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Glycosylated dipeptides as hydrogelators: design, synthesis and characterization

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In multicellular organisms, cells are surrounded by an acellular dynamic assembly known as extracellular matrix (ECM). It undergoes constant remodeling via assembly and disassembly of its components and thus, the use of supramolecular chemistry seems a straightforward approach for the design of its mimics. ECM provides a wealth of bioinformation coded by its components at spatial and functional level. So far, peptide amphiphiles that copycat specific sequences of ECM proteins have been mainly used as building blocks in supramolecular bioapproaches. However, ECM contains another class of biomolecules - glycans - that do also play important roles in matrix structuring and function.

Herein, we propose to assemble supramolecular gels from short glycosylated peptide amphiphiles as a structural analogues of ECM proteoglycans. Previously, it has been shown that the dipeptide diphenylalanine (FF) can self-assemble directionally and form long nanofibers. When FF is functionalized with aromatic capping groups, it can further assemble into nanofibrous hydrogels. Inspired by these previous findings, we conjugated a monosaccharide (glucosamine, galactosamine) to N-fluorenylmethoxycarbonyl diphenylalanine (Fmoc-FF) through N,N'-Dicyclohexylcarbodiimide/ N-hydroxysuccinimide (DCC/NHS) coupling. The obtained glycopeptide mimic was characterized by mass spectrometry, NMR and HPLC. We aim to investigate the influence of different saccharide units on the assembly process, the properties of the generated nanoassemblies and their gelation at physiological conditions. Interactions with different proteins such as lectins and growth factors are also within the targets of the project.