Bilayers at the ILL

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Interactions of model membranes with surfactants and antimicrobial peptides studied by small-angle neutron diffraction.

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Due to alarming increase in the number of cases of antibiotic-resistant bacterial infections, it is necessary to develop new antibiotics, explore relationships between structure and observed effect and study the mechanism of antimicrobial action. Amphipathic antimicrobial peptides are perspective compounds which display antimicrobial effects. Dermaseptins represent a large group of cationic peptides exhibiting membrane damaging effect. [1] N,N-dimethyl-1-dodecanamine-N-oxide (DDAO) is an amphiphilic surfactant possessing antimicrobial activity. [2] Moreover, DDAO displays phytotoxic, antiphotosynthetic and immunomodulatory activity and it can play an important role in designing lipid based systems for drug and DNA delivery. Antimicrobial effect is a required attribute of new potential antibiotic drug, but what is even more necessary is its specific selectivity against bacterial membranes, leaving mammalian membranes unaffected. Therefore, both the bacterial membrane mimicking model and mammalian membrane model were studied. Small-angle diffraction experiments were performed at the D16 instrument. Oriented stacks of bilayers with various amount of dermaseptin S1 and DDAO were hydrated from vapour using the dedicated chambers of D16 with humidity controlled at 97% and the data was collected from series of rocking curves (using a rotating sample with 2D detector at fixed position). To vary the scattering contrast between the lipid bilayers and water, measurements were repeated for samples with diverse D2O/H2O mixtures (e.g., D2O volume fractions of 8, 40, 70, 100%). The contrast variation approach allowed us to perform the Fourier reconstruction of the scattering length density profiles.

1. P. Nicolas, A. Ladram, in: A.J. Kastin (Ed.), *Handb. Biol. Act. Pept.*, 2nd ed., Elsevier, 2013, p. 350–363.
2. F. Devinsky et al., *J. Pharm. Pharmacol.* 42, 1990, p. 790–794.

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