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Resveratrol hydrogel: A solution for burn wound

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Hydrogels are three-dimensional ionically cross-linked structures that have the potential to absorb a considerable amount of water and inflate to gently release the entrapped medication. They had been widely used for drug delivery, diabetic wound healing, open incision wound healing, protein delivery, and stimuli-responsive drug delivery system preparation.

Resveratrol, a polyphenol component found in grape skin and red wine, is a natural polyphenol compound. It has also been studied for angiogenesis inhibition, tumour growth inhibition, wound healing inhibition, antiaging pharmacology of cutaneous wound healing, endothelial cell wound healing, and diabetic wound healing. Following oral dosing, resveratrol has been reported to improve angiogenesis by increasing collagen synthesis at the wound site and encouraging fibroblast proliferation, resulting in greater granulation extension and hence increased wound healing. Resveratrol has been discovered to stimulate angiogenesis by increasing collagen synthesis at the wound site and encouraging fibroblast proliferation, resulting in greater granulation extension and thus increased wound healing.

It has been hypothesized that combining resveratrol and sodium alginate hydrogels may promote skin tissue regeneration following burn wounds, based on numerous pharmacological properties of resveratrol, including antioxidant, anti-inflammatory, and wound healing abilities, and the ability of sodium alginate to be easily processed into hydrogels. The goal of this research was to create resveratrol-sodium alginate hydrogels and test their ability to regenerate skin tissue in animals.

This study was carried out at the Department of Dermatology, Nanjing Medical University, Nanjing, Jiangsu Province, China. The solution casting approach was used to make sodium alginate-based hydrogel films. In a nutshell, 3 g of sodium alginate were correctly weighed and allowed to dissolve in enough water to make a 3% solution with 2% glycerol added as a plasticizer in the entire formulation under continuous magnetic stirring at 400 rpm under ambient circumstances. By sonicating the mixture for 30 min and then pouring 50 g of it onto glass Petri plates, the trapped air bubbles were released. The dried films were removed from the Petri dishes and packed in zipper plastic bags before being stored in a desiccator until they were needed again.

The solution casting process was used to create the hydrogel film. Non-cross-linked hydrogels had an average thickness and weight of 0.0420.005 mm and 0.2240.009 mg, while cross-linked hydrogels had an average thickness and weight of 0.0530.005 mm and 0.2460.01 mg. Although cross-linking resulted

in a modest increase in the thickness and weight of the individual hydrogel films, the difference was insignificant (students t-test, $p>0.05$). The thickness of the hydrogel film is directly but weakly associated with cross-linking time ($R = 0.684$), whereas the weight of the hydrogel film is substantially and directly connected to cross-linking time ($R = 0.974$), according to the person correlation analysis.

The physicochemical and in vivo characterisation of resveratrol-loaded ionically cross-linked sodium alginate hydrogel films are described in this paper. Resveratrol has been shown to have a variety of pharmacological effects, including the ability to assist animals to regrow skin following burn wounds. The total weight variation and thickness of the hydrogel films were not substantially affected by the cross-linking reaction (students t-test, $p>0.05$), but the weight variation was shown to be directly and strongly linked with cross-linking duration. The in vitro drug release analysis of F1 and F2 revealed that the F1 formulation released the drug immediately amidst rapid swelling and degradation, whereas the F2 formulation considerably maintained the drug release for 24 hours, releasing just 20.490.28% of the drug for the entire trial. The rigidification of hydrophilic domains and fluidization of hydrophobic domains of the polymer maximizes hydrogel film resilience in the event of stress and shear, resulting in improved physicochemical properties. On day 14 after wounding, the sodium alginate-based hydrogel film filled with resveratrol hastened the skin regeneration process in rats, initiating quicker wound closure and higher percent re-epithelization.

This discovery will aid researchers in exploring the potential for resveratrol to be synthesized into topically applied formulations, which has yet to be fully explored. As a result, a unique burn wound healing therapy technique is offered.

JOURNAL REFERENCE

Lu, H., M. Kong, J. Jia, N.R. Khan, H.M. Basit, N.M. Marwat and A. Wahab, 2022. Resveratrol loaded ionically cross-linked hydrogel film for burn wound healing potential in animals. Int. J. Pharmacol., 18: 122-132.

KEYWORDS

Resveratrol hydrogel, drug delivery, diabetic wound healing, antiaging pharmacology, angiogenesis, sodium alginate hydrogels