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In vivo selective deuteration of complex biological systems

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The success of using neutron scattering methods to study biological systems often relies on the use of differential biomolecules labelling. Biomolecular deuteration increases the scattering length density contrast in order to make each partner clearly distinguishable from one another and to match them out independently using solvent contrast variation strategies without impairing the signal of the visible partner [1]. The deuteration of biomolecules can either be done in vitro (notably for lipids) and has been extensively studied in vivo for proteins [2]. However, the partners are produced and purified separately, which can be detrimental for their stability and reassembling a complex in vitro is not necessarily straightforward. In addition to extending the knowledge on in vivo deuteration by deciphering the level of DNA and lipid deuteration depending on the culture conditions, we offer a unique way of coproducing simultaneously protein and lipid/DNA while labelling only one of the partner. This work will then allow to study composite systems (such as nucleoproteins or membrane protein) by neutron scattering techniques without requiring to reassemble the complex hence favoring native like conditions. One application would be to associate this strategy to the use of Styrene Maleic Acids (SMA) for generation of lipodiscs directly from biological membranes where the SMA and the lipids would be simultaneously matched out, hence allowing the structural study of membrane proteins in its native environment [3].

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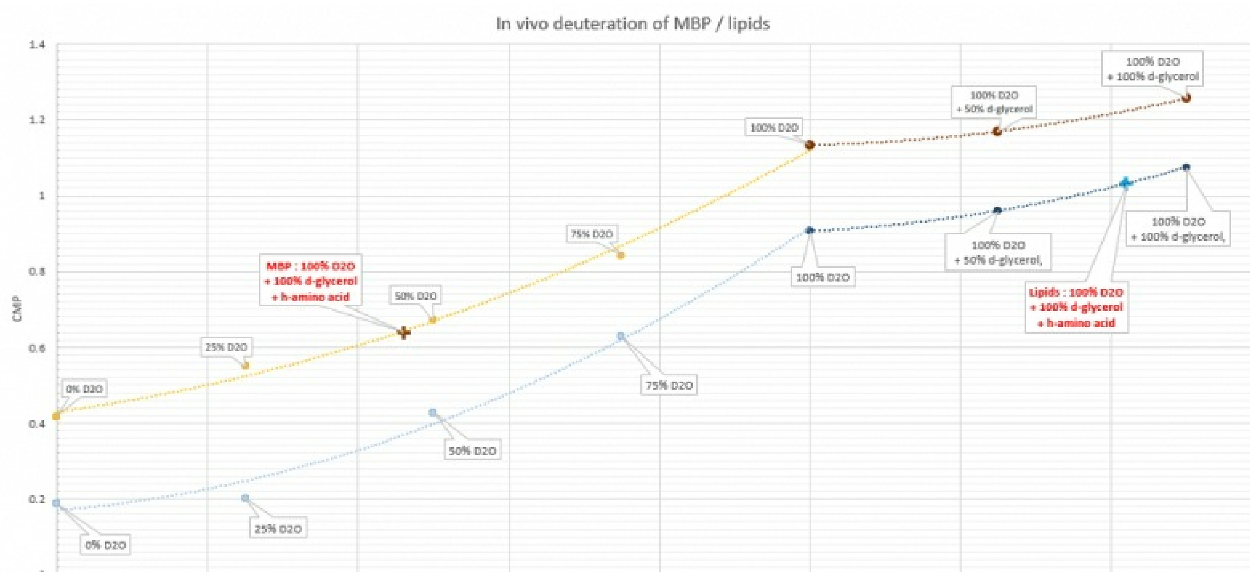

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