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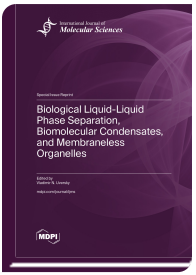
Special Issue Reprint

Biological Liquid-Liquid Phase Separation, Biomolecular Condensates, and Membraneless Organelles



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This reprint presents recent developments in the field of biological liquid–liquid phase separation (LLPS, also known as biomolecular condensation). LLPS and related biogenesis of various membraneless organelles (MLOs) and biomolecular condensates (BMCs) represent fundamental molecular mechanisms governing the spatio-temporal organization of the intracellular space. In fact, MLOs and BMCs, being liquid droplets, represent specific compartments within a cell that are not enclosed by a lipid membrane. Most biological LLPS processes are reversible, and many MLOs/BMCs exist transiently; they rapidly emerge when conditions are changed and rapidly disintegrate as soon as the original conditions are restored, thereby showing a characteristic “now you see me, now you don’t” behavior. Numerous MLOs/BMCs are found inside eukaryotic cells, where they exist as liquid droplets (or cellular bodies, puncta, etc.) in the cytoplasm, nucleoplasm, mitochondrial matrix, and stroma of chloroplasts. Furthermore, MLOs/BMCs are commonly observed in Archaea, bacteria, and, likely, viruses. MLOs/BMCs have numerous crucial functions, and their biogenesis is known to be controlled by various external factors and environmental cues, such as changes in temperature, pH, and ionic strength of the solution. All of these have garnered the close attention of many researchers to biological LLPS, MLOs, and BMCs.

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