International Journal of Pharmaceutical Science and Research
ISSN: 2455-4685; Impact Factor: RJIF 5.28
Received: 15-02-2019; Accepted: 19-03-2019
www.pharmacyjournal.net
Volume 4; Issue 2; April 2019; Page No. 21-31

Development of gel based ophthalmic preparation of solid lipid nanoparticles containing ofloxacin and prednisolone

Nida Parveen[1], Shobhna Singh[2], Himanshu Joshi[3]
[1] Invertis Institute of Pharmacy, Invertis University, Bareilly, Uttar Pradesh, India
[2-3] Department of Pharmacy, MJP Rohilkhand University, Bareilly, Uttar Pradesh, India

Abstract
The aim of the present study was focused on the development of solid lipid nanoparticles based gelling system of antibiotic drugs to be administered through ocular route. Five formulations (OF1, OF2, OF3, OF4 and OF5) of solid lipid nanoparticles were prepared containing ofloxacin and four formulations (PF1, PF2, PF3 & PF4) of solid lipid nanoparticles were prepared containing prednisolone. Solid lipid nanoparticles were prepared by emulsification followed by sonication method. Prepared ofloxacin and prednisolone containing solid lipid nanoparticles were evaluated for particle size, shape, surface morphology, drug content and in-vitro drug release studies. The average particle size was found to be in range 354.2 nm for ofloxacin & 349.2 nm for prednisolone formulations. The particles were uniform, spherical in shape and had 60 to 88.3%w/w of drug entrapped for ofloxacin formulation & 58 to 84.45%w/w for nanoparticles containing prednisolone. The drug release from solid lipid nanoparticles showed sustained release of drug. All the formulation showed better result in terms of stability. Among the five formulations of ofloxacin and four formulation of prednisolone the best result were found with OF4 formulation of ofloxacin & PF1 formulation of prednisolone. The solid lipid nanoparticles of ofloxacin & prednisolone were incorporated into gel so as to make it suitable to be administered by ocular route. Solid lipid nanoparticles containing gel showed drug delivery up to 88.7% to 92.7%. Ofloxacin & prednisolone containing nanoparticles loaded gel showed better result when compared with the ofloxacin nanoparticles; because the release rate revealed that the gel gave higher release of drug initially for quick onset of action.

Keywords: solid lipid nanoparticles (SLN), ofloxacin, prednisolone, ocular route, gelling system

1. Introduction
Solid lipid nanoparticles were firstly introduced in the beginning of 1991. These are submicron in size range (50-100nm) composed of physiological lipids [1, 2]. These nanoparticles posses a lipid core matrix in a nanometer range, stabilized by a surfactant layer [3, 4]. These are based on biocompatible lipids and provide sustained effect on the formulation either by diffusion or dissolution [5]. SLN have several advantages over other colloidal carriers, such as the possibility of controlling drug release, long term stability, drug targeting, and good drug loading of drugs may it be lipophilic or hydrophilic, free from biotoxicity due to the use of physiological lipids [6]. The solid lipid nanoparticles, due to their nano size range can be an effective ocular drug delivery system as they improve ocular bioavailability, enhance corneal absorption, prolong the ocular retention time and provide a sustained drug release profile [7]. The solid lipid nanoparticles were realized by exchanging the liquid lipid (oil) of the emulsion by a solid lipid meaning that lipid is solid at room temperature and at body temperature also [8]. The use of solid lipid instead of liquid lipid was much better idea to achieve controlled drug release, as the mobility of the drug in the solid is considerably lower as compared with liquid oils [9]. The smaller size of solid lipid nanoparticles offer several advantages like larger surface area, high drug loading capacity, interaction with target site up to molecular level and enhances the bioavailability of drug. The lipid core provides incorporation of wide variety of drugs, which get dissolved, dispersed and entrapped in it. Due to their biodegradable and biocompatible properties the solid lipid nanoparticles are used to deliver lipophilic drugs, macromolecules, proteins, peptides, genes, antigens, food molecules, hydrophilic drugs and diagnostic molecules [10].

1.1 Solid Lipid Nanoparticles for Ophthalmic Use
Ophthalmic drug delivery is one of the most interesting and challenging task which the pharmaceutical researcher encounter due to the unique anatomy and physiology of eye [11]. Eye is an unique and challenging organ for therapeutic drug delivery on to the surface as well as in the interior part of the ocular structure. Most of its anatomical and physiological makeup/architecture interferes with the fate of the administered drug and bioactive. Tears permanently wash the surface of eye [12]. Recently the use of nanotechnology in the ophthalmic field has gained much attention, because nanoparticulate drug delivery is considered to be one of the most promising technologies to overcome poor drug stability and difficulties in delivery of the drug across the biological membrane. Various types of ophthalmic conventional formulations like solution, suspension, ointment are available in the market, but all these formulations have some disadvantages like rapid precorneal elimination of drug, high variability in efficiency and blurred vision. The ophthalmic solutions lead to poor bioavailability of drug by dilution and drainage from the eyes and the therapeutic response of the drug is reduced as well and delayed [13, 14].