

The Solid Lipid Nanoparticle (SLN) and Microemulsion Formulation Containing Parsol® 1789, 5000 and MCX: SPF and Physiochemical Characteristics Evaluation.

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Abstract

Introduction: Sunlight has some benefits and also harms like as skin aging, photosensitivity, irregular hyper-pigmentation and skin cancer. So the use of sunscreen creams is proposed for protection and minimizes harmful adverse effects of sunlight. Solid lipid nanoparticles (SLN) and microemulsions (ME) are new drug delivery systems that are suitable for sunscreen delivery.

Methods and Results: Different concentrations of lipid (Witepsol H35 and H15) and surfactants (Tween® 60 and Span® 60) were used as an ingredient for SLN formulations. Parsol® 1789, 5000 and MCX are used as active agents. SLN and ME were prepared by using High-shear Homogenization and ultrasound method. The particle size analysis, drug release, encapsulation studies and SPF evaluation of different SLN samples were examined. Stability of microemulsions was performed using a centrifuge. Also we used different concentrations of isopropyl myristate as a lipid, Tween® 80 and propylene glycol as a surfactant for preparing ME formulations. After adding sunscreen ingredients, particle size analysis and physical stability tests were studied. According to particle size analysis the best formulations for H35 consists of 5% lipid, 15% surfactant with HLB=12 and for H15 consists of 5% lipid, 5% surfactant with HLB=11. Particle size of all of the formulations were less than 1µm, encapsulation efficacy was more than 70%. The maximum SPF was 38.75 and belongs to SLN formulation with lipid H35 and MCX (5%). According to turbidity and particle size the best formulation for ME was chosen. All of the ME formulations containing sunscreen agents have less than 500 nm particle size.

Conclusions: Our result shows that SLN formulation is good carriers for sunscreen delivery. SLN particles act as a barrier for sunlight. So loading a UV absorbent like as MCX can improve sun screen ability of the formulation. Our result shows a SPF equal to 38.75. Also in SLN formulations the release of UV absorbent may be slower and has more duration in time. So the adverse effect may be lower and duration of action may be better. Finally we conclude that formulation of sunscreen in SLN base can improve sunscreen properties of products.

Key words: SLN, Microemulsion, MCX, Parsol, SPF.

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