

Formulation and Physicochemical Characterization of Magnetic Nanoparticles Containing Brimonidine for Ophthalmic Drug Delivery

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Abstract

Introduction: Recently, magnetic nanoparticles (MNPs) drew a great attention for application in drug delivery systems. Due to their biocompatibility and non-toxic properties, they have potential to create versatile drug delivery systems. Brimonidine (a relatively selective alpha-2 adrenergic receptor agonist) has a significant effect on lowering intraocular pressure in glaucoma. In this study MNPs were coated with alginate and chitosan and loaded by brimonidine to prepare a drug delivery system applicable in glaucoma treatment.

Methods and Results: Brimonidine, sodium alginate and MNPs have been prepared as a dispersion. Chitosan solution was added dropwise to the previous dispersion. The dispersion was centrifuged and the absorbance of the supernatant analyzed by UV spectrophotometer at the λ_{max} of 246 nm. The final dispersion was freeze-dried. The morphological studies of chitosan alginate MNPs (C-A-MNPs) have been done by using transmission electronic microscope (TEM). The release rate of brimonidine tartrate was evaluated by Franz diffusion cell through cellophane membrane.

Results showed that more than 93% of the brimonidine tartrate was loaded on the C-A-MNPs. The formulation prepared was stable at room temperature protected from light. Release study showed that less than 40% of the brimonidine was released after 2 hours compared to simple formulation of brimonidine solution which showed more than 80% release after 2 hours. This finding showed sustained release in C-A-MNPs formulation. Kinetic of drug release from C-A-MNPs was slower than blank and followed zero order. The stability of formulation was more than 2 years.

Conclusions:

It can be concluded that loading of brimonidine on C-S-MNPs may decrease the frequency of administration and increase the efficacy of the product.

Key words: Brimonidine, Iron (I, II) Oxide, Magnetic Nanoparticles, Ophthalmic Drug Delivery