

Synthesis and characterization of succinyl chitosan nanoparticle and study their applications in the biomedical field

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Chitosan is a deacetylated form of chitin and it is one of the most abundant naturally occurring co polysaccharides. Wound dressing is a promising medical application for chitosan and its derivatives. Chitosan is insoluble in water, which has significantly restricted its applications. Chemical modification through introduction of hydrophilic functionalities is a well known process to increase the water solubility of chitosan. The objective of this study was to synthesize N-Succinyl-Chitosan (N-Suc-Chi) nanoparticles and evaluate its ability to accelerate the wound healing process. Three different N-Suc-Chi derivatives were synthesized by changing weight ratios of succinic anhydride to chitosan as 1:1(N-Suc-Chi 1), 2:1(N-Suc-Chi 2) and 3:1(N-Suc-Chi 3). The degree of substitution (DS) was determined by a titrimetric method. The N-Suc-Chi 3 was characterized by FT-IR spectroscopy, ¹H NMR spectroscopy, X-ray diffraction (XRD), zeta potential analysis, and solubility test. N-Suc-Chi nanoparticles (N-Suc-Chi NPs) were prepared with Sodium Tripolyphosphate (TPP) through ionic cross linking method. The morphology, particle size and zeta potential of the nanoparticles were investigated and shown a 58.9 ± 6.2 nm particle diameter with a $+38.0 \pm 2.3$ mV zeta potential. Further, we investigated the ability of N-Suc-Chi NPs to accelerate the wound healing process by *in vitro* scratch assay and WST-1 cell proliferation assay using Human Dermal Fibroblasts (HDF cell). *In vitro* scratch assay results revealed that N-Suc-Chi NPs has higher ability to cell migrate towards the cells free area than N-Suc-Chi treated one. The WST-1 cell proliferation assay was showing the much better proliferation and biocompatibility of N-Suc-Chi NPs.

Keywords: *Chitosan, N-Succinyl-Chitosan, wound healing*

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