Carlotta Marasini et al., Madridge J Pharm Res. 2018
http://dx.doi.org/10.18689/2638-1591.a2.004

madridge CONFERENCES
International
Pharma Conference and Expo
May 2-4, 2018 Rome, Italy

How can the Chemical-Physical Properties of the Solution Influence the Formation and the Morphology of Amyloid Proteins?

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Protein amyloid-like aggregation is related to devastating pathologies as Alzheimer´s and Parkinson´s diseases. During this process, the protein native state converts into a partially unfolded non-native state and then associates into smaller, soluble oligomers of different sizes. Subsequently, elongated fibrils are formed (i.e. fibrillation). In some protein system, also amyloids-like superstructures (spherulites) have also been found in vitro during the aggregation (1, 2) and in vivo (3, 4). Importantly, monomers, oligomers, fibrils, and spherulites coexist in an equilibrium that is influenced by the environment (5, 6). It is known that water, co-solutes, small molecules, concentrations, temperature, etc., play a crucial role in the native state of proteins, changing the structure and influencing inter-protein interactions. In this study, we aim to demonstrate how the chemical-physical composition of the solutions as well as the temperature, not only affect the protein initial states but also the dynamic of the fibrillation, the equilibrium between the species formed and the morphology of the mature fibrils (7). Also, our results emphasize that the final state of the fibrillation is not a stationary state but still a dynamic system that also after have been formed it can be highly influenced by incubation at different temperatures, pH and times.

Biography:

Dr. Carlotta Marasini is a physicist with a specialization in biophysics. Her specialization focuses on the study of different proteins involved in several diseases combining biophysical and biochemical techniques. During her masters, she spent six months at the ILL in Grenoble studying the aggregation of insulin by neutron scattering. She received her Ph.D. in bioengineering from the University of Genoa in 2013, performing a structural study of a protein responsible for Cystic Fibrosis disease. She was worked as postdoc at the University of Copenhagen, She is studying analysis the structure and kinetics of different proteins involved in neurodegenerative diseases.