Effects Of Detergent Concentration On Membrane Protein-Lipid Complexes I Escherichia Coli

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Many membrane proteins are part of oligomeric protein complexes (1). They may also bind lipids to various extent and specificity. The N-dodecyl-β-D-maltoside (DDM) detergent is good for solubilising membrane proteins and complexes under mild conditions, without stripping away structurally resolved endogenous lipids. It is well known that purification of protein complexes in intact form is largely dependent on the solubilisation conditions (1), and which can differ for various complexes.
In this study, the changes in the protein to lipid ratio and micellar sizes of detergent-protein-lipid complexes, as a result of an increase in DDM concentration, was studied by Fourier Transform Infrared Spectroscopy (FTIR) and Dynamic Light Scattering (DLS) techniques. An interface-bound glycosyl-transferase from the mycoplasma Acholeplasma laidlawii (glucosyldiacylglycerol synthase; alMGS) was overexpressed Escherichia coli (E-coli) BL21-AI cells. This enzyme is known to be capable of forming vesicles, in which excessive amounts of alMGS production can be achieved (330 mg protein/L culture) (2). In vitro, it has a strong affinity for anionic phospholipids (3). Subsequent to overexpression of alMGS, membrane preparations were solubilised with different DDM concentrations and solubilised protein–lipid-detergent complexes were analysed both with FTIR and DLS techniques. Infrared results displayed that the protein to lipid ratio varied in the aggregates under the concentration range of the detergent used, and DLS results also underlined that micellar sizes of these complexes could also differ strongly between the low and high detergent concentrations. We now aim at identifying the types and amounts of lipids strongly associated with this vesicle-inducing protein.

(1) Stenberg et al., (2005) J. Biol. Chem. 280: 34409-19.
(2) Eriksson et al., (2009) J. Biol. Chem. 284: 33904-14.
(3) Li et al., (2003) Biochemistry 42: 9677-86.