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Coronavirus: Entry and Infection from an Interdisciplinary View

Coronavirus (CoV) represents a serious public health concern because it infects a wide range of animals and has no readily available countermeasures when it emerges in humans and causes serious disease. Notable outbreaks in the human population are severe acute respiratory syndrome (SARS)-CoV (2002-2003), Middle East respiratory syndrome (MERS)-CoV (2012-present), and most recently, SARS-CoV-2/COVID-19, which has highlighted just how underprepared we are as a society to deal with these emerging viruses. There are two main ways to impede infection: 1) vaccinate to condition the immune system to recognize the virus, and 2) use antiviral strategies to interrupt some aspect of the infection process. For the first one, development of a vaccine takes more than 18 months and is not appropriate for rapid response to an emerging pandemic; furthermore, virus evolution requires continual boosting of immune system with updated formulations. The second strategy can potentially respond more quickly because there are many places to interrupt the virus infection process. However this requires a more extensive knowledge of the biological processes the virus uses to gain entry into the host cell. In this presentation, I will cover the basics of enveloped virus entry, with a focus on virus life cycle. Then, I will focus in on the aspects of CoV biology and life cycle that make it both unique and rich with opportunities to exploit for antiviral development. In particular, I will focus on our recent work on the impact of calcium ions on CoV entry and the exploration of calcium-blocking drugs to reduce infection. Next, I will highlight recent work on antibody development against the membrane fusion machinery the virus uses to deliver its genome into the host cell. I will highlight approaches and knowledge gained across a wide variety of disciplines that have been necessary to help us understand this virus, and will continue to be integral to solving the challenges we currently face with it and viruses yet to emerge.

FAMU-FSU DEPARTMENT OF
CHEMICAL & BIOMEDICAL
ENGINEERING

Fall 2020

GRADUATE SEMINAR SERIES

Where:

Zoom

When:

Friday, September 4th,
2020 at 11:00am

Susan Daniel

Susan Daniel is an Associate Professor at the Robert Frederick Smith School of Chemical and Biomolecular Engineering at Cornell University. She leads a research group of biomolecular engineers working to understand cell membrane functions and the biological processes that happen within them. Her group pioneered the use of “cell-free” biomembrane platforms for re-creating cellular processes on chip, in particular, her group has devoted over a decade using these platforms to understand virus interactions with host cell surfaces and the entry process of membrane enveloped viruses, like coronavirus. Much of the work they do has impact in human health or advancing biotechnologies for the good of humankind. Susan and her group’s research has garnered a number of scientific recognitions. Susan is the elected Chair of the Gordon Research Conference on Bioanalytical Sensors for 2022. She is the recipient of a National Science Foundation CAREER award (2011), the Schwartz Life Sciences award (2016), and in 2017, Susan was honored with the College of Engineering’s Research Excellence Award. Six of her students received NSF Graduate Research Fellowships, and several others have been honored with prestigious fellowships including Howard Hughes Medical Institute Gilliam Program, Sloan Foundation, and participation in esteemed NIH-funded training grants.

Susan believes that greater access to education for all people leads to more diverse perspectives and greater creativity, which are essential to pursue her research topics. She is committed to the promotion of inclusive and empowering environments in all aspects of education, but especially the STEM fields. Susan was the Director of Graduate Studies in her department from 2016-2019. During her tenure, she took the bold position that she could meet demographic parity and still maintain graduate student quality, which she achieved. Susan served as the faculty advisor for the Chemical and Biomolecular Engineering Graduate Women’s Group (CBE Women) for 12 years. This group provides professional development and leadership opportunities to graduate students to complement their technical graduate education. In 2018, she founded CBE’s Diversity and Inclusion Program to educate and inform members about inclusive practices and to build an enriching environment for all - from the classroom to the lab. Susan’s efforts have been recognized with the Denice Denton Emerging Leader Award (2012), the Zellman Warhaft Commitment to Diversity Award (2014), the Alice H. Cook award (2015). In 2016, she was selected to the shortlist of the international GEDC/Airbus Diversity Award for her outreach program (called WOMEN) for 10th grade girls and their families from rural upstate New York communities, which has occurred annually since 2010. Susan lives on campus with her family as the faculty-in-residence for Balch Hall for freshmen students. In this role she provides educational programming and intellectual engagement activities for a hall of 445 women.

Susan holds a BS, MS and PhD from Lehigh University and conducted her post-doctoral work at Texas A&M University in the Department of Chemistry.