Bilayers at the ILL

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Interaction of DDAO surfactant with model membrane - liposome-micelle transition

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Surfactant N,N-dimethyl-1-dodecanamine-N-oxide (DDAO) possess a wide range of biological effects (antimicrobial, phytotoxic, antiphotosynthetic, immunomodulatory). Interaction of non-ionic form of DDAO with DOPC and DOPC-CHOL (CHOL:DOPC =0.5:1 mol/mol) model membranes was studied by SANS. Unilamellar liposomes were prepared by extrusion in PBS buffer. Aggregation of DOPC and DOPC-CHOL unilamellar liposomes at zero and low DDAO concentration was detected. We supposed that it was induced by constituents of PBS buffer. Lamellar paracrystal model was used to analyse the SANS data for samples with DDAO:lipid in the range 0 – 1 mol/mol. The number of bilayers interacting in the aggregate, was found close to 1.4. The intercalation of surfactant molecules into the lipid bilayer caused narrowing of the lipid bilayer. Undistinguished changes in repeat distance after addition of DDAO up to molar ratio DDAO:lipid = 0.5 were followed by an increase at higher DDAO concentration. A transition from bilayer to cylindrical micelles took place around molar ratio DDAO:lipid =1. The SANS data in the range DDAO:lipid = 3 - 5 mol/mol were analysed using a model of rigid cylinder with elliptical cross section. Pore formation in lipid bilayer caused by DDAO was studied by fluorescence probe leakage method. The changes in the size of lipid aggregates upon increasing DDAO concentration were followed turbidimetrically. Structure of DDAO - lipid aggregates, partition coefficient of DDAO between lipid and aqueous phase, as well as effective ratios Re (the amount of DDAO integrated into the bilayer to the amount of lipid at particular DDAO concentration in the sample) are not considerably influenced when one third of DOPC molecules is substituted with CHOL.

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