Oral Presentation

Functional Cyclotide Complexes: Self-Aggregation and Affinity with Target Receptors and Lipid Bilayers

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ABSTRACT: Cyclotides, plant-derived peptides with exceptional chemical and thermal stability, have emerged as promising candidates for various biological applications including therapeutics, and eco-friendly pesticides. This study investigates the formation of supramolecular complexes between cyclotides and their interactions with phospholipid membranes and target insecticide receptors. Using molecular operating environment (MOE) tools, we analyzed 30 cyclotide structures for aggregation, and simulated their interactions with different phospholipid (POPC, POPE, POPG) bilayers using GROMACS MD simulations software. Cyclotide pairs readily form stable complexes driven by specific local interactions. The binding affinities between cyclotide dimers ranged from -10 to -80.0 kcal/mol, with a preference for POPC membranes. Cyclotides also influenced membrane properties, slightly decreasing thickness and increasing lipid area per lipid, suggesting a "carpet model" mechanism of interaction. These results provide insights into the molecular interactions between cyclotides and phospholipid bilayers, shedding light on their potential biological activities.

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