Etodolac transdermal cubosomes for the treatment of rheumatoid arthritis: ex vivo permeation and in vivo pharmacokinetic studies.

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Abstract

In this study, transdermal etodolac-loaded cubosomes were developed in order to relieve patient pain and joints stiffness by providing stable etodolac concentration at the targeting sites through controlled drug delivery via the noninvasive skin route with more sustaining and less frequent dosing. Different ratios and percentages of poloxamer 407 and monoolein were used to formulate the cubosomes using emulsification and homogenization processes. The etodolac-loaded cubosomes showed particle size values ranging from 135.95 to 288.35 nm and zeta potential values ranging from −18.40 to −36.10 mV. All the cubosomes offered an encapsulation efficiency value of about 100% and showed drug loading capacity ranging from 1.28 to 6.09%. The in vitro drug release studies revealed a controlled drug release profile with a drug release rate up to 15.08%/h. Increasing poloxamer concentration in etodolac-loaded cubosomes resulted in nanoparticles with less particle size and faster drug release. The particles exhibited cubic and hexagonal shapes. The DSC and X-ray analysis demonstrated that the drug was encapsulated in the cubosomes bicontinuous structures in amorphous form. In addition, investigated cubosomes exhibited fast drug penetration through excited mice skin followed by slower drug penetration for up to 24 h. The pharmacokinetic study in human volunteers showed that the selected etodolac-loaded cubosomes enhanced the bioavailability of etodolac as compared to the oral capsules (266.11%) with evidence of longer half-life and higher MRT that reached 18.86 and 29.55 h, respectively. The etodolac-loaded cubosomes propose a promising system for treatment of arthritis simply through skin application.

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