Diflucortolone valerate loaded solid lipid nanoparticles as a semisolid topical delivery system

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Abstract

Solid lipid nanoparticles (SLNs) are promising delivery carriers that have been utilized for formulation and delivery of various drugs. For topical administration, they are usually incorporated into gel or cream to increase their residence time, which is time-consuming process and could affect their stability and characteristics. Preparation of solid lipid nanoparticles (SLNs)-based semisolid formulations could have potential pharmaceutical applications. The aim of this study was to formulate the corticosteroidal drug, diflucortolone valerate (DFV) into topical semisolid SLN formulations using a rapid cheap one-step process. SLN formulations were developed using a high-shear homogenization combined with sonication, using different types of solid lipids (e.g., Geleol®, Precirol® ATO5, Tristearin® and Compritol® 888ATO) and Poloxamer® 407 as a surfactant. Selection of the lipids and using high lipid concentration were the key elements to get semisolid formulation immediately after sonication without incorporating the nanoparticles into a gel or a cream base.
DFV SLN formulations possessed average particle size ranging from 203.71 ± 5.61 to 1421.00 ± 16.32 nm with a narrow size distribution and possessed shear thinning behavior. Incorporation of lipid based surfactants (Labrasol® or Labrafil®) was found to significantly increase DFV encapsulation efficiency (up to 45.79 ± 4.40%). Semisolid DFV-loaded SLN with high drug encapsulation efficiency and acceptable rheological behavior for topical preparation could be prepared in a one-step process.

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