Formulation and Evaluation of Betamethasone Sodium Phosphate Loaded Nanoparticles for Ophthalmic Delivery

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Abstract:

Betamethasone sodium phosphate is a potent glucocorticoid with anti-inflammatory activity and can be used in treatment of macular edema. The aim of this work is to formulate and investigate mucoadhesive chitosan-sodium alginate nanoparticles as new vehicle for the prolonged topical ophthalmic delivery of betamethasone sodium phosphate. Ionotropic gelation method was used to produce betamethasone loaded chitosan alginate nanoreservoir system. The effect of changing different formulation parameters (pH of chitosan solution, sodium alginate concentration, calcium chloride concentration, chitosan concentration, drug concentration and the addition of tween 80) on the physicochemical properties and in-vitro release of the drug loaded nanoparticles was studied. The mean particle size ranged from 16.8 to 692 nm and the zeta potential generally ranged from +18.49 to +29.83 mV depending on the formulation conditions. The highest encapsulating efficiency obtained was 64%. In-vitro release studies showed an initial burst release of the drug followed by slow sustained release over 24, 48 or 72 hours depending on the formulation parameters. The in-vivo studies carried out for two selected formulations showed the release of 84%, 59.5% of the drug over 12 hours for both F3C and F12 respectively. The results of physicochemical properties of F3C and F12 upon storage showed good stability at both 25°C and 40°C as the drug content was within the accepted range, the pH was (5–7) and the mean particle size for both formulations over the three months was still interesting for ophthalmic application. The results of this study suggest that chitosan alginate nanoparticles would be a promising system for the sustained release delivery of betamethasone sodium phosphate to the posterior segment of the eye.

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