Study of delayed-release of carboxyfluorescein from liposome-loaded chitosan physical hydrogels

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Abstract (300 word limit)

Statement of the problem: The property of prolonged release for therapeutic agents from liposomes or biocompatible gels has widely been investigated during the last decade [1, 2]. To overcome classic issues that may be encountered with common drug delivery systems such as the "burst effect" or fast outside diffusion of drugs [3], an "hybrid" system composed of liposomes entrapped within a chitosan physical hydrogel [4] has been developed (Figure 1) and is presented herein. It combines the advantages of both components recognized for the drug delivery applications.

Methodology & Theoretical Orientation: The elaboration process of this "hybrid" system consists in the addition of a suspension of pre-formed phosphatitdylcholine liposomes entrapping a model molecule (carboxyfluorescein, CF) to a chitosan solution. The polymer gelation [4] was subsequently carried out according to experimental conditions optimized in this work. The release of this model molecule from "hybrid" system is assayed by fluorescence.

Findings: The release study of a water soluble CF entrapped in liposomes, themselves incorporated in a chitosan hydrogel has confirmed the concept of delayed-release. Indeed, the CF release was found to be longer in the "drug-in-hydrogel" systems in comparison with the "drug-in-liposomes-in-hydrogels" ones.

Conclusion & Significance: These first results show that such a "hybrid" system could be a step forward in drug delivery for tissue engineering [6], regenerative medicine or wound healing applications. The next step of this work will be to study the impact of structural parameters of the chitosan (*e.g.*, weight-average molecular weight or acetylation degree) and liposomes on the drug release and the interactions between the two components of this "hybrid" system. The influence of the nature, the charge and the molecular weight of the therapeutic agent could also be investigated.

Image

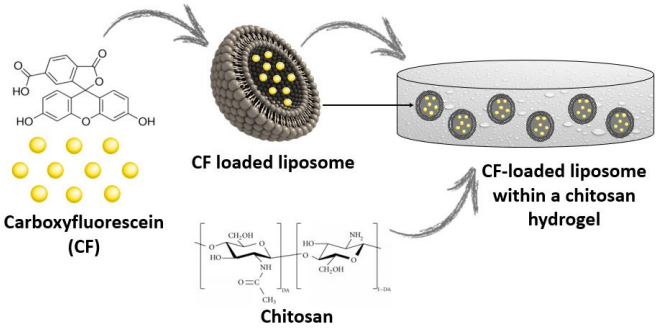


Figure 1: Schematic representation of original "hybrid" biosystem considered herein.

Recent Publications (minimum 5)

1. Allen T. M, Cullis P. R, Liposomal drug delivery systems: From concept to clinical applications, Advanced Drug Delivery, 65:36-48.
2. Hoare T. R, Kohane D. S (2008) Hydrogels in drug delivery: Progress and challenges. Polymer 8:1993-2007.
3. Pjanović R, Bošković-Vragolović N, Veljković-Giga J, Garić-Grulović R, Pejanović S, Bugarski B (2010) Heilig M, Egli M (2006) Diffusion of drugs from hydrogels and liposomes as drug carriers. Journal of Chemical Technology & Biotechnology 85:693-698.
4. Billard A, Pourchet L, Malaise S, Alcouffe P, Montembault An Ladavière C (2015) Liposome-loaded chitosan physical hydrogel : Toward a promising delayed-release biosystem. Carbohydrate Polymers 115:651-657.
5. Montembault A, Tahiri K, Korwin-Zmijowska C, Chevalier X, Corvol M.-T, Domard A (2006) A material decoy of biological media based on chitosan physical hydrogels: application to cartilage tissue engineering. Biochimie 88:551-564.
6. Hurler J, O. A. Berg O. A, Skar M, Conradi A. H, P.J. Johnsen P. J,, Škalko-Basnet N (2012) Improved Burns Therapy: Liposomes-in-Hydrogel Delivery System for Mupirocin. Journal of Pharmaceutical Sciences 10: 3906-3915.



Biography (150 word limit)

Soline Peers is a second year PhD student in Lyon, France at Ingénierie des Matériaux Polymères laboratory. One research axes of this lab is the elaboration of materials for life science. As a physico-chimist with a strong interest in biology and improving health, she dedicates her work to materials in the service of mankind. Her research deals with improving drug delivery by the elaboration of originals systems to enhance drug-delayed release.

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Notes/Comments: