PLGA Nanoparticles as subconjunctival injection for management of glaucoma.

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Abstract

Nanoparticles fabricated from the biodegradable and biocompatible polymer, polylactic-co-glycolic acid (PLGA), could be a promising system for targeting ocular drug delivery. The objective of this work was to investigate the possibility of encapsulating brinzolamide in PLGA nanoparticles in order to be applied as a subconjunctival injection that could represent a starting point for developing new therapeutic strategies against increase in ocular pressure. The brinzolamide-loaded PLGA nanoparticles were fabricated using emulsion-diffusion-evaporation method with varying concentrations of Tween 80 or poloxamer 188 (Plx) in aqueous and organic phases. The nanoparticles were characterized in terms of particle size and size distribution, entrapment efficiency and in-vitro drug release pattern as well as DSC and X-ray analysis. Nanoparticles prepared using Tween 80 in the aqueous phase showed higher encapsulation efficiency and smaller particle size-values compared to those prepared using Plx. Furthermore, the addition of Plx 188 or Brij 97 to the organic phase in the formulation containing Tween 80 in the aqueous phase led to an increase in the particle diameter-values of the obtained nanoparticles. The nanoparticles had the capacity to release the brinzolamide in a biphasic release profile. The nanoparticles were spherical in shape and the drug was entraped in the nanoparticles in an amorphous form. Selected nanoparticles, injected subconjunctivally in normotensive Albino rabbits, were able to reduce the IOP for up to 10 days. Nanoparticles loaded with brinzolamide with lower particle size were able to reduce the IOP for longer period compared to those with higher particle size. Histopathological studies for the anterior cross sections of the rabbitsô eyes revealed that the tested nanoparticles were compatible with the ocular tissue. The overall results support that PLGA nanoparticles, applied as subconjunctival injection, can be considered as a promising carrier for ocular brinzolamide delivery with targeting delivery of the drug to the eye tissues.

AAPS PharmSciTech 2017, February