

“Clinical translation of engineered microsystems in hematology”

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Wilbur A. Lam, MD, PhD is a physician-scientist-engineer and clinical pediatric hematologist/oncologist. He is the W. Paul Bowers Research Chair of Pediatrics and Biomedical Engineering at Emory University and Georgia Tech and an attending physician at the Aflac Cancer and Blood Disorders Center of the Children's Healthcare of Atlanta. His laboratory focuses on developing microsystems to study and diagnose hematologic diseases including sickle cell disease, thrombotic/bleeding disorders, and leukemia. He is also principal investigator of the Atlanta Center for Microsystems Engineered Point-of-Care Technology (ACME POCT), an integral part of the NIH's Point-of-Care Technologies Research Network (POCTRN) and RADx COVID-19 initiative.

ABSTRACT

Hematologic processes are frequently comprised of cellular and biomolecular interactions that are biophysical in nature and may involve blood cells (erythrocytes, leukocytes, and platelets), the vascular endothelium, soluble factors (coagulation proteins, von Willebrand factor, and cytokines), the hemodynamic environment, or all of the above. These phenomena are often pathologically altered in hematologic diseases and are difficult to study using standard in vitro and in vivo systems. With the capabilities to dissect cellular and biomolecular phenomena at the micro to nanoscales with tight control of the mechanical and fluidic parameters, micromechanical and microfluidic systems can provide new insight into key aspects of hematology. For example, the capability of using microsystems to study biology at the single cell level enables the quantitative investigation of how the mechanical and physical microenvironment affects platelet physiology and biophysics. Using micromechanical systems, we have characterized platelet contraction, a poorly understood biophysical aspect of clotting, at the single cell level and have demonstrated that platelet contraction force is not only dependent on microenvironmental mechanical and biochemical cues but may also function as a clinical biophysical biomarker to aid in the diagnosis of bleeding disorders. In addition, using single cell micropatterning techniques to study single platelets, we have demonstrated that platelets mechanosense and physiologically respond to the geometry and physical properties of their microenvironment. Microfluidic systems also enable the quantitative study of hematologic and vascular phenomena under tightly controlled hemodynamic conditions. Using microfluidic techniques, we have developed “endothelialized” microvasculature models of blood diseases to and to function as novel drug discovery and diagnostic assays. By developing state-of-the art microdevices to answer hematologic questions, microsystems engineering has the potential to significantly advance our understanding of blood disorders and to develop novel diagnostics and therapeutic targets for patients afflicted with those potentially life-threatening diseases.

**Friday, April 16th
12:00 Noon**

Seminar will be presented virtually via Zoom:

<https://go.unc.edu/j5W3E>