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BRIEF REVIEW ON EMULGEL

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ABSTRACT

Emulgel is used to treat aches and pains caused by colds, headaches, muscle aches, backaches, arthritis and other conditions and injuries.The Patient adherence to topical formulations is significant in relation to chronic skin diseases, like fungal infections, acne, psoriasis. Emulgel is one of the recent technology in NDDS used topically having characteristics of dual control release i.e. emulsion as well as gel. Emulgels have emerged as One of the most interesting topical delivery systems as it has dual release control system i.e. gel and emulsion. When gel and emulsion are used in Combined form, the dosage form are referred as emulgel.

Keywords: Emulgel, Gelling agents, Topical drug delivery, Skin diseases

Introduction

Topical drug delivery can be defined as the application of a drug containing formulation to the skin to directly treat the cutaneous disorder. The topical drug delivery system is generally used where other routes (such as oral, sublingual,rectal, and parental) of drug administration fails or in local skin infection like fungal infection. Topical drug delivery is a an attractive route for local and systemic treatment.

The formulation of emulgel is thermodynamically stable and exhibits low interfacial tension, which is obtained by mixing surfactant and co-surfactant, having with respect to various properties like permeability enhancement, along with good thermodynamic stability. The emulgel system has a dual-release and sustained-release pattern of control. The emulgels enhance the bioavailability and also patient compliance. Evaluation of physical parameters like pH, viscosity, particle size, zeta potential, drug content, stability studies, skin irritation tests, etc. has been performed.. (1)

A unique aspect of dermatological pharmacology is the direct accessibility of the skin as a target organ for diagnosis and treatment. The main advantage of the topical delivery system is to bypass first pass metabolism. Avoidance of the risks and inconveniences of intravenous therapy and the varied conditions of absorption, such as pH changes, the presence of enzymes, and gastric emptying time are another advantage of the topical drug delivery system as compared with conventional ointments and creams gel formulations generally provide faster drug release.

Topical drug administration is a localized drug delivery system anywhere in the body through ophthalmic, rectal, vaginal and skin as topical routes. These are apply a wide spectrum of preparations for both cosmetic and dermatological, to their healthy or diseased skin. (2)

Emulgel are emulsions, which are either water-in-oil or oil-in-water type. They are gelled by the mixing of the gelling agent. Emulsion acts as a controlled release drug delivery system in which drug particles are entrapped in internal phase and get passed through external phase to skin and get absorbed slowly. The internal phase, acting as a reservoir of the drug, provides a controlled way to reach the external phase of the skin. The gel captures small drug particles and provides release in a controlled manner because of a cross-linked network. It increases the contact period of medication over the skin because of its mucoadhesive property. Since Emulgel possesses the property of both gel and emulsions it acts as dual control release system. (3)

Difficulty in delivery of hydrophobic drugs is major limitation of gels.So to overcome this limitation emulgels are prepared and with their use even a hydrophobic drug can enjoy the unique properties of gels. When gels and emulsions are used in combined form the dosage forms are referred as emulgel. In fact, the presence of a gelling agent in the water phase converts a classical emulsion into an emulgel. O/W system is used to entrap lipophilic drugs whereas hydrophilic drugs are encapsulated in the W/O system.

Emulgels are generally a combination of emulsion and gel. Emulsions, either of the water in oil or oil-in-water type, these emulsions are gelled by mixing with a gelling agent and this Emulsified gel is act as the superior carrier for poorly water soluble or hydrophobic drugs (4)

Emulgel

As the name suggest, they are the combination of gel and emulsion. Both oil-in-water and water-in-oil type of emulsion used as a vehicle to deliver various drugs to the skin. They also have a high ability to penetrate the skin.

The most common method for drug delivery is the oral route; however, other methods such as parenteral, sublingual, subcutaneous, and vaginal routes are also utilized. In some cases, drugs may not elicit a pharmacological response when administered orally due to factors like low absorption, structural properties, lipophilicity, and poor bioavailability, which can also lead to significant side effects. This necessitates the development of a topical drug delivery system that can effectively deliver the medication (5)

The presence of the gelling agent in water phase converts a classical emulsion into an emulgel. Emulgel for dermatological use has several favourable properties such as being thixotropic, greaseless, easily spreadable, easily removable, emollient, non-staining, water-soluble, longer shelf life, bio-friendly,transparent and pleasing appearance.molecules can basically penetrate into the skin by three routes: through intact stratum corneum, sweat ducts, or sebaceous follicle.The surface of the stratum corneum presents more than 99% of the total skin surface available for percutaneous drug absorption.Passage through this outermost layer is the rate limiting step for percutaneous absorption.

