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Ethanol enhances collective dynamics of lipid membranes MARTIN KAYE, MAIKEL RHEINSTADTER, McMaster University, Hamilton, Ontario, Canada — Lipid bilayers have long been considered simple homogeneous passive barriers. However, there is a growing consensus that bilayer composition and properties impact their role in membrane function. One molecule which participates in lipid bilayers is ethanol. Ethanol is principally known to increase membrane permeability, serving as a model drug enhancer. While bilayer permeability was thought to depend solely on structural properties such as the area per lipid, this may be supported by thermal fluctuations in the bilayer core. Thermal motion results in the formation of small voids in the hydrocarbon chains, which may play a role in the transport small molecules through the membrane core. In both inelastic neutron scattering experiments and molecular dynamics simulations we find evidence for a new low-energy dynamic mode in the fluid phase of DMPC bilayers immersed in a 5% water/ethanol solution [1]. The molecular motion associated with this phonon corresponds to coherent displacements of the carbon atoms in the lipid tails both in, and partially normal to, the plane of the membrane. This finding supports the possibility of a fluctuation supported trans-membrane transport process in lipid bilayers.

[1] "Ethanol enhances collective dynamics of lipid membranes", M. D. Kaye, M. Tarek, K. Schmalzl, M. C. Rheinstädter, submitted to Physical Review Letters

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