MAS20-2020-000162

Abstract for an Invited Paper
for the MAS20 Meeting of
the American Physical Society

Characterization of Phosphatidylinositol Phosphates Binding in Lipid Bilayers by Solid-state NMR

ANDREW NIEUWKOOP[1], Rutgers University

Phosphatidylinositol phosphates (PIPs) are a class of membrane lipid that regulate diverse cell processes in eukaryotic organisms. As a major regulator of cellular growth, metabolism, immunity, and development, misregulation of PIP levels has enormous impacts on human health, factoring in diseases such as diabetes, cancer, obesity, and immune disorders amongst many others. Despite decades of effort, there remains no direct method to confirm PIP binding by a protein in a lipid bilayer. The Nieuwkoop lab is working use solid-state NMR and molecular dynamics simulations to understanding the properties of PIP containing lipid bilayers, map the PIP binding sites of PIP binding domains, and characterize the effects of PIP binding on the structure and dynamics of PIP binding proteins. We utilize ^{13}C, ^{31}P and ^{1}H detected solid-state NMR to assign the chemical shifts and probe the structure and phase transitions of lipid headgroups. We use ^{13}C, ^{15}N and ^{1}H detected spectra at 13, 40 and 100+ kHz MAS to assign the chemical shifts of the PIP binding domains and to look for binding at to nitrogen containing side chains. We use molecular dynamic simulations to probe the PIP binding sites and determine the effects of PIP binding on domain structure and orientation. The overall goal is to develop a set of tools to directly detect PIP binding in lipid membranes by solid-state NMR.

[1]Department of Chemistry and Chemical Biology