Self-Assembled Cubosomes as Colloidal Platforms for Antimicrobial Peptide Delivery

Małgorzata Dietrich [1], Ewa Gajda [2], Marlena Godlewska [2], Damian Gaweł [2], Ewa Nazaruk [1]

[1] University of Warsaw, Faculty of Chemistry, Warsaw, Poland
[2] Centre of Postgraduate Medical Education, Marymoncka, Warsaw, Poland

enaz@chem.uw.edu.pl

Antimicrobial peptides (AMPs) represent promising alternatives to conventional antibiotics due to their broad-spectrum activity. In parallel, lipid nanoparticles have emerged as versatile colloidal carriers for targeted drug delivery; however, most clinically approved systems remain limited to lamellar liposomes.
Here, we propose non-lamellar lipid nanoparticles, cubosomes, as advanced carriers for peptide antibiotics. Cubosomes are self-assembled colloidal structures composed of a curved lipid bilayer enclosing an interconnected network of aqueous nanochannels, providing exceptionally high internal surface area and drug-loading capacity. To enhance interactions with bacterial membranes, the nanoparticles were functionalised to promote targeted binding.
The interactions of AMP-loaded cubosomes were investigated using both model lipid membranes and biological systems. The results indicate improved membrane affinity and suggest enhanced delivery efficiency of encapsulated peptides. These findings highlight cubosomes as promising, tunable colloidal platforms for antimicrobial delivery and support their potential in the development of next-generation nanomedicine strategies against antibiotic resistance.

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lipid nanoparticles, cubosomes, antimicrobial peptide

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