properties; non-volatility and non-explosiveness. However, the safety of ILs in aquatic environments has not been fully assessed. In this work, we investigated the effects of ILs on ion channels when they are incorporated into a lipid bilayer. We chose gramicidin A (gA) as our model protein that selectively permeates cations. The ion permeability of gA varies depending on the type of ILs. In order to measure channel activities of gAs, we used two methods; fluorescence assay utilizing stop-flow spectrometer and measurement of ion currents across lipid bilayers using a patch clamp instrument. Furthermore, we revealed that alkyl chain length of ILs and ion strength of buffer play important roles in ion permeability and confirmed how electrostatic effects due to charges on the membrane surface changed depending on ion strength of buffer using MD simulation. As a result, we should be able to design safer ILs by taking our results into account.

Lung surfactants (LS), a complex mixture of lipids and proteins present in the alveolar lining of lungs, help in lowering surface tension to near zero at expiration. Deficiency of this surfactant can lead to Neonatal Respiratory Distress Syndrome in infants, while a dysfunction of LS can cause Acute Respiratory Distress Syndrome (ARDS) that affects patients irrespective of age. Successful medical intervention such as surfactant replacement therapy (SRT) requires a good understanding of surfactant composition and function. Currently there is no clinical use of LS on use in SRT, particularly the interactions between components making up this mixture. Our objective was to understand the interaction of cholesterol (a component whose role and even presence in SRT is highly debated) and Minib (a synthetic protein mimic of native surfactant protein SP-B) at air-water interface. We report the alteration in lipid domain formation of films containing 1,2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC); 1-palmitoyl-2-oleoyl-sn-glycero-3-phosphatidylglycerol (POPG) in the ratio 7:3 under the influence of varying concentrations of Minib and cholesterol. Fluorescence imaging under constant compression, along with analysis of domain size distributions, reveals that Minib increases line tension between lipid domains, and prefers to stay in fluid POPG regions, making the liquid-ordered domains smaller in size. Small amounts of cholesterol prefer packed domains, stretching them into spirals during the process, lowering their line tension. In both cases, higher concentration yields more prominent consequences in terms of the stated changes. However, mixture containing both cholesterol and Minib shows reduction in domain size with no changes in domain shape. This suggests the dominance of Minib over cholesterol when interacting with lipid domains, which may have important effects on the performance of synthetic LS.

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Dynamic Measurements of Membrane Insertion Potential of Synthetic Cell Penetrating Peptide/pDNA/Ca++ Complexes
Nabil A. Alhakamy1, Cory J. Berkland2, Prajna Dhar2
1Pharm.Chem, University of Kansas, Lawrence, KS, USA, 2Chemical & Petroleum Engineering and Pharmaceutical Chemistry, KU, University of Kansas, Lawrence, KS, USA, 3Chemical & Petroleum Engineering, University of Kansas, Lawrence, KS, USA.
Noncovalent complexation of plasmid DNA (pDNA) using cell penetrating peptides (CPPs) has been less explored due to the relatively large complex size formed and the low-level gene expression. Here, condensing synthetic CPP polypeptides using CaCl2 produced small and stable complexes, which show higher level of gene expression. Anionic (i.e., POP and POPEG) or zwitterionic (i.e., POPC) phospholipid monolayers at the air-water interface are used as model cell membranes to monitor the membrane insertion potential of synthetic CPPs. The insertion potential of complexes having different cationic (dTAT, H9, K9, R9, and RH9) and amphiphilic (RA9, RL9, and RW9) peptides were recorded using a Langmuir monolayer approach that reproduces complexation to model membranes. Further, to mimic the pH of early endosome and late endosome and lysosome, phospholipid complex interactions were recorded at normal (pH 7.4) and low (pH 4.4) pH. All the complexes studied induced disruptions in phospholipid packing, which were most pronounced for the complexes having amphiphilic CPPs (i.e., RW9 and RL9). Particularly, the surface pressure of the complexes was significantly lower at normal pH when compared to acidic pH in the presence of POPEG and POPC monolayers, except for RL9 and RW9 complexes. In contrast, the surface pressure of the complexes was significantly higher at normal pH when compared to acidic pH in the presence of POPEG monolayer. Since the late endosomes contain an abundance of PC lipids and low pH, these results may be highly relevant to understand the efficiency of endosomal escape of these complexes.