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b-cyclodextrin-linked chitosan/alginate compact polyelectrolyte complexes (CoPECS) as natural and functional biomaterials with intrinsic anti-inflammatory activity

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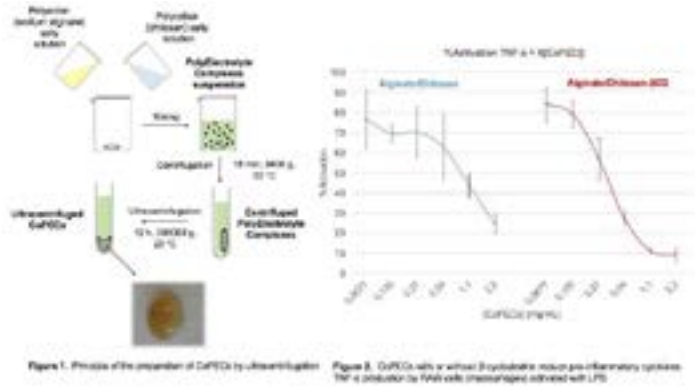
Statement of the Problem: Nowadays, the development of functional biomaterials able to contain and release drugs is of increasing interest for the treatment of various diseases and inflammation states. Synthetic Compact Polyelectrolyte Complexes (CoPECs), have shown interesting properties such as self-healing and stretching abilities or capacity to immobilize and protect enzymes. Very recently, alginate and chitosan natural polyelectrolytes, in the form of CoPECs, have been described as promising candidates for the development of high-performance biomaterials.

Purpose: The purpose of the current study is to functionalize this new natural CoPEC and to evaluate its potential as anti-inflammatory functional biomaterial. Indeed, one of its constituents, chitosan, is already known to have anti-inflammatory effects.

Methodology & Technical Orientation: Chitosan was chemically modified with b–cyclodextrin and mixed with alginate to make a final CoPEC able to trap and release drugs. The ratio between the two constituents of the material was determined by titration of the fluorescently labeled alginate. The intrinsic anti-inflammatory potential of the functionalized material, as well as its effect on cell viability, were assessed through *in vitro* assays.

Findings: Functionalized CoPEC is non-cytotoxic and causes a decrease of the production of NO and of pro-inflammatory cytokine TNF-a by macrophages previously activated with LPS. In addition, the biomaterial attenuates the differentiation of macrophages, which corroborates its anti-inflammatory action.

Conclusion & Significance: Given its anti-inflammatory efficacy and the multitude of final shapes it can take (crude material, membrane, micro- and nanoparticles), b-cyclodextrin-linked chitosan/alginate CoPEC could be used as anti-inflammatory biomaterial with the ability to deliver additional drug for combined treatment of severe chronic diseases such as Crohn's disease, arthritis or cancer.



Recent publications

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2. Reisch A et al. (2012) Compact saloplastic poly(acrylic acid)/poly(allylamine) complexes: kinetic control over composition, microstructure, and mechanical properties. Advanced Functional Materials. 23(6):673-682.
3. Reisch A et al. (2014) On the benefits of rubbing salt in the cut: self-healing of saloplastic PAA/PAH compact polyelectrolyte complexes. Advanced Materials. 26(16):2547-2551.
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Biography

Alexandre Hardy obtained his Engineering Degree in Materials from Polytech'Paris-University Pierre and Marie Curie (Paris, France) in 2015. Passionate about Biomaterials, he is currently a PhD student in the field of polymeric biomaterials in the Laboratory of Conception and Evaluation of Bioactive Molecules – Team BioVectorology, UMR 7199 CNRS/University of Strasbourg (France).

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