate myogenesis. PURPOSE: The purpose of this study was to determine the extent to which angiogenesis is increased in α7Tg muscle following acute or repeated bouts of eccentric exercise and elucidate a role for mMSCs in this event. METHODS: mMSCs were isolated from α7Tg muscle by fluorescent activated cell sorting (FACS) and pericyte markers were examined by flow cytometry. Wild type (WT) and α7Tg mice (5 wk) were subjected to single or multiple bouts (3x/wk, 4 wks) of downhill running exercise. Additionally, DiI-labeled mMSCs were injected into WT mice. Measures of angiogenesis and vessel growth were evaluated by immunohistochemistry. RESULTS: A large percentage of isolated mMSCs were positive for pericyte markers. DiI-labeled mMSCs injected into WT muscle migrated to the vascular niche and incorporated directly into vessels. Although capillary:fiber ratio, capillary density and tortuosity index did not increase, the number of large vessels was significantly increased in α7Tg muscle following single and repeated bouts of exercise ($p<0.05$; 3-fold for repeated bouts) and in WT muscle receiving mMSC transplantation ($P<0.05$; 48%). CONCLUSION: This study demonstrates that mMSCs contribute to vascular growth in skeletal muscle in response to eccentric exercise, and that this adaptation is coordinated with increased myogenesis previously reported. Well-orchestrated responses similar to this may be a key mechanism in the successful regeneration of several tissue types.

Seminar Presented by:

Center for Cellular Mechanics
University of Illinois at Urbana-Champaign

IGERT Integrative Graduate Education and Research Traineeship
Cellular and Molecular Mechanics and BioNanotechnology

M-CNTC NCI Alliance for Nanotechnology in Cancer
Midwest Cancer Nanotechnology Training Center

CNST University of Illinois Center for Nanoscale Science and Technology