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Self-assembling amyloid building blocks as scaffolds for rational material design

Self-assembling peptides gain increasing interest as scaffolds for novel bionanomaterials; rationally designed self-assembling building blocks are especially attractive. We have been focusing on modular designs that consist of a central ultrashort amphiphilic motif derived from the adenovirus fiber shaft. This central amphiphilic motif can be further modified with amino acids targeted for various functionalities. The designer peptides self-assemble into fibrils that are structurally characterized with Transmission Electron Microscopy, Scanning Electron Microscopy and X-ray fiber diffraction; these fibrils were targeted to bind to metal nanoparticles, silica, calcium, and more recently, cells [1]. We have been using a combination of computational and experimental approaches towards rational designs. More recently we have reported that the YATGAIIGNII sequence from the HIV-1 gp120 V3 loop self-assembles into amyloid fibrils of which the first three and the last two residues are outside the GAIIG amyloid core [2]. We postulate that this sequence with suitable selected replacements at the flexible positions can serve as a designable scaffold for amyloid-based materials. Such short self-assembling peptides that are amenable to computational design offer open-ended possibilities towards multifunctional bionanomaterial scaffolds of the future.

1. G. Deidda et al., *ACS Biomat. Sci. Eng.* 3 (2017), 1404-1416.
2. C. Kokotidou et al., *FEBS Lett.* 592 (2018), 1777-1788.

Preferred topic

Biopolymers

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