

Nanofibers Material as a Potential Dressing of Wound: Development and Characterization

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Abstract

Wounds especially chronic ones comprise a medical problem that can lead to many irreversible complications ranging from infection into amputation, sepsis and death. In this project, the aim was to investigate a combination of gold nanorods (GNRs) loaded with quercetin (Quer) and incorporated into nanofiber scaffold as a promising wound dressing material. Optimization of various parameters in terms of Quer loading, incorporation of the resulted complex into polymeric solutions and fabricating nanofibers was carried. Incorporation of both concentration of GNRs ($\sim 95\mu\text{g/mL}$)-PEG-Quer or GNRs ($\sim 48\mu\text{g/mL}$)-PEG-Quer into polymeric mixture of 23% (w/v) Poloxamer 407 and 21% (w/v) PLGA in chloroform has produced intact

GNR-containing nanofiber sheets. GNRs incorporation has resulted in better characteristic of nanofibers in terms of morphology as they became smoother with a smaller number of beads when they were investigated under light and scanning electron microscopes. Tensile strength and dynamic mechanical thermal analysis testing revealed the refinement in elasticity of the sheets that contained GNRs. GNRs-containing sheets demonstrated huge ability to retain water as they increased in weight by an average of 647% after incubation in PBS for 24hr compared to control sheets that increased by an average of only 48% under the same conditions. Cellular toxicity testing against human dermal fibroblasts indicated the biocompatibility of the nanofibers sheets as an average of ~ 73% of fibroblasts were alive after 24hr of exposure to GNRs-containing nanofiber sheets compared to control untreated cells. GNR/Quer-containing nanofibers could be considered a promising wound dressing material that enhances the wound healing complicated process.