



Exploring the Therapeutic Potential of Bromelain-Infused Proposomal Hydrogels for Accelerating Burn Wound Recovery: In Vivo and In Vitro Insights

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Abstract

Purpose Burn wounds are the most severe kind of injury to the soft tissue and can result in profound, widespread wounds. Due to significant scarring and skin contractures, burns can cause severe mental and emotional suffering. Burn injuries have long been treated locally using a variety of techniques, as they present a challenging medical issue. Bromelain, a blend of protein-digesting proteolytic enzymes, was incorporated into Proposomes and then further into a hydrogel for ease of administration.

Method Soya lecithin was used as a lipid, and propylene glycol served as an 'edge activator' in the cold mixing process to formulate proposomes. CCD (Central Composite design) with three centre points optimised Bromelain-loaded proposomes (Br-PPs). Particle size, PDI, Zeta potential, Entrapment efficiency, and cumulative drug release were measured for the batches. The optimised batch had a particle size of 167.9 nm, a PDI of 0.264 with a zeta potential of -42.1 mV, an entrapment efficiency of 97.4%, and a cumulative drug release of 92.3%. In-vivo activity: The wound healing activity of prepared Bromelain-loaded proposomal hydrogel was studied on Wistar rats weighing 250-300 g. A burn wound of 1 cm² was induced, and the treatment continued for 18 days, followed by daily rinsing of the wound with saline and drying the same with sterilised gauze (non-woven) before the application of SSD (Silver sulfadiazine cream) or hydrogel. The Epithelialization Period, Wound Contraction, Oxidative stress and Histopathology were estimated to observe the healing progress. Statistical studies were carried out on all the evaluations.

Conclusion The Br-PPs hydrogel exhibited better efficacy towards burn wound healing and is considered a promising strategy for burn therapy that supports the debridement of burn wounds.

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