

Development and Characterization of Multiphase Hydrogel Systems for Wound Healing

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Abstract : Present work was based with objective to release of the antimicrobial and debriding agent in sustained manner at the wound surface. In order to provide a long-lasting antimicrobial action and moist environment on wound space, Biocompatible moist system was developed for complete healing. In the present study, a biocompatible moist system of PVA-gelatin hydrogel was developed capable of carrying multiple drugs- Quercetin and Carbopol in controlled manner for effective and complete wound healing. Carbopol and Quercetin were prepared by thin film hydration techniques and optimized system was incorporated in PVA-Gelatin slurry. PVA-Gelatin hydrogels were prepared by freeze thaw method. The prepared dispersion was casted into films to prepare multiphase hydrogel system and characterized by in vitro and in vivo studies. Results revealed the uniform dispersion of microspheres in a three-dimensional matrix of the PVA-Gelatin hydrogel observed at different magnifications. The in vitro release data showed typical biphasic release pattern, i.e., a burst release followed by a slower sustained release for 5 days. Prepared system was found to be stable under both normal and accelerated conditions. Histopathological study showed significant ($p < 0.05$) increase in fibroblast cells, collagen fibres and blood vessels formation. All parameters such as wound contraction, tensile strength, histopathological and biochemical parameters- hydroxyproline content, protein level, etc. were observed significant ($p < 0.05$) in comparison to control group. Present results suggest an accelerated re-epithelialization under moist wound environment with delivery of multiple drugs effective at different stages of wound healing cascade with minimum disturbance of wound bed.

Keywords : multiphase hydrogel, optimization quercetin, wound healing

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