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Abstract

Potential Protective Activity and Stability of Cornstarch/Chitosan Films Loaded with the Ctx(Ile^{21})-Ha Antimicrobial Peptide †

Cesar Augusto Roque-Borda [1,*], Bruna Fernandes Antunes [2], Silvio Rainho Teixeira [3] and Eduardo Festozo Vicente [4]

[1] Tuberculosis Research Laboratory, School of Pharmaceutical Sciences, São Paulo State University (UNESP), Araraquara 14800-903, SP, Brazil
[2] School of Biotechnology in Regenerative Medicine and Medicinal Chemistry, University of Araraquara (UNIARA), Araraquara 14801-340, SP, Brazil; bruuhfernandes_@hotmail.com
[3] School of Technology and Sciences, São Paulo State University (UNESP), Presidente Prudente 19060-900, SP, Brazil; silvio.rainho@unesp.br
[4] School of Sciences and Engineering, São Paulo State University (UNESP), Tupã 17602-496, SP, Brazil; eduardo.vicente@unesp.br
* Correspondence: roqueb.cesar@gmail.com
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Abstract: The high mortality rate of different multi-resistant bacteria (MDR) has led to an immediate and urgent solution. Patients hospitalized for chronic diseases have a weakened immune system and are at high risk of contracting an opportunistic infection. Likewise, the WHO prioritized studies against a selected group of MDR bacteria for their control [1]. In this scope, the Ctx(Ile^{21})-Ha antimicrobial peptide (AMP) presented great potential and efficient biological activity against *Acinetobacter baumannii* and *Pseudomonas aureginosa* MDR bacteria [2–4]. Thus, the aim of this research was to design ultrasound-assisted micro-structured films loaded with the Ctx(Ile^{21})-Ha AMP, based on starch and chitosan, for its effective protective action. Gelling was performed for grain breaking and to expose the hydroxyls [5]. For this, 10 g of cornstarch was used as well as 300 mL of distilled water under agitation at 90 °C for 1 h. Then, 5 mL of the gelled starch was added and mixed with 50 mg of peptide. Then, it was stored in petri dishes at 50 °C for 5 h. Chitosan film was synthesized by free-radical polymerization in the presence of crosslinker [6]. Chitosan dispersion (CD) was prepared by dissolving 2% *w*/*v* chitosan in 2% *v*/*v* acetic acid solution. Ctx(Ile^{21})-Ha was placed on the CD with 0.3% *w*/*v* of glycerol and magnetic agitation at 150 rpm. For this, its properties were evaluated by DSC/TGA, FTIR, XRD, and SEM. The physicochemical stability studies of the AMP showed its structure unchanged for up to 3 months exposed to water and for up to one year in the form of a dry film. These results were confirmed by the LC/MS profile, in which XDR indicates a consistent semi-morpho phase. Finally, with these results, we check its stability and protective potential over time and, based on previously published results on their activity against MDR bacteria [2], we conclude that the new products based on AMPs could be potential anti-MDR bacterial agents, avoiding the exposure of critically ill patients in intensive care or post-surgery beds and preventing their dissemination.

Keywords: AMP; MDR bacteria; chitosan; cornstarch; hydrogel film

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