ABSTRACT

Fungal infections are one of the most common causes of skin diseases. Occurrence of fungal infection is increasing worldwide. Oral therapy of fungal infection has associated with toxic effect, long duration of treatment and intolerance by the patient while topical therapy for superficial fungal infections is associated with poor solubility of drugs, irritation to skin and less permeability through skin. Hence to improve the penetration of drugs, to minimize side effects of drugs and rapid symptomatic relief from fungal infections, the solid lipid nanoparticles containing antifungal drugs were prepared.

In the present research the Butenafine loaded solid lipid nanoparticles (BUTE-SLN) and sertaconazole loaded solid lipid nanoparticles (SERT-SLN) were prepared and incorporated in to aloe vera gel for improved penetration of drug through stratum corneum and to enhance the therapeutic activity of drug. The BUTE-SLN and SERT-SLN were prepared using simple modified solvent emulsification technique. The BUTE-SLN and SERT-SLN were composed of the novel excipients such as OLML and OLMS, dimethyl sulfoxide (DMSO), TPGS and stearyl amine. A 3 factor 2 level factorial design was used to optimize the BUTE-SLN formulation while taguchi experimental design was opted for the optimization of SERT-SLN dispersion. The optimized formulations were evaluated for particle size, polydispersity index, zeta potential, entrapment efficiency and drug loading. All the formulations were found to be nanometric range with spherical shape with maximum drug entrapment potential. The optimized formulations of BUTE-SLN and SERT-SLN were lyophilized and analyzed for DSC, FT-IR and XRD study. The results reveal that the drug and excipients were compatible with each other, no interaction was observed and the crystalline drug and lipid transformed into amorphous SLN. The SLN dispersions were subjected to stability study as per ICH guideline and were found to be stable.

The BUTE-SLN and SERT-SLN were incorporated in to aloe vera gel to improve the penetration of drug and to give additive effect in the treatment of fungal infection. The BUTE-SLN gel and SERT-SLN gel were evaluated for different physicochemical
properties. BUTE-SLN gel and SERT-SLN gel showed non Newtonian pseudoplastic flow and excellent spreadability, ease of application and adhesion. The BUTE-SLN gel and SERT-SLN gel were found to be occlusive which prevent the trans membrane water loss and observed to have more skin hydrating potential than the marketed cream. The BUTE-SLN gel and SERT-SLN gel were studied for in vitro drug release and in vitro permeation of drug. The gel showed biphasic release pattern which showed initial burst release and then sustained release. The initial burst release shows quick onset of action and sustained release gives prolonged antifungal effect. Skin retention study reveals the maximum concentrations of drug were quantified into stratum corneum. Skin irritation study was performed according to OECD guideline and the formulations were found to be non irritant and safe for topical use. The BUTE-SLN gel and SERT-SLN gel showed enhanced antifungal activity and stability of the formulations over the period of study.

Hence the formulation of antifungal drugs BUTE and SERT into solid lipid nanoparticles for topical drug delivery proves to be promising carrier for the delivery of the drugs. The formulations were found to be safe, compatible with enhanced penetration of drug in to the skin achieved.