

A Novel Hydrogel of Poloxamer 407-Chitosan-hyaluronic Acid as Possible Wound Healing in Skin and Mucosa [†]

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1. Background

The use of hydrogels in the treatment of wound healing is becoming an increasingly routine. Hydrogels are materials that protect wound healing, avoiding and/or controlling infection and providing moisture for the irregular wound environment. Poloxamer 407 (P407), chitosan (CH) and hyaluronic acid (HA) are biomaterials investigated to promote wound repair. P407 has thermoreversible properties and promotes wound contraction [1]. CH presents inherent analgesic, hemostatic and microbial effects [2]. HA interacts directly with cells through its cell surface receptors resulting in fibroblast proliferation and protein synthesis [3].

2. Purpose

The aim of this work was to develop and characterize a hydrogel (HG) prepared from a physical mixture of P407, CH and AH for the treatment of skin and mucosal wounds.

3. Methods

The 0.5% CTS was dispersed in 0.5% acetic acid. Previously prepared 0.2% HA solution was added to the previous solution. The final HG was made by adding P407 (18%) using the cold method with continuous stirring for 24 h. The HG was characterized by the following methods: swelling test, microbiological and in vivo studies. Swelling rate was assessed by a gravimetric method in phosphate buffer saline (PBS) at 32 ± 0.5 °C for pH 5.5 and 37 ± 0.5 °C for pH 7.4. The antimicrobial activity was evaluated through a Kirby–Bauer Disk Diffusion Susceptibility Test [4] against Gram-negative bacteria, Gram-positive bacteria and fungi. The wound healing efficacy of the HG was evaluated in burn induced mice. The formulation was applied topically once a day over 14 days. Two groups were evaluated: hydrogel and reference formulation.

4. Results and Discussion

The swelling behavior in wound healing could help to absorb exudates and provides mechanical resiliency to the delivery system at the biological site of action [4]. Our results showed high swelling rates, the best value being at pH = 5.5. The HG provides an

important improvement on antimicrobial properties and showed similar activity to reference. The wound healing in animals treated with HG was similar to Silvederma®.

5. Conclusions

The HG exhibited important antimicrobial and biological effects. Thus, this hydrogel could be proposed as a suitable vehicle for new therapies for wound healing and infections on skin and mucosa.

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