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REVIEW ARTICLE

Nanoemulgel: An Innovative Carrier for Drug Delivery of Poorly Water-Soluble Drugs

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Abstract: Recently, the delivery of hydrophobic/ poorly water-soluble drugs has been a difficult task. Various approaches have been developed to counter the former and other main issues, such as solubility, bioavailability, *etc.* However, only a few formulations have successfully addressed the problems and nanoemulgels are a standout among them. The nanoemulgel drug delivery approach combines multiple benefits associated with emulsion and gel technologies to improve active moiety solubility, bioavailability, and longevity. The article discusses the present status of nanoemulgel research and development, including its preparation methods and characterization techniques. Additionally, the possible uses of nanoemulgel in targeted drug delivery and cosmetic/ personal care products are discussed. Overall, nanoemulgel technology has shown significant promise as a novel approach to augment the transport of water-insoluble moieties. With further research as well as development, it is expected to have a substantial impact on the pharmaceutical and cosmetic industries. This inclusive review highlighted the role of nanoemulgels as a promising carrier for drug delivery, with an overview of a few illustrations supporting the cause.

Keywords: Nanoemulgel, topical drug delivery, lipophilic drug, absorption enhancer, permeability.

1. INTRODUCTION

Comprehensive research in developing chemical synthesis techniques has resulted in a large increase in the production of drugs that are not readily soluble in water [1]. According to the latest data, around 70% of novel chemical entities (NCEs) are insoluble in water [2]. A drug delivery system is a multidisciplinary approach to the delivery of therapeutics to the target tissue, which gives new ideas on controlling the pharmacokinetics, pharmacodynamics, immunogenicity, bio-recognition, non-specific toxicity, and efficacy of the drug. These recently created drugs are challenging to administer orally due to their hydrophobic characteristics. Their characteristics include limited ingestion bioavailability, variable assimilation processes, and intra- and intersubjective pharmacokinetic heterogeneity [3]. Researchers have devised numerous techniques to circumvent the restrictions of poor solubility and biological availability. Alternative means of delivery of formulation design and synthetic or physical altering of drug molecules can be employed to resolve the absorption of drug problems. Despite their numerous ways to administer drug methodologies, lipid-based drug delivery has attracted much interest in hydrophobic drug delivery. Its components include macroemulsion, nanoemulsion, niosomes, self-emulsifying formulation, liposomes, solid-lipid nanoparticles, and more. Within various composition alternatives, emulsion-based preparation is a commercially viable way to overcome the constraint of poor absorption [4]. Nanoemulsions can improve dermal drug absorption, enhancing the absorption rate and penetration of hydrophobic drugs, making them a viable alternative for drug delivery approach [5]. Although the oral route increases patient compliance, it has significant downsides, including gastrointestinal irritation, unavoidable adverse effects, extensive poisoning, and first-pass liver metabolism [6]. To circumvent any of such concerns, a soothing, easy, and subtle topical drug delivery method may be an acceptable option. This offers multiple benefits above the ingestion route, including targeted drug distribution resulting in lower systemic adverse reactions, minimal gastrointestinal discomfort, bypass of the first-pass metabolic process, and enhanced drug absorption [7, 8]. Indigenous topical formulations, such as lotions, creams, and ointments, have a viscous nature, durability concerns, limited spreadability, and other limitations that impair patient compliance. Advanced transdermal preparations, such as clear gel, nano gel, and (micro/nano) emulgel, enhance patient compliance and formulation efficiency, durability, and tolerability. Numerous investigations indicate that topically applied medication strategies enhance drug absorption [9, 10]. The usual epidermal approach is approximately three times more effective than ingestion regarding lacidipine bioavailability. This could be because the therapy avoids the metabolic process's first-pass [9].

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