Lipid-based liquid crystals as carriers for antimicrobial peptides: phase behavior and antimicrobial effect

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The number of antibiotic-resistant bacteria is increasing worldwide and the demand for novel antimicrobials is constantly growing. Antimicrobial peptides (AMPs) could be an important part of future treatment strategies of various bacterial infection diseases, as many of the today's available antibiotics are becoming less effective.

In this work, lyotropic liquid crystalline (LC) structures consisting of cubic glycerol monooleate/water and hexagonal glycerol monooleate/oleic acid/water gels have been examined as carriers for AMPs. These LC structures have capability of solubilizing both hydrophilic and hydrophobic substances as well as being biocompatible and biodegradable. Both bulk gels and discrete dispersed structures, i.e. cubosomes and hexosomes have been studied. Three AMPs named AP114, DPK-060 and LL-37 have been investigated with respect to phase stability of the LC structures and antimicrobial effect.

The most hydrophobic peptide (AP114) was shown to induce an increase in negative curvature of the cubic LC system. The most polar peptide (DPK-060) induced a decrease in negative curvature while LL-37 did not change the LC phase at all. The hexagonal LC phase was not affected by any of the AMPs. Moreover, peptides AP114 and DPK-060 loaded cubosomes showed preserved antimicrobial activity, whereas LL-37 loaded particles displayed a loss in its broad spectrum bactericidal properties. AMP loaded hexosomes showed a reduction in antimicrobial activity.

References

[1] Boge, L., H. Bysell, L. Ringstad, D. Wennman, A. Umerska, V. Cassisa, J. Eriksson, M.-L. Joly-Guillou, K. Edwards, and M. Andersson, *Lipid-based liquid crystals as carriers for antimicrobial peptides: phase behavior and antimicrobial effect.* Langmuir, 2016.

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