Interaction of Trehalose Lipid with Saturated Phosphatidylethanolamine Membranes

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Trehalose lipids are a group of glycolipid biosurfactants mainly produced by rhodococci which present interesting physicochemical and biological properties. They have a range of industrial applications. Trehalose lipids appear to have antiviral and antifungal properties and some of them are associated with virulence in certain bacterial strains. The amphiphilic nature of trehalose lipids points to the membrane as their hypothetical site of action. We have purified a trehalose lipid from Rhodococcus sp. and studied its interaction with dimiristoylphosphatidylethanolamine with different acyl chain length (DLPE, DMPE and DPPE) membranes, using differential scanning calorimetry, X-ray diffraction and infrared spectroscopy. It has been found that trehalose lipid greatly affects the gel to liquid crystalline phase transition of phosphatidylethanolamines, broadening and shifting the transition to lower temperatures with the appearance of lower melting transitions which probably reflect the formation of a trehalose lipid enriched domains. Trehalose lipid does not affect the interlamellar repeat distance of phosphatidylethanolamines. Trehalose lipid produces a progressive fluidification of the acyl chains and a dehydration of the carbonyl group of the phospholipid as seen by infrared spectroscopy. The above evidence supports the idea that trehalose lipid intercalates into the phosphatidylethanolamines bilayers and produces structural perturbations which might affect the function of the membrane.

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