The features of emulgels like being safe, gentle, non-allergenic, and not clogging pores stem from what goes into them. To make an emulgel, you need to choose the right oil, something to mix it all together, and a substance to make it gel-like. These choices are key to creating an effective product. (6)

The major steps involved in percutaneous absorption include the establishment of a concentration gradient,which provides the driving force for drug movement across the skin,release of drug from the vehicle (partition coefficient), and drug diffusion across the layers of the skin (diffusion coefficient).

There are two sorts of topical delivery products available: external and internal products. As their name implies, the external products are applied by spreading or spraying, internal products are delivered orally, vaginally, or rectally. Topical preparations may be classified according to their consistencies, namely solid preparations, liquid preparations, semi-solid preparations, and another miscellaneous preparation. Many factors will, however, influence absorption of the drug through any route of entry. Some factors, i.e., skin thickness, skin pH, hydration, inflammation, partition coefficient, molecular weight, etc., affect the topical route. (7)

Advantages

1. Avoidance of first pass metabolism.
2. Avoidance of gastrointestinal incompatibility.
3. More selective to a specific site.
4. Improve patient compliance.
5. Suitability for self-medication.
6. Providing utilisation of drug with short biological half-life and narrow therapeutic window.
7. Ability to easily terminate medication when needed.
8. Convenient and easy to apply.
9. Incorporation of hydrophobic drugs
10. loading capacity
11. Better stability
12. feasibility and low preparation cost
13. Controlled release
14. intensive sonication

Disadvantages

1. irritation on contact dermatitis.
2. The possibility of allergenic reactions.
3. The poor permeability of some drug through the skin.
4. Drug of large particle size not easy to absorb through the skin.
5. The occurrence of the bubble during formation of emulgel.

Rationale

There are many disadvantages in many widely used relevant means such as ointment, cream, lotion. They have very sticky, which causes restlessness for the patient when used. Apart from this, they also have low -spread coefficients and must use with RUB, and they also show the problem of stability. Due to all these factors in the large group of semicolide preparations, the use of transparent gels has expanded both cosmetics and the production of medicine. It is a gelkolloid that usually contains 99% fluid, which is stable from the stress on the surface between it and a macromolecular network of fibers formed with a small amount of a gyneching fabric. Despite the many benefits of gel, an important limit in the distribution of hydrophobic is medication. therapeutic silence can be successfully incorporated and distributed through Gels

Drug Delivery across the Skin

The superficial layer of the skin is epidermis and it is composed of stratified keratinized squamous epithelium which varies in thickness in different parts of the body. Skin as a target organ for diagnosis and treatment of dermatological problem. The skin acts like a two-way barrier for prevent absorption or loss of water and electrolytes. In topical drug absorption three primary mechanisms are present

