Supramolecular structuring of cyclo-dipeptides

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Cyclo-dipeptides are the simplest cyclic biomolecules that could play a key role in the origin of life [1-2]. They have a huge potential in biomedicine due to their unique features, such as high stability, cell permeability, crossing the blood-brain barrier, stimuli responsivity, no/low toxicity, structural and biofunctional diversity, easy modification, low costs of production, and so on [3]. They have the inherent ability to build specific highly organized nano-biomimetic structures, through non-covalent interactions, acting as a catalyst to easy gellation. Thus, cyclic dipeptides provide minimalistic scaffolds for self-assemblies, that can have relevance in addressing complex biological problems, inter alia tissue engineering, bio-sensing, or can help to understand biological processes. Notably, the self-assembly process is observed in living organisms, regarding arranging bio-machinery, especially the DNA helix [2].

The design of cyclo-dipeptide-based self-assembled structures still is a challenge. This work provides a deep insight into the supramolecular nature of cyclic dipeptides and considerations on supramolecular structuring of all known, so far, cyclo-dipeptide structures, directed by H-bonding synthon patterns, which can be helpful in the development of innovative drugs, vaccines, diagnostics, drug/gene delivery systems and bio-materials useful in diverse diseases, mainly cancers, viral and neurodegenerative disorders.

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