Lateral diffusion of lipids senses local hydration in biomembranes

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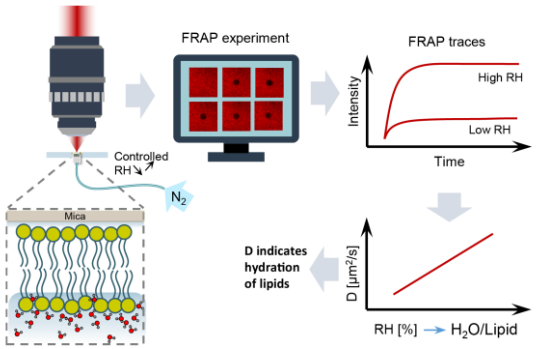
From various electrical and mechanical studies, supported lipid bilayers (SLBs) have been realized to possess brilliant implementation potential in terms of technological application as biosensors and biocoatings[1]. Structure and dynamics of SLBs are modulated not only by lipid-lipid, lipid-protein interactions, but the interplay between lipids and the water hydrating the membrane plays a crucial role altering the lateral diffusion of lipids in biomembrane[2]. Using fluorescence microscopy imaging and Fluorescence Recovery After Photobleaching (FRAP) techniques, we have studied phase separated SLBs at varying local hydration states by changing relative humidity of the environment. Our study shows that the lateral mobility of liquid disordered phase lipids varies accordingly with change in local hydration state during dehydration as well as rehydration[3]. A six-fold decrease in diffusion coefficient values have been observed from fully hydrated membrane to 0% relative humidity condition. Moreover, the change of diffusion coefficient of lipids with hydration state is absolutely reversible and repeatable, i.e. the mobility change occurs in multiple dehydration and rehydration cycles. This significant dependence and high sensitivity down to a few water molecules per lipid offers a huge potential for SLBs to be utilized as hydration sensor on a molecular level and can be used to investigate local hydration heterogeneity in biomimetic systems[4].



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