Northeastern University
College of Engineering

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Distinguished Seminar Speaker

Multiscale Mechanoimmunology: From Molecular Mechanisms to Precision Therapies

Kolade Adebowale Ph.D.

Incoming Assistant Professor at UC San Diego Bioengineering | Postdoc @ Harvard SEAS and Wyss Institute

Abstract: Multiscale Mechanoimmunology: From Molecular Mechanisms to Precision Therapies Therapeutic immune cells have the potential to treat complex diseases. Some therapies, such as CAR T cells, are effective against blood cancers but are not effective against solid cancers, which comprise about 90% of adult cancers. A key requirement of the role of therapeutic cells in tumor eradication is their ability to migrate to and infiltrate the tumor. To accomplish this, cells navigate various mechanoimmunological factors, such as tissue viscoelasticity. One consequence of viscoelasticity is time-dependent stress relaxation - a decrease in stress in response to applied deformation. However, the mechanisms by which viscoelasticity regulates migration are not fully understood. In addition, limited studies have quantitatively compared the transport of cell therapies in tissue-like environments. My research aims to address these research gaps. To address the potential role of viscoelasticity on 3D cell migration, I developed hydrogels that mimic the stress relaxation behavior of native tissues. I found that enhanced stress relaxation potentiates monocyte migration. Mechanistically, our data support a model whereby WASP-mediated actin polymerization generates physical force at the leading edge of the cell to generate micron-sized channels for cells to migrate through. In a separate project, I integrated macrophage phenotype and morphometric transitions. Together, our studies establish a platform to determine the role of mechanical cues in shaping the immune response and to leverage fundamental mechanisms to enable the rational design of "living drugs."

Biography: Kolade Adebowale will join the Shu Chien-Gene Lay Department of Bioengineering as an assistant professor in Spring 2025. Dr. Adebowale received his Ph.D. from Stanford University in 2021 under the guidance of Professor Ovijit Chaudhuri. Dr. Adebowale is a postdoctoral fellow with Professor Samir Mitragotri at Harvard University. While at Stanford, Dr. Adebowale received the NSF GRFP, a Stanford Graduate Fellowship, and an NIH F31 grant. At Harvard, Dr. Adebowale was awarded an NSF Ascend – MPS postdoctoral fellowship and was an NIH MOSAIC K99/R00 scholar. Dr. Adebowale's main research areas are biomaterials, mechanobiology, and immunology. He seeks to integrate engineering design principles in cancer immunology to enable rational engineering and prediction of effective, next-generation immune cell therapies. Furthermore, Dr. Adebowale strives to understand how the complex functionality of the immune system arises from mechanical cues and simple biophysical principles. Dr. Adebowale is excited to teach and mentor the next generation of scientists and engineers.

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