Title: The Dynamic Vascular Endothelial Glycocalyx: Fundamentals and Clinical Relevance

Abstract: The Ebong research lab studies how the mechanical forces of blood flow affect endothelial cells, which line the blood vessels and guard them from disease conditions like atherosclerosis and cancer metastasis. Much of the focus is on studying the structure and function of the protective gel-like layer of sugar molecules and proteins coating the surface of the endothelial cells—called the glycocalyx—to understand, on a molecular level, how mechanobiology remodels the endothelial cells to facilitate protection from disease. This glycocalyx structure gives fragile arteries the resilience they need to withstand the raucous fluid environment coursing through them, especially at the branch points where plaques are most prevalent. Glycocalyx sheds in the presence of disease, so it is of great interest to study how gradual glycocalyx degradation initiates and/or promotes pathological remodeling that leads to atherosclerotic lesion or secondary tumor formation. The Ebong lab constructs in vitro systems comprising fluids and mammalian endothelial cells, to replicate both healthy and disruptive blood-flow conditions and to uncover the intricacies of the flow-glycocalyx-endothelial cell relationship. This work is combined with live animal studies to assess the validity of the findings, in real disease conditions. The long-term goal is to leverage mechanobiology, endothelial cells, and the glycocalyx to develop clinically relevant therapies and reverse the progression of disease.

Biographical Sketch: Dr. Eno Essien Ebong earned her S.B. (1999) in Mechanical Engineering from the Massachusetts Institute of Technology in Boston, MA in 1999 and her M.Eng (2001) and Ph.D. (2006) in the area of biomechanics from the Department of Biomedical Engineering at Rensselaer Polytechnic Institute in Troy, NY. She was a National Institutes of Health Cardiovascular Research Fellow (2007 to 2012) at the Albert Einstein College of Medicine in New York, NY. Currently, Dr. Ebong is an Associate Professor of Chemical Engineering, Bioengineering, and Biology at Northeastern University. She recently received the prestigious NSF CAREER Award, for her “EMBRACE STEM (Endothelial MechanoBiology Research And multiCultural Education in STEM)” project. She was previously awarded the NIH Mentored Research Career Development Award (K01), for studying "Atheroprotective vs. Atherogenic Glycocalyx Mechanotransduction Mechanisms.”