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| Title: | Conformational Characteristics and Phase Behavior of Intrinsically Disordered Proteins—Where Physical Chemistry Meets Biology. |
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| Keywords: | Phase Behavior of Intrinsically Disordered Proteins<br>multitude of biological functions<br>intriguing biophysical phenomena. |
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| Abstract: | The past two decades have witnessed a burgeoning interest in a fascinating class of proteins that do not autonomously fold into unique, well-defined, 3D structures and exist as conformationally heterogeneous and rapidly interconverting structural ensembles. These natively unfolded proteins are termed intrinsically disordered proteins (IDPs) and are associated with a multitude of biological functions. (1−3) Biased amino acid composition and low sequence complexity impart conformational plasticity to IDPs that can participate in promiscuous interactions with their biological binding partners. A growing body of work also demonstrates that some of these IDPs and proteins comprising intrinsically disordered regions (IDRs) can undergo intracellular biomolecular condensation via liquid–liquid phase separation (LLPS), resulting in the formation of highly dynamic, permeable, and regulable membrane-less organelles. (4) These liquid-like functional condensates can also undergo (aberrant) pathological liquid-to-solid phase transitions into amyloid-like aggregates that are linked to a range of debilitating human diseases. (5) The physicochemical properties of IDPs including their conformational dynamics and phase behavior are of immense importance in decoding the molecular determinants of biological phase transitions involved in both normal cellular physiology and pathophysiology. Existing and emerging tools and concepts of physical chemistry are beginning to shed light on some of these intriguing biophysical phenomena. |
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