Preparation and Characterization of Novel, Mucoadhesive Chloramphenicol Nanoparticles for Ocular Drug Delivery

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Abstract

Introduction: For the treatment of eye infections using anti-infective agents, topical ocular application is the most convenient route of administration. Topical delivery of drug agents is associated with a number of problems and challenges owing to the unique structure of the eye. The efficacy of conventional ocular formulations is limited by poor corneal retention and permeation, resulting in low ocular bioavailability. The objective of the present study was to develop ocular delivery for Chloramphenicol used to treat bacterial infections of the eye, which can prevent frequent drug administration and enhance patient compliance.

Methods and Results: Chitosan/TPP nanoparticles were prepared by an ionic gelation method. CS was dissolved in acetic acid (1% v/v) to obtain the cationic phase. CS-NPs were obtained upon the addition of TPP by drop-wise to chitosan solution under magnetic. The chloramphenicol-loaded nanoparticles were characterized for particle size, morphology, zeta potential, drug encapsulation efficiency, and subsequent release and corneal penetration study. HPLC Method was prepared for chloramphenicol determination. Stability of NPs has been tested. The obtained nanoparticles had small particle size and positive surface charges, which improved good stability in six months. The NPs thus produced improved high penetration through isolated sheep cornea due to the interaction with negatively charged biological membranes. These coatings achieved pronounced penetration enhancing effect as compared to chloramphenicol solution. This formulation of nanoparticles has a strong potential for a sustained release effect of the drug, when applied to the eye topically.

Conclusions: It is notable that the chitosan coating as biocompatible and biodegradable polymer, has the potential to be used as a non-toxic penetration enhancer in nanoparticle form, especially for ocular drug delivery.

Keywords: Ocular drug delivery; Nanoparticles; Corneal Penetration; Chloramphenicol