THE OHIO STATE UNIVERSITY

The William G. Lowrie Department of Chemical and Biomolecular Engineering Graduate Program

Cordially invites you to attend a seminar on

Microfluidic Platforms to Quantify Immune Cell Decision-Making Phenotypes

Caroline N. Jones, Ph.D.

Assistant Professor
Department of Bioengineering
University of Texas at Dallas

Thursday, October 1st, 11:30 AM

Zoom Webinar URL:
https://osu.zoom.us/j/99202885175?pwd=OEszVGhPbTcxbjRGZngveGhmRnV5UT09
Password: 320327

Bio

Caroline N. Jones received her B.S. in Biological and Environmental Engineering from Cornell University in 2002. She developed pathogen biosensors with Antje Baeumner at Cornell University and received her M.Eng. in 2003. She did her graduate work on engineering cellular microenvironments with Alexander Revzin, receiving a Ph.D. in Biomedical Engineering from University of California, Davis in 2010. She completed her postdoctoral training in Bio MEMS, neutrophil cell migration and inflammation with Daniel Irimia and Mehmet Toner at the Center for Engineering in Medicine of Massachusetts General Hospital and Harvard Medical School, where she was a Ruth L. Krischstein-National Service Research Award Training Grant research fellow. From 2015-2020 she was an Assistant Professor in the Department of Biological Sciences at Virginia Tech. She recently moved her laboratory and is an Assistant Professor in the Department of Bioengineering at the University of Texas at Dallas where she is continuing her research focused on engineering microfluidic devices to quantify immune cell phenotypes. In 2019, she was awarded the NIH NIGMS Maximizing Investigators' Research Award (MIRA R35 for Early Stage Investigators) to measure septic patients' immune signatures.

Abstract

There are over ten trillion cells in the human immune system. Revolutionary single-cell technologies have led to the profound discovery that there is more heterogeneity within specific immune cell populations than previously thought. The Jones laboratory focuses on engineering novel microfluidic platforms to enable fundamental research on the dynamics of immune-pathogen interactions with single-cell resolution. This work is interdisciplinary involving aspects of microfabrication, surface engineering, biomaterials, biosensors, computational modeling, and immunology/molecular biology to define and quantify principal factors that underlie the decision-making processes of immune cell migration, differentiation and activation in response to challenges. Dr. Jones will present three research themes from her laboratory:

1) **Lab-on-a-chip platforms to detect immune cell dysfunction during sepsis.** We recently reported on an innate immune cell "priming" paradigm where pre-treatment with super-low doses of lipopolysaccharide was shown to significantly dysregulate neutrophil migratory phenotypes. We are currently using this same microfluidic technology to quantify innate immune cell function in human septic patients.
2) **On-chip biosensors to study immune cell-pathogen interactions with single-cell precision and to screen novel immunotherapies**. We have developed several biosensors to detect hallmark inflammatory mediators, such as elastase and ICAM expression, with single cell resolution. We use this to screen and evaluate the mechanisms of novel immunotherapies.
3) **3D hydrogel platforms to precisely control and quantify the effects of the microenvironment on cell phenotypes.** We have engineered heparin hydrogels with solid-phase presentation of growth factors to precisely define and tune the cellular microenvironment.

The engineering tools developed in the Jones Laboratory, can be applied to study basic mechanisms and roles of immune cells in inflammatory disorders, including sepsis and cancer. Immunotherapies are also on the cutting-edge of treating many diseases. The devices created in the Jones Laboratory will be able to screen and evaluate the basic mechanisms of therapies in a high-throughput manner as well as monitor patient immune response.