ItPS Seminars

18th Oct 2024
3pm CEST

Ian W Hamley
Professor

Bioactive Self-Assembling Peptides and Lipopeptides

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Italian Peptide Society

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Bioactive Self-Assembling Peptides and Lipopeptides

I will review selected examples of recent work in my group that exploits the self-assembly propensity of designed peptides and lipopeptides to control their diverse structures and bioactivities in aqueous solutions and gels. I will discuss highlights of recent research on arginine-containing surfactant-like peptides which show diverse nanostructures including a new type of alpha-helical nanotube, and hydrogel and emulsion formation along with remarkable bioactivity such as selective antimicrobial activity. I will also briefly outline selected discoveries on bioactive self-assembling lipopeptides including those with anti-cancer,6 and organocatalytic properties, and those with applications in tissue engineering and the production of cultured meat. I will also discuss our recent work on a conserved coronavirus spike protein peptide that forms amyloid structures, differing from the native helical conformation and not predicted by amyloid aggregation algorithms. We examined the conformation and aggregation of peptide RSAIEDLLFDKV, a sequence common to many animal and human coronavirus spike proteins. This sequence is part of a native α-helical spike glycoprotein domain, close to and partly spanning the fusion sequence, and it is not predicted to form amyloid by aggregation propensity algorithms. However, we found that this peptide aggregates into β-sheet amyloid nanotape structures close to the calculated pI =4.2, but forms disordered monomers at high and low pH. We also uncovered conditions for hydrogelation, relevant to potential future applications.

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