Bilayers at the ILL

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Aescin-induced conversion of gel-phase lipid membranes into bicelle-like lipid nanoparticles

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Mixtures of the phospholipid 1,2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC) and the saponin beta-aescin spontaneously form monodisperse, bilayered discoidal micelles (also known as “bicelles” or “nanodisks”) in aqueous solution. Such bicelles form below the melting temperature of DMPC when the phospholipids are in the rigid state and are precursors of spontaneously formed vesicles. The aescin concentration must be far above the cmc (cmc(aescin) = 0.3-0.4 mM). It was found that the shape and size of the bicelles are tunable by composition. High amounts of aescin decrease the size of the bicelles from diameters of aroun 320 Å at 7 mol% to around 150 Å at 30 mol% beta-aescin. The structures are scrutinized
by complementary small-angle X-ray (SAXS) and neutron (SANS) scattering
experiments. The scattering curves are subsequently analyzed by model-independent
(IFT analysis) and a model based approach where bicelles are described as polydisperse bilayer disks encircled by a beta-aescin rim. Moreover, the monomodal distribution and low polydispersity of the samples were confirmed by photon correlation spectroscopy (PCS). The discoidal structures were visualized by transmission electron microscopy (TEM).

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