Hydrogel Surface Functionalization of Cotton to Improve Wound Dressing Applicability

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INTRODUCTION

Cotton still are the most used substract for wound management. However, textiles can cause wound dehydration and became mechanically anchored to the wound' surface, turning their change in a painful process. To overcome these drawbacks, modification of cellulosic textiles has been extensively study to improve their application as wound dressing. Thus, our group developed a composite material of cotton functionalized with hydroxypropylmethylcellulose / cyclodextrin hydrogel to be used as antimicrobial wound dressing (figure 1).

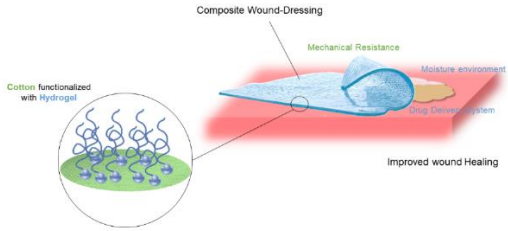

Figure 1. Schematic representation of a cotton substract functionalized with hydrogels for improved wound healing.

METHODS

The composite synthesis was performed by one-step chemical crosslinking. The reaction parameters, such as crosslinker concentration and polymeric solution concentration, were optimized. The obtained composites were characterized base on their physicochemical and mechanical properties. Moreover, to confirm the drug delivery ability of the system, antimicrobial molecules were loaded, and their antimicrobial activity assessed.

RESULTS AND DISCUSSION

The composites, obtained from the crosslinking between cyclodextrins, hydroxypropyl methylcellulose and cotton substract, were developed to be applied as wound dressings capable of preventing wound infections. The hydrogel will improve the wearability and drug delivery capacity of cotton textiles. And the cotton will improve the hydrogel' mechanical properties, facilitating the handle process. The composites were easy to handle and soft, thus suitable for the contact with injured skin.

The hydrogels' swelling profile was transferred to the composite. To the best of our knowledge, loading of gallic acid (as antibacterial agent) into composites wound dressings, and its release for control wound infections, have not been evaluated until now. The swelling and gallic acid loading profiles were similar. The results obtained (DSC, FTIR and release) suggested that gallic acid may be inside the cyclodextrins cavity and, also, trapped in the polymeric network. Regarding the biological properties of the composites, the gallic acid antibacterial activity was preserved after its incorporation within the wound dressings.

CONCLUSIONS

In conclusion, the developed composites showed the combined properties of cotton and hydrogel. Moreover, the loaded composites were able to destroy bacterial cells, preserving the gallic acid antibacterial activity. Based on the results from the present work, the developed composites showed suitable properties for application as antibacterial wound dressing.

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