

MATERIALS AND BIOMATERIALS SCIENCE AND ENGINEERING

Tip-specific Endothelial Cells Induction in vitro and Their Role in Matrix Remodeling During Angiogenesis

ABSTRACT: Peripheral arterial disease is caused by blockages in blood flow to the lower extremities and can lead to critical limb ischemia, limb amputation, and mortality. Promoting the growth of new blood vessels and angiogenesis in ischemic limbs is a promising treatment strategy that could be accomplished by either 1) activating microvascular endothelial cells (ECs) to convert into sprouting ECs, called tip-specific ECs with distinct polarized morphology, or 2) delivering tip-specific ECs directly into the ischemic limb. However, tip-specific EC with filopodia protrusions has only recently been recognized as a distinct cell type lacking canonical markers in human tissues, and no success in isolating this highly angiogenic cell type. In this study, human umbilical vein endothelial cells (HUVECs) were treated with two main pro-angiogenic growth factors, vascular endothelial growth factor (VEGF) and basic fibroblast growth factor (bFGF), and sorted based on DLL4⁺ expression. RT-qPCR results show putative tip-EC markers such as CD143, PLAUR, and CD93 in the DLL4⁺ population with VEGF treatment. Understanding tip-specific ECs' gene signature upon induction will reveal new approaches in developing therapies for angiogenesis-associated diseases such as critical ischemic limb.

BIOGRAPHY: I am a fourth-year PhD candidate in Tissue Engineering at MBSE, and a multidisciplinary researcher with a foundation in materials science. After earning a Bachelor of Science in Materials Science and Engineering from Iran, I spent a decade in the solar energy industry, where I contributed to the implementation of more than 600 MW solar projects in Iran. Building on this industrial experience, I obtained a master's degree in Materials Science and Processing for Sustainable Energetics (cum laude) from Tallinn University of Technology and Tartu University. My research focused on Estonian phosphate beneficiation via froth flotation and the recovery of rare earth elements, furthering innovations in resource efficiency. Currently, I am a fourth-year PhD candidate in Tissue Engineering at MBSE, where I investigate the roles of tip-specific endothelial cells in sprouting angiogenesis and matrix remodeling.



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Refreshments: 1:45pm, Seminar: 2-3pm