Supramolecular hydrogels as a structural analogues of ECM proteoglycans

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INTRODUCTION

Extracellular matrix (ECM) is a dynamic network which serves as a structural support for cell attachment but also as a bioinformation transducer that regulates many cell functions. Glycosaminoglycans are main component of ECM: they are involved in protein glycosylation - a common modification of the proteins which can change their structure and function and, thus, modulate cell behavior. Supramolecular hydrogels that contains short glycopeptides have been proposed as ECM mimics because these molecules can code and present biochemical information in a dynamic and responsive manner just as the native matrix. Herein, we generated very short glycopeptide amphiphile by the conjugation of a well-studied dippeptide amphiphile (N-Fluorenylmethoxycarbonyl dihydroxanilamine, Fmoc-F) and the monosaccharide D-glucosamine-6-phosphate, to produce nanofibrous hydrogel.

MATERIALS AND METHODS

RESULTS AND DISCUSSION

Characterization of the hydrogels

Hydrogel preparation

30 min

4h

Characterization of the hydrogels

Circular Dichroism (CD)

1. Gel formation

2. Gel stability

3. CD spectra

4. Fluorescence

5. FTIR

6. X-ray diffractometry

7. SEM

CONCLUSIONS AND FUTURE WORKS

Main conclusions:

- The glycopeptide was successfully synthesized and purified with 98.8% of purity degree.
- The hydrogels at 25°C were assembled, in aqueous environment, via hydrogen bonding interactions between the peptide backbones (β-sheet conformation) and n-stacking of Fmoc tails, confirmed by CD and fluorescence spectrometry.
- The hydrogels at lower concentrations was assembled after the contact with D-MEM culture medium due to the interactions with calcium ions present in the medium and also the pH change.

Future works:

- SEM analysis will be performed to study the morphology of the hydrogels and rheometer to measure the mechanical properties.
- The system can be further tailored to similar systems by varying the gelation process and the saccharide units. Cell encapsulation and targeted delivery will be further explored.

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