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Selective partitioning to the liquid ordered phase: fluorescent lipid probes

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Selective partitioning of lipids and proteins into specific membrane phases enables a range of cellular processes, including endosome formation, biomaterial sorting and transport, and signal transduction. Selective in vivo labeling of these structures could provide nanoscale-level understanding on their mechanics of formation and transport properties, but progress has been hindered by a lack of phase selective imaging probes. This presentation will describe our recent efforts examining the role of the structure and chemistry of headgroup and spacer of fluorescent-labeled lipids on partitioning behavior in liquid ordered (Lo) and liquid disordered (Ld) phase separated lipid membranes. Previously, we have shown that biotinylated lipids can be designed to preferentially partition to the Lo phase. In that work we found that the hydrophobicity of the biotin headgroup perturbs the membrane resulting in selective partitioning to the Ld phase. By inserting short polyethylene glycol (PEG) spacers between the headgroup and lipid body, headgroup interaction can be attenuated thereby allowing the structure of the lipid tails to direct phase partitioning. In the current work we further extend this work to fluorescent labels (i.e., fluorescein, rhodamine B, cyanine 3) on lipids evaluating the role of headgroup size, structure, and hydrophobicity on phase partitioning behavior and the relationship with spacer chemistry and structure.

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