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Insertion and activation of functional Bacteriorhodopsin in a floating bilayer

Content

The proton pump transmembrane protein bacteriorhodopsin was successfully
incorporated into planar floating lipid bilayers in gel and fluid phases, by applying a detergent-mediated incorporation method. The method was optimised on single supported bilayers by using quartz crystal microbalance, atomic force and fluorescence microscopy techniques. Neutron and X-ray reflectometry were used then both on single and floating bilayers with the aim to determine with subnanometer accuracy the structure and composition of this membrane-protein system before and after protein activation. Lipid bilayer integrity and protein activity were preserved upon the reconstitution process. Reversible structural modifications of the membrane, induced by the bacteriorhodopsin functional activity triggered by visible light, were observed and characterized at the nanoscale [1].

Since the pioneering work in the seventies on cell membrane structure by neutron scattering, developments driven by constantly improving neutron instrumentation, coupled with development of measurement and analysis methods, have involved both the optimisation of samples towards more biologically relevant model systems and include the use of more complex lipid mixtures up to natural extracts. A natural lipid deuteriation facility has been set-up at the ILL (http://www.ill.eu/L-Lab) and recent results on lipid production and characterisation will be presented together with some examples of applications in model membrane structural studies.

[1] Mukhina et al., JCIS 2021, 597 (35)

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