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Keynote talk - Models of biological membranes: complex lipid composition and membrane proteins

Wednesday 8 December 2021 10:00 (40 minutes)

Biological membranes are mainly composed of lipids and proteins. Unfortunately, the complex composition of biological membranes prevents their direct investigation with biophysical methods. Therefore, most physico-chemical and biophysical studies on biological membranes rely on simple models composed of lipid bilayers including only 1-3 lipid species and in fewer cases membrane proteins. Among all, supported lipid bilayers represent suitable systems to mimic the lipid component of biological membranes and allow for structural and dynamic investigations by means of several surface sensitive techniques. However, loading membrane proteins with controlled orientation in a supported lipid bilayer remains a challenge in this field.[1]
Recently, we showed the preparation and characterization of lipid bilayers including either complex lipid mixtures, i.e. lipid extract from the yeast Pichia Pastoris, or membrane proteins. Supported lipid bilayers with or without membrane proteins were prepared by a recently developed protocol. The method is based on the application of peptide-discs [2], a specific kind of nanodiscs where the protein belt is composed by self-assembled 18A peptide molecules. The peptide discs can be adsorbed on the hydrophilic surface of the solid support and since the formation of the 18A belt is reversible, they can be disassembled by rinsing with fresh buffer solution. We showed that this method can successfully lead to the production of supported lipid bilayer with biologically relevant lipid compositions [3] and also to the incorporation of membrane protein with asymmetric structure, i.e. composed by one large extramembrane domain (EMD) a transmembrane domain (TMD).[4]

References:
[1] G. Fragneto et al., Current Opinion in Colloid & Interface Science, 2018, 38, 108-121.
[2] S. R. Mitdgaard et al., Soft Matter, 2014, 10, 738-752.
[3] A. Luchini et al., Anlytical Chemistry, 2020, 92, 1, 1081-1088.
[4] A. Luchini et al., JCIS, 2021, 585, 376-385.

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