Contribution ID : **102** Type : **Poster**

Effect of Glycerol on the Structure of an Intrinsically Disordered Protein

Intrinsically disordered proteins (IDPs) are defined by their lack of secondary structure in dilute aqueous solution. One of the best characterized plant IDPs is Cold Regulated (COR) 15A from the model plant Arabidopsis thaliana. This COR15A protein is highly hydrophilic and predominantly unstructured in solution, but fold into mainly amphipathic α-helices during drying or in the presence of high concentrations of low-molecular-mass crowding agents such as sucrose or glycerol. Due to its high conformational flexibility, no crystal structures are available for COR15A and there are also no reported NMR spectra. We investigated structural information of the COR15A protein based on the presence of a crowding agent (glycerol in this case) in order to induce the folding of the protein.

The structural properties of the protein COR15A was studied by small angle neutron and X-ray scattering, wide angle scattering, circular dichroism (CD) spectroscopy and dynamic light scattering (DLS). The obtained results from these measurements showed that the structure of the protein COR15A has transferred into a more compacted structure upon increasing the concentration of glycerol (0, 20, 40, 60, 80%v/v).At the high Q-range there is a significant change in the value of the power law scaling coefficient from 1.7 to 3 when the protein COR15A dissolved in a solvent contains 80%(v/v) glycerol comparing with in a pure buffer solution. Furthermore, both small angle scattering and DLS measurements suggested that an oligomer formed during this folding process which can be descried as a molecular complex comprised of a few monomers.

Topic

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Session Classification : Poster Session

Track Classification : Soft Matter