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Advancements in the provision of Deuterated Lipids for Neutron applications from the National Deuteration Facility

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Molecular deuteration significantly increases the options for structure-function investigations using neutron scattering and diffraction techniques. Chemical deuteration activities, where catalysed 1H/2H exchange is followed by custom chemical synthesis, have led to diverse neutron scattering and reflectometry studies previously hampered by the lack of appropriate scattering contrast in multi-component samples. Deuteration of phospholipids is a common practice to elucidate membrane structure, dynamics and function, by providing selective visualisation in neutron scattering. Although analogous deuterium- (2H) and hydrogen-containing (1H) molecules have similar physicochemical properties, these isotopes of hydrogen result in vastly different for neutron scattering signals. Over the past few years the National Deuteration Facility (ANSTO) has increased its synthetic capability to produce complex deuterated molecules including lipids and phospholipids. Such synthetically challenging molecules are perdeuterated phytantriol1, tail deuterated POPC, and perdeuterated POPC.2 Phytantriol is an interfacially-active lipid that is chemically robust, non-digestible and forms particles with internal bicontinuous cubic phase structures (cubosomes) when dispersed with non-ionic surfactants at physiological temperatures.
The tail-deuterated POPC, perdeuterated POPC and tail-deuterated GMO isotopologues would also provide suitable contrast for many neutron experiments and so these have been also our synthetic targets. Recently neutron reflection was employed to investigate the impact of phospholipid saturation (POPC-d64) and presence of cholesterol in cell model membranes on LDL and HDL lipid exchange and removal processes.3 Neutron reflection data that distinguish the effect of phospholipid acyl chain saturation and the presence of cholesterol on the ability of lipoproteins to exchange lipids to/from model membrane will be presented.

Reverences:
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Do you wish to take part in the poster slam

Yes

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