School of Molecular Sciences
Arizona State University

SMS Fall 2023 Seminar Series

Friday November 3 | 3pm | Biodesign Auditorium

Revealing membrane protein-lipid interactions with native and lipidomic mass spectrometry

Due to their important biochemical roles, membrane proteins are important drug targets. Although lipids can influence membrane protein function, the chemistry of lipid binding remains difficult to study because protein-lipid interactions are polydisperse, competitive, and transient. We have been developing new analytical approaches to quantify protein-lipid interactions in bilayers and understand how membrane proteins remodel their surrounding lipid environment. In one new approach, we are using lipidomic mass spectrometry (MS) to quantify the exchange of lipids between lipoprotein nanodiscs with and without an embedded membrane protein. Shifts in the lipid distribution towards the membrane protein nanodiscs reveal lipid binding, and titrations allow measurement of the optimal lipid composition for the membrane protein. We have also been studying how lipids bind to specific sites on membrane proteins. Here, we mutate different potential lipid binding sites on the membrane protein surface and simultaneously measure binding to the mutant and wild type versions with native MS. By performing these experiments at different temperatures, we uncover the thermodynamics of lipid binding to specific residues and discover the relative affinities of different lipid binding sites. Ultimately, we expect these unique combinations of nanodiscs and MS will provide new insights into how lipids modulate the structure and function of membrane proteins.

Michael Marty, PhD

Associate Professor, University of Arizona

Dr. Michael Marty is an Associate Professor of Chemistry & Biochemistry at The University of Arizona. Dr. Marty earned his B.A. in chemistry and mathematics at St. Olaf College. He then completed his Ph.D. in chemistry as a Springborn Fellow at the University of Illinois Urbana-Champaign with Prof. Stephen Sligar and went on to postdoctoral research at the University of Oxford with Prof. Dame Carol Robinson. He joined the faculty at The University of Arizona in 2016. His research applies lipoprotein nanodiscs with native mass spectrometry to study membrane proteins, antimicrobial peptides, and their interactions with lipid bilayers.

*ZOOM option available: https://asu.zoom.us/j/81517529537