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Temperature Induced Structural Evolution of DMPC-Saponin-Mixtures: From Bicellar to Vesicular Structures?

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Saponins are plant derived surfactants which occur e.g. in nuts and exhibit an amphiphilic structure built of a hydrophobic steroidic or triterpenic backbone with a varying number of hydrophilic sugar chains. Some saponins, including aescin, are used specifically for the relief of venous diseases e.g. varicose veins.
The interaction of aescin with model membranes composed of the phospholipid 1,2-dimyristoyl-*sn*-glycero-3-phosphocholine (DMPC) was studied in a wide aescin content range. An incorporation into the lipid bilayer and an aescin domain formation was proven in small, unilamellar vesicles. After membrane saturation with aescin molecules, vesicles get decomposed into very small, bicellar structures. By increasing temperature a conversion back into bigger vesicular structures takes place. Interestingly, these aggregates decompose again when lowering the temperature to about 23 ℃, the main phase transition temperature (T_m) of the lipid DMPC. In the present contribution, the temperature-dependent conversion of bicellar into vesicular structures as a function of the aescin content is investigated with scattering methods. The aim is to elucidate the correlation of the relaxation into the bicellar state and T_m of DMPC at the molecular length scale. Here, neutron contrast variation is of paramount importance, since it allows to match the contrast of the hydrophobic DMPC membrane part. In this way structural changes in the hydrophilic part of the lipid bilayer can be focused.

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