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Effect of lipid composition on peptide-induced coalescence in bicellar mixtures

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Transfer of lipid material between mulitlamellar reservoirs and the surface active layer is required to maintain the functional surfactant layer in alveoli. Surfactant Protein B (SP-B) is believed to facilitate interlayer contact implicit in such activity. The way in which SP-B might promote trafficking of surfactant material was investigated using mixtures bilayered micelles containing long- and short- chain lipids. Because of their propensity to progressively coalesce into more extended bilayer structures on heating, bicellar mixture suspensions provide interesting systems to study peptide-induced interaction between lipid structures. 2H NMR was used to study the effect of an SP-B fragment (SP-B63-78), at 10% (w/w), on the coalescence behaviour of three bicellar mixtures: DMPC-d54/DMPC/DHPC (3:1:1); DMPC-d54/DMPG/DHPC (3:33:0.67:1); and DMPCd54/DMPG/DHPC (3:1:1). In bicellar mixtures containing only zwitterionic lipids (DMPC-d54/DMPC/DHPC), the peptide had no effect on the temperatures at which transitions to more extended structures occurred. Conversely, in bicellar mixtures containing anionic lipids (DMPC-d54/DMPG/DHPC), addition of the peptide was found to reduce the temperature at which the magnetically-orientable bicellar ribbon phase was replaced by more extended lamellar structures. This peptide-induced perturbation of bicellar mixture phase behaviour increased with anionic lipid concentration. Comparisons with spectra obtained from 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 these mixtures both in the presence and absence of the peptide. These results indicate the interaction of SP-B63-78 with lipid structures depends on the presence of anionic lipids and that the mechanism by which SP-B63-78 interacts with bicelles does not involve a separation of anionic and zwitterionic long-chain lipids.

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