Biophysical aspects of amyloid fibrils

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Abstract

Introduction: Amyloid fibrils are associated with lots of human diseases such as Alzheimer, Parkinson, spongiform encephalopathies and diabetes. Various protofibrils assemblies together and form ordered packed B-parallel structures. Their crucial role in initiation of toxic process in neurodegenerative disorders in well known. Divers sequences of amino acids can form the amyloidic state of proteins.

Methods: In this study, the spectroscopy methods were NMR spectroscopy, CD spectroscopy and Infrared spectroscopy. Kinetic measurements of amyloid fibril elongation were done using Thioflavin-T (ThT) and quartz crystal microbalance (QCM). Solution small angle x-ray scattering (SAXS) and differential scanning calorimetry (DSC) combined with simulated annealing of the protein were applied. Computational studies help to understand the application and analysing the obtained results.

Results and discussion: Experimental kinetic measurements and theoretical analysis, showed that electrostatic effects control protein aggregation. Furthermore, the magnitude of binding of a variety of ions to protein molecules was determined. Our results suggest that longer amyloid fibrils are more stable. Our spectroscopy techniques confirmed that the formation of amyloid fibrils are a generic property of polypeptide chains, and for different peptides and proteins, the mechanism of formation is similar.

Conclusion: amyloid fibrils cause neurotoxic effects in neurodegenerative disorder. Detailed biophysical studies of amyloid fibrils can elucidate new aspects and features of this diseases and help our investigating on the prevention of these fibril formation and treatment of these diseases to be more effective.

Keywords: Amyloid β, Fibrillation**,** Biophysical study, Aggregation, Protofibrils

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