

Peptide-induced coalescence of bicellar lipid assemblies: sensitivity to anionic lipid and peptide properties (MSc seminar)

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ABSTRACT: Bicellar lipid mixture dispersions progressively coalesce to larger structures on warming. This phase behaviour is particularly sensitive to interactions that perturb bilayer properties. In this study, ^2H NMR was used to study the perturbation of bicellar lipid mixtures by two peptides which are structurally similar (SP-B63-78, a lung surfactant protein fragment and Magainin 2, an antimicrobial peptide). Particular attention was paid to the relation between peptide-induced perturbation and lipid composition.

In bicellar dispersions containing only zwitterionic lipids (DMPC-d54/DMPC/DHPC (3:1:1)) both peptides had little to no effect on the temperature at which coalescence to larger structures occurred. Conversely, in mixtures containing anionic lipids (DMPC d54/DMPG/DHPC (3:1:1)), both peptides modified bicellar phase behaviour. In mixtures containing SP-B63-78, the presence of peptide decreased the temperature of the ribbon-like to extended lamellar phase transition. The addition of Magainin 2 to DMPC-d54/DMPG/DHPC (3:1:1) mixtures, in contrast, increased the temperature of this transition and yielded a series of spectra resembling DMPC/DHPC (4:1) mixtures. Additional studies of lipid dispersions containing deuterated anionic lipids were done to determine whether the observed perturbation involved a peptide-induced separation of zwitterionic and anionic lipids. Comparison of DMPC/DMPG-d54/DHPC (3:1:1) and DMPC-d54/DMPG/DHPC (3:1:1) mixtures showed that DMPC and DMPG occupy similar environments in the presence of SP-B63-78, but different lipid environments in the presence of Magainin 2. This might reflect the promotion of anionic lipid clustering by Magainin 2. These results demonstrate the variability of mechanisms of peptide-induced perturbation and suggest that lipid composition is an important factor in the peptide-induced perturbation of lipid structures.

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