

Sphingomyelin structure influences the lateral diffusion and raft formation in lipid bilayers

Filippov A., Orädd G., Lindblom G.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Liquid-disordered/liquid-ordered two-phase coexistence regions in hydrated bilayers have been investigated for sphingomyelins (SMs) of three different origins: egg, brain, and milk with the pulsed-field gradient NMR technique for lateral diffusion measurement. It is found that the three SMs have the same diffusional behavior in bilayers of SM alone, but in the multicomponent systems of dioleoylphosphatidylcholine/SM/cholesterol, the ability to form domains differs for the three SMs. The two-phase area is more extended for eggSM than for brain SM, and no two-phase coexistence is found for milk SM. The differences in behavior are correlated with the homogeneity of the SM hydrocarbon chain compositions, in which egg SM has the most homogeneous and milk SM has the most heterogeneous composition. The results indicate that a crucial element in the domain-forming process is the formation of highly packed bilayers of SM and cholesterol rather than specific interactions between SM and cholesterol. © 2006 by the Biophysical Society.

<http://dx.doi.org/10.1529/biophysj.105.075150>
