Formulation and Physicochemical Evaluation of Electrospun Hybrid Nanofibers Containing Argireline Acetate Used for Wound Healing

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Introduction:

Argireline acetate as one of the most interesting peptides used in cosmeceuticals has been evaluated in other indications recent decades. In this study, application of argireline acetate loaded in electrospun nanofibers has been investigated in healing process of wounds.

Methods:

A hybrid electrospun scaffold was prepared by Poly 3-hydroxybutyrate-co-valerate (PHBV) and poly ethylene oxide (PEO). Argireline acetate was loaded in Poly Ethylene Oxide (PEO) in 2 layers between three layers of PHBV. Morphology, diameter, contact angle, mechanical strength, loading efficiency and release profile of the scaffolds were evaluated.

Results:

Scanning electron microscopy (SEM) showed all nanofibers were spun without any beads. Diameters varied ranging 270-430 nm. It was indicated that peptide-loaded scaffold had lower contact angle and mechanical strength but, almost similar morphology with larger diameter in comparison to PHBV scaffold. Argireline acetate exhibited around 53% loading efficiency and above 76% release from scaffolds within 8 hours. Presence of Argireline acetate in scaffolds indicated higher cell viability in In-vitro cytotoxicity test of scaffolds toward Human Dermal Fibroblast (HDF) in comparison to blank scaffolds. In-vivo studies in rats with second-degree burn have also determined the high affinity of peptide-loaded scaffold toward acceleration of wound healing process and reduction of wound area in a shorter time. Finally, the histology analysis exhibited more percentage of collagen synthesis and angiogenesis, therefore, further

epithelialization rather than blank scaffold was revealed.

Conclusion:

In this study, it was shown that loading Argireline acetate in wound dressing scaffolds could accelerate the proliferation phase of wound healing, although it needs more evaluation specially on effective dose of Argireline acetate, type and ratio of polymers used for electrospinning and stability of peptide in scaffold.

Acknowledgements:

The research was funded by Tehran University of Medical Sciences and Health Services, grant number 96-03-33-32293, 2016.

Learning Objectives:

Loading method used for electrospinning.

Cell compatibility with electrospun polymeric fibers and loaded Argireline acetate.

Evaluate release pattern of Argireline acetate as a peptide drug model from electrospun nanofibers.