Nanostructured lipid carriers with a minoxidil association.

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Abstract

In this study, minoxidil was used to make a lipid nanoparticles carrier (NLC) gel, which is a medicine that is commonly used to treat alopecia, or baldness. The melt dispersion ultrasonication process was used to create nine different Minoxidil-NLC formulations (NLC1–NLC9) employing liquid and solid lipids with Cholesterol and Soy protein lecithin in various quantities. The properties of NLC1–NLC9 were examined, including particle size and distribution, scanning electron microscopy (SEM), drug entrapment efficiency (EE), and drug release behaviour. The drug concentration, pH, spreadability, rheology, and in vitro release of the nanoparticulate dispersion were all measured and characterised. Primary skin irritation investigations were used to assess the NLC-based gel's safety. Imperfect crystallisation occurred in the inner core of the NLC particles, according to DSC measurements. The NLC's drug release pattern was biphasic, with burst release at first and then steady release. These findings suggest that the NLC3 is a good minoxidil carrier, with good drug loading capacity and regulated drug release. NLC gel generates gels with good consistency, homogeneity, spreadability, and rheological behaviour, according to research. The current study found that using an NLC-based gel containing minoxidil mixed in a mixture of solid and liquid lipids in nanoparticulate form helped us achieve our goal.

Keywords: Minoxidil, Nanostructured lipid carrier, DSC, SEM.

Introduction

Pharmaceutical technology has embraced Nanotechnology, and novel pharmaceutical formulations forms are being developed to deliver a variety of physicochemically distinct medicinal molecules. The main and common issues are poor water solubility and low bioavailability of novel pharmacological compounds [1]. As a result, there is a growing need to create a drug carrier technology that overcomes this disadvantage. Nanodisperse technologies such as Liposomes, nano emulsification, and lipid nanoparticles are becoming increasingly important as vehicles for regulated release of active compounds and targeting to skin layers [2].

Because of the film generation on the skin surface, these systems have occlusive qualities due to topical administration. It increases hydration, which minimises topical and transdermal water loss and hence improves medication penetration into the stratum corneum [3]. It's also been stated that the occlusion factor of SLN and NLC is proportional to their particle size, increasing as the mean particle diameter decreases. The lipid particles' small size enables intimate contact with the stratum corneum, perhaps increasing the amount of medication that reaches the mucosa or skin. Controlled release from some of these carriers is achievable thanks to their strong lipid matrix [4].

Furthermore, by varying the volume of moisture lipids added towards the composition, the NLC can be kept solid at body temperature, allowing for drug release profile modification. When it's required to deliver a medicine over a lengthy period of time, minimise systemic absorption, or when the agent causes irritation at high doses, this becomes a useful tool [5].

Conclusion

Minoxidil, a pyridine derivative, was first created as an antihypertensive oral medication. Foliar application of high ethyl alcohol and/or propylene glycol content may cause significant adverse effects such as scalp dryness, irritation, burning, redness, and allergic contact dermatitis. To reduce side effects and improve androgenic alopecia treatment, novel dermatologist formulations free of polar solvents are needed.

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