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Nanoparticles of S-ibuprofen: Physicochemical Characterization, Release Profile and Ocular Tolerance

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Extended Abstract

Ocular drug delivery systems have the potential to improve drug bioavailability, reducing side effects and facilitating patient adherence by avoiding frequent administration, which is a major noncompliance with many chronic eye disorders as inflammatory process. Several recent studies have shown that non-steroidal anti-inflammatory drugs are also effective in the treatment or prevention of postoperative ocular. In this way, (S)-Ibuprofen, also named Dexibuprofen (DXI), is the enantiomer which provides drug therapeutic efficacy reducing side effects of the racemic form.

Although a different number of polymers have been investigated for formulating biodegradable nanoparticles (NPs), polyesters such as poly (lactic-co-glycolic acid) (PLGA) are the most promising biodegradable and biocompatibility polymer, approved by FDA for therapeutic device. Polyethylene glycol (PEG) surface coating had been reported to prolong the residence time of the particles in the precorneal area (Giannavola et al. 2003).

The aim of the present work was the design and physicochemical characterization of S-Ibuprofen PLGA-PEG nanoparticles for ocular drug delivery, analysing drug release profile and ocular tolerance

PLGA-PEG nanoparticles were prepared by solvent displacement method (Fessi et al, 1989). Briefly, an organic solution polymer in acetone containing S-ibuprofen was poured, under moderate stirring into an aqueous solution containing surface active agent (PVA). Acetone was then evaporated and the volume of NPs was concentrated under reduced pressure. Morphology of particles was observed by transmission electronic microscopy. Morphometric properties (average size, polydispersity index) and zeta potential were determined by correlation photonic spectroscopy and electrophoretic mobility respectively. Entrapment efficiency (EE) of drug in the NPs was evaluated by a fluorescence spectroscopy method previously validated, after centrifugation filtration of samples. Interaction of drug with polymer was determined by differential scanning calorimetry. Formulations were optimised by factorial design.

The mean size of developed nanoparticles was smaller than 200 nm being polidispersity index in the range of monodisperse systems (<0.1), both confirmed by TEM. Surface charge had been found to be negative, being encapsulation efficiency higher than 90 %.

Studies of prediction of short time stability showed no significant modifications of the backscattering profile due to particle size. The "*in vitro*" release profile of DXI from NPs showed an initial burst effect followed by a slower release.

Ocular tolerance of developed systems, assessed by "*in vitro*" and "*in vivo*", was adequate without ocular irritation signs.

According to results obtained, it can be concluded that the association DXI to PLGA-PEG nanoparticles provides a new and stable drug delivery system, suitable for treatment of ocular inflammation disorders.

Acknowledgements

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References

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