Bilayers at the ILL

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Partitioning of DNA nanochannel between Lo/Ld phases in a lipid membrane: Relevance of lipid anchors

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DNA origami is emerged as a powerful and versatile method to fabricate highly controllable 3-dimensional structures at the nanometer-scale. One example of those powerful DNA nanostructures is a membrane-spanning DNA channel, which exhibited the ability to mimic the biological channels in transporting of ions and biomolecules across the lipid membrane (Burns et al.2016).
Membrane-spanning DNA channel exists often in a cylinder-like structure of six-helix bundle attached with a lipid anchor in order to lower the energy barrier of DNA insertion into lipid bilayer. At the time of this study, the relevance of the lipid anchor in controlling the preferential interaction of DNA with different lipid compositions has not been studied. *In vivo*, for instance, palmitoylated proteins are enriched in lipid raft; whereas prenylated proteins segregate into non-raft lipids (Melkonian et al. 1999). Here we address a question whether the spatial configuration of the lipid anchor could play a role in targeting the DNA nanochannel to a distinct lipid domain phase.We fabricated DNA nanopores of six DNA double helices arranged in parallel with a 9-15-nm length and decorated with hydrophobic tags derived from fatty acid tail of lipids. These fatty acid chains were chosen based on their potency in partitioning the membrane-bound proteins *in vivo* into lipid rafts (liquid-ordered phase, lo) and non-raft phases (liquid-disordered, ld). The DNA channels with various lipid anchors were incubated with giant unilamellar vesicles (GUVs) with Lo + Ld phase coexistence and the lipid phase preference of DNA channels was visualized under confocal microscope. Moreover, the transport activity of these artificial channels was assessed by a release technique of a fluorescent dye encapsulated into SUV liposomes.

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