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Deuterated Phospholipids to Study the Structure, Function and Dynamics of Membrane Proteins Using Neutron Scattering

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Contrast matching and contrast variation in neutron scattering provide unparalleled power for understanding the structure, function, and dynamics of a selected component in a multicomponent system. A sophisticated contrast study often requires the availability of deuterated molecules in which deuterium atoms are introduced in a predictable and controlled fashion to replace protons. This can be achieved by direct deuteration of precursors followed by custom chemical synthesis, for which expertise and capabilities have been developed at facility (NDF), ANSTO.

In this paper we will discuss recent high impact research output using deuterated phospholipids produced by NDF/ANSTO. We will describe the synthesis and applications of selectively or perdeuterated unsaturated phospholipids to contrast match out the whole lipid bilayer or nano disks within a multicomponent system. Further, we also describe their role in investigations related to membrane lipoproteins (ApoE) exchange in relation to lipid unsaturation,[1] effect of membrane composition,[2] and conformational analysis Mg²⁺ channel by neutron scattering techniques.[2, 3]

References:

1. Waldie, S., et al., Lipoprotein ability to exchange and remove lipids from model membranes as a function of fatty acid saturation and presence of cholesterol. *Biochimica et Biophysica Acta (BBA) - Molecular and Cell Biology of Lipids*, 2020. 1865(10): p. 158769.
2. Waldie, S., et al., ApoE and ApoE Nascent-Like HDL Particles at Model Cellular Membranes: Effect of Protein Isoform and Membrane Composition. *Frontiers in Chemistry*, 2021. 9(249).
3. Johansen, N.T., et al., Mg²⁺-dependent conformational equilibria in CorA: an integrated view on transport regulation. *bioRxiv*, 2021: p. 2021.08.20.457080.

Level of Expertise

Experienced Researcher

Presenter Gender

Man

Pronouns

He/Him

Which facility did you use for your research

National Deuteration Facility

Students Only - Are you interested in AINSE student funding

Do you wish to take part in the Student Poster Slam

Condition of submission

Yes

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