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Preparation and characterization of chitosan/PVA nanofiberus films containing mafenide acetate by electrospinning

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Background and Aims: Electrospinning is an old technique established for preparation of submicron polymeric fibers. Recently, electrospun nanofibers have shown several medical and pharmaceutical advantages due to their extremely small diameter and high porosity. They can imitate the extra cellular matrix (ECM), utilized as wound healing and protective dressing, and used to controlled drug release. Chitosan is one of the important biomaterials which has shown wound healing and antimicrobial properties. The main purpose of this study is to investigate the feasibility of formation of mafenide acetate loaded nanofiberus films by electrospinning technique using PVA and chitosan.
Methods: A 32 full factorial design was used to formulation of electrospinning solutions. Chitosan ratio in Chitosan/PVA solutions (0, 10, and 30%) and drug content (0, 20, and 30%) were chosen as independent variables. Nanofibers diameter and morphology (SEM), drug release rate, films mechanical strength (puncture test), water vapor transmission test and microbial penetration test were evaluated as responses.
Results and Conclusions: The results showed that electrospinning of chitosan solution by itself was impossible but addition of PVA could facilitate the process. SEM analysis revealed that PVA solution results in smooth fibers which were comparatively large in diameter. Increasing chitosan concentration decreased the nanofibers diameter, caused the formation of beaded structures, and decreased the mechanical strength of films. All formulations had maximum drug release in 1 hour and showed acceptable water vapor transmission rate and prevent microbial penetration.

Keywords: Electrospinning; Nanofiber; Chitosan; Polyvinyl alcohol; Mafenide acetate