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Institut Thématique Multi-Organismes
Technologies pour la santé

Bioinspired Supramolecular Gels for Biomedical Applications

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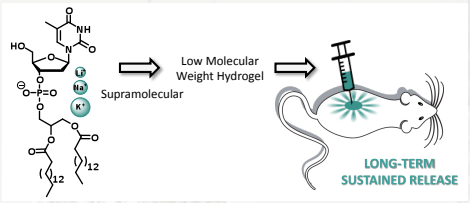
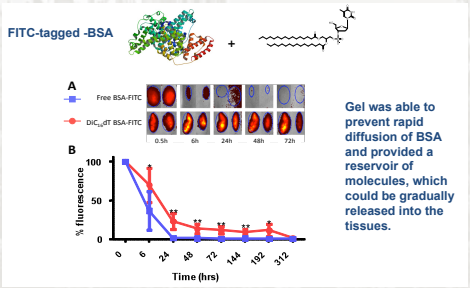
INTRODUCTION

Advances in biomaterials sciences are leading to novel approaches in the field of health science and technology. Effective integration of biological units in these new technologies is critical for interfacing biological functions. As an alternative to synthetic polymers, biomolecules such as nucleic acids, amino acids, sugars represent valuable bioorganic material for the construction of biomedical devices due to their general biocompatibility and their supramolecular properties. While the utility of synthetic biomolecules for biomedicine has been demonstrated through a number of reports, an undeveloped potential for more effectively using the molecular and supramolecular capabilities of bioconjugates as biomaterials remains to be explored.

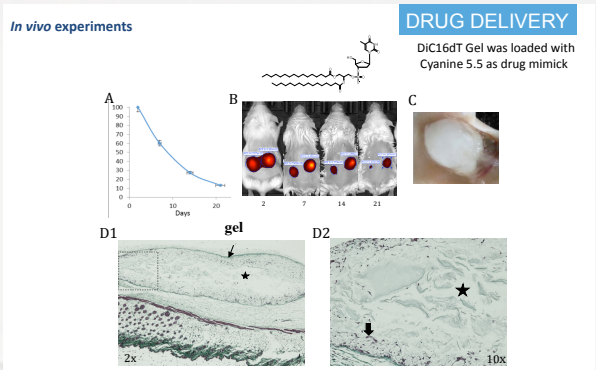
*BIOMATERIALS FOR IN VIVO DRUG DELIVERY**

Hydrogels formed by the self-assembly of low molecular weight gelators (LMWG) are promising scaffolds for drug delivery applications. A new biocompatible hydrogel, resulting from the self-assembly of nucleotide-lipid salts can be safely injected *in vivo*. The resulting hydrogel provides *in situ* sustained release of proteins *in vivo*.





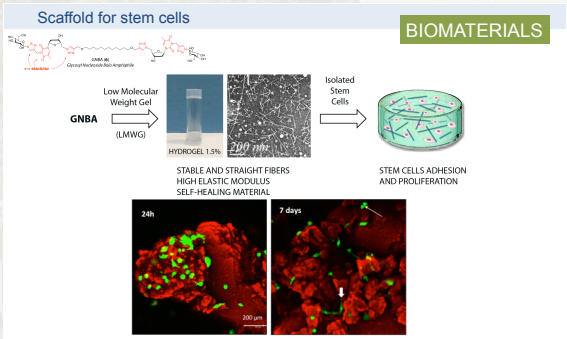
Gel was able to prevent rapid diffusion of BSA and provided a reservoir of molecules, which could be gradually released into the tissues.



-The ionic supramolecular gel was preserved in physiological conditions even after *in vivo* injection.
- Non immunogenic (no fibrosis)
- No toxicity. NOAEL (no observed adverse effect level) > 30 mg/Kg/Day

*BIOMATERIALS FOR TISSUE ENGINEERING**

The bola-amphiphile structures derived from nucleolipids feature unique rheological and biological properties suitable for tissue engineering applications. This kind of hydrogel scaffold exhibits the following essential properties: it is nontoxic, easy to handle, injectable, and features a biocompatible rheology. The reported glycosyl-nucleoside bolaamphiphiles (GNBA) are the first examples of LMWG that allow the culture of isolated stem cells in a polymer free gel matrix.



Biocompatible supramolecular scaffolds allowing stem cells adhesion and proliferation Isolated cells

CONCLUSION

The bioinspired approach developed in our lab is based on the synthetic combination of biomolecules, (i.e. nucleic acids sugars, lipids) This supramolecular technology provides an efficient tool to prepare well-defined nano systems with tunable physico-chemical properties and functions. The novel supramolecular biomaterials offer an alternative to polymers for biomedical applications, including sustained drug release, scaffold for regenerative medicine, for example.

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