Physics and Physical Oceanography Seminar

Effect of Lung Surfactant Protein B Fragment, SP-B1-9 in Model Lipid Bilayer

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TIME: 1:00 pm
Place: Webex (link will be sent out)

ABSTRACT: Lung surfactant is a mixture of protein and lipid that reduces the surface tension at the air-water interface in the lungs and thus reduces the work needed to breathe. Two hydrophobic proteins, SP-B and SP-C, are thought to facilitate the re-spreading of fresh and recycled surfactant material from bilayer and multilayer reservoirs. In an earlier deuterium NMR study of bilayer model membranes containing either the SP-B fragment SP-B(1-25, 63-78) or the fragment SP-B(8-25, 63-78), it was found that lipid acyl chain orientational order was perturbed more strongly by SP-B(1-25, 63-78). Both fragments contain the first and last SP-B helices but differ in whether or not the insertion motif, SP-B1-7, is present, suggesting that the insertion motif might play a role in the capacity of SP-B to promote the bilayer reorganization implicit in lung surfactant function. To gain more insight into the interaction of the insertion motif with surfactant lipids, we have studied the effect of SP-B1-9 on lipid acyl chain order in DPPC d62/POPG(7:3) bilayers using deuterium NMR and GROMACS molecular dynamics simulations.

Using deuterium NMR at a peptide: lipid ratios of 0.066 and 0.098, we find that the concentrations of peptide do not have a significant effect on the lipid acyl chain orientational order. MD simulation of a bilayer model containing SP-B1-9 at a peptide: lipid ratio of 0.031 shows a decrease in chain orientational order. This is contrary to the experimental result. It might be due to the aggregation of peptides in the experiments. The MD simulations also provide information about the average peptide orientation and conformation. These findings may provide a better understanding of the extent to which the insertion motif may contribute to the capacity of SP-B to promote the reorganization of bilayer surfactant material.

ALL ARE WELCOME!