Supramolecular Structures Via Self-assembly of Aβ Congeners

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One pathological manifestation of Alzheimer's patients is the deposits of amyloid plaques in the brain. The primary component in the plaques is a peptide (Aβ) consisting of 39-43 amino acid residues. Due to its unique amphiphilic character, the peptide self-assembles in aqueous media leading to the formation of well-organized fibriller structures. Understanding the detailed mechanism of self-assembly of of Aβin variants solution and the structure of these resulting assemblies have been useful for the development of methods for altering or preventing the process of fibrillogenesis. By using solid-state NMR, CD, EM, AFM, biochemical assays and SANS/SAXS, a detailed atomic scale structure of the fibrils formed by $A\beta_{10-35}$ has been developed. Using the detailed framework of the fibril structure, further insight on the role of metal ions in the nucleation and growth of the fibrils has been achieved. The formation of extremely large tubular structures by the self-assembly of smaller variants of the Aβ peptide ($A\beta_{16-22}$) sheds light on the relationship between the length of the peptide and the extent of lamination of the β-sheets. These unique supramolecular self-assemblies formed by the variants of Aβ peptide may have interesting and useful applications in nanotechnology.

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