proceedings

MDPI

Proceedings

Development and In Vitro Characterization of Diacerein Loaded Chitosan-Chondroitin Sulfate Nanoemulgel for Osteoarthritis

Bazla Siddiqui, Asim-ur-Rehman and Naveed Ahmed *

Department of Pharmacy, Quaid-i-Azam University, Islamabad 45320, Pakistan; bazla.siddiqui@bs.qau.edu.pk (B.S.); arehman@qau.edu.pk (A.-u-R.)

* Correspondence: natanoli@qau.edu.pk

† Presented at the 2nd International Online-Conference on Nanomaterials, 15–30 November 2020; Available online: https://iocn2020.sciforum.net/.

Published: 15 November 2020

Abstract: The proficient function of diacerein and anti-inflammatory polymers have been utilized to develop sustained release transdermal diacerein nanoemulgel for long term osteoarthritis treatment, by overcoming the deleterious outcomes of drug associated with the oral route. Chitosan (CHS) and Chondroitin Sulfate (CS) were employed as natural anti-inflammatory and biodegradable polymers to formulate diacerein nanoparticles (DCR-NPs) through ionic gelation method. Optimized nano-formulation was prepared using Design Expert software, by investigating the impact of polymers and surfactant concentrations on particle size, PDI and entrapment efficiency employing Response Surface Methodology (RSM). DCR-NPs formulated using 0.4% CHS, 0.1% CS and 0.015% (*w*/*v*) Tween 80 depicted spherical shaped nanoparticles with particle size of 320.0 ± 3 nm having PDI, zeta potential and entrapment efficiency of 0.3 ± 0.07, 40 ± 0.3 mV and 82 ± 4.16% respectively. DCR-NPs were further analyzed for confirmation of electrostatic interactions between polymers and drug through Fourier transform-infrared spectroscopy (FTIR). Through in vitro studies 95% release of DCR in 72 h was exhibited following Korsmeyer-Peppas model. For transdermal application, nanoemulgel of optimized DCR-NPs was formulated utilizing argan oil as permeation enhancer with intrinsic anti-inflammatory properties, providing synergistic effect to the formulation. Nanoemulgel was characterized in terms of visual appearance, spreadability, drug content and rheological behavior providing sustained release of drug up to 96 h following Higuchi model with improved *ex vivo* permeation, confirmed by fluorescent microscopy. Concisely, DCR-nanoemulgel sustained the release of drug having superior penetration properties with provision of enhanced therapeutic effect owing to the presence of CHS, CS and argan oil possessing indelible anti-inflammatory attributes.

Keywords: diacerein; chitosan; chondroitin sulfate; nanoemulgel; transdermal delivery; sustained effect