"Complexity in the Chemistry and Physics of Lipid Membranes as a Handle to Activate the Delivery of Cargo to Cells"

Wednesday
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3:00 pm
Wu and Chen Auditorium
Levine Hall

Cecelia Leal
Associate Professor
of Materials Science and Engineering
University of Illinois at Urbana-Campaign

Abstract

Lipid materials having nanostructures that deviate from the conventional flat bilayer arrangement such as hexagonally packed lipid tubes and bi-continuous cubic phases are ubiquitous in nature. Their role remains elusive but over the years several pathologies and organelle functions have been coupled to lipid membrane structural complexity. In this talk, we will discuss lipid membrane polymorphism and how it can be exploited to generate a new class of materials for the delivery of cargo to cells. We combine a number of techniques including X-ray scattering, cryo-EM, and cell culture to demonstrate that the structure of lipid nanoparticles is a powerful handle to boost the delivery of genes to cells. The simple argument that non-lamellar phases having intertwined nanoscale channels exist to increase surface-to-volume ratio might be insufficient to completely describe the experimental findings.

If there is time, we will also introduce the concept of soft-material alloys. Lipids and polymers can mix in hybrid membranes having synergistic dynamical and structural properties; many of which are seen in lipid-protein membrane systems in nature

Bio

Cecilia Leal is an Associate Professor of Materials Science and Engineering (effective August 2019) and is affiliated with the Materials Research Laboratory and the Beckman Institute at the University of Illinois at Urbana-Champaign (UIUC). She received a M.S. in Industrial Chemistry from the University of Coimbra in Portugal and a PhD in Physical Chemistry from the University of Lund in Sweden. Cecilia was a Swedish Research Council postdoctoral fellow in Materials Science at the University of California in Santa Barbara before she started her appointment at UIUC in 2012. Her research interests lie at the intersection of materials science and physical chemistry with a focus on soft materials relevant in biology. Cecilia is the recipient of the 2019 UIUC Office of Provost Distinguished Promotion Award, the 2018 UIUC College of Engineering Dean's Award for Excellence in Research, the 2016 NSF CAREER Award, and the 2016 NIH Director's New Innovator Award.

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