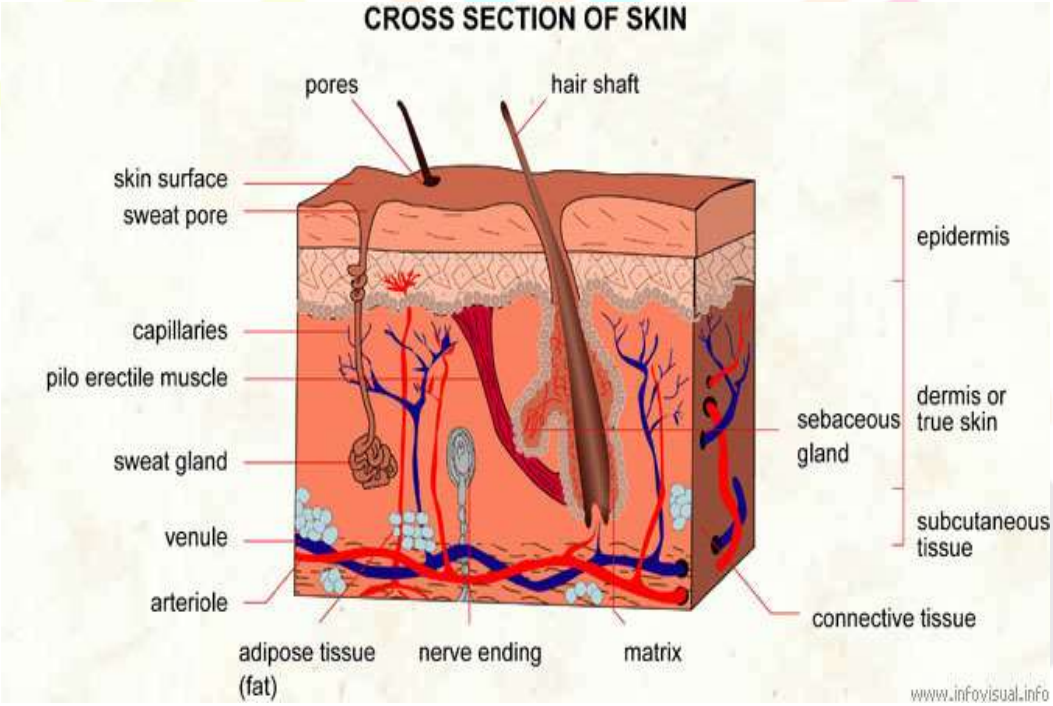
1) Transcellular

2) Intercellular

3) Follicular.

Mostly drugs pass by the torturous path around corneocytes and through the lipid bilayer to viable layers of the skin. Creams and gels that are rubbed into the skin have been used for many years to deliver as a pain killer medication and antimicrobial drugs to an affected site of the body. These include, among others like a gels and creams for vaginal yeast infections, topical creams for skin infections and creams to soothe arthritis pain. Newer technologies now allow other drugs to be absorbed through the skin (transdermal). These can be used to treat not just the affected areas (for example, the skin) but the whole body (systemic)

The stratum corneum layer, which is the outermost layer of skin, is the cutaneous barrier to the very substances that come in contact with the skin. While the stratum corneum itself is 10 to 20 cells thick over most of the body, it doesn't make an exception for the rest of the body. Actually, every corneocyte has a typical size of a flat, plate-like structure-34-44 μm long, 25-36 μm wide, and 0.5 to 0.20 μm thick thus creating intercellular spaces of stocks equal to 750 to 1200 μm. Lipids (present in levels of 5-15%) include lamellar lipids like ceramid, glycosphingolipid, and cholesterol sulfate, plus neutral lipids, protein (comprising of 75-85% of total lipids) with mainly keratin as the dominant fresh material. (8)



Cross Section Of Skin

Factors affecting topical absorption of drug

✓ Physiological factors

1. Skin thickness.
2. Lipid content.
3. The density of hair follicles.
4. The density of sweat glands.
5. Skin pH.

6. Blood flow.
7. Hydration of skin.
8. Inflammation of skin.

✓ Physicochemical factors

1. Partition coefficient.
2. The molecular weight (<400 Dalton).
3. The degree of ionisation (only unionised drugs gets absorbed well
4. Effect of vehicles**.**

PREPARATION OF EMULGEL

The emulgel formulation is prepared according to the three specific steps mentioned above: **1)Preparation of an emulsion**

The oil phase of the emulsion consists of an emulsifier dissolved in the vehicle (oil). The aqueous phase of the emulsion consists of an emulsifier dissolved in the vehicle (aqueous phase). Depending upon whether the drug is hydrophobic or hydrophilic, it is either dissolved in an ethanol solution or combined with the aqueous or oil phase of an emulsion. Dissolve the preservatives into the aqueous phase of the emulsion together with the penetration enhancer. The temperature of each phase is individually raised to 70-80°C. The oily phase was then combined into the continuous mixing of aqueous as it cooled down to room temperature.

Preparation of Gel base

The gelling agent is dissolved in purified water while stirring continuously at slow speed. Triethanolamine (TEA) is then used to adjust the pH to a value between 6 and 6.5.

Incorporation of Emulsion into Gel base.

A 1:1 ratio of emulsion and gel base is prepared and mixed with glutaraldehyde, used as a cross-linking agent. (9)

Evaluation of emulgel

1) **Fourier transform infrared spectroscopy (FTIR):** The main aim of this study was to find a stable storage condition for the drug in solid state and to identify compatible excipients for the formulation.
2) **Physical examination:** The prepared emulgel formulas were visually examined for color, homogeneity, consistency, and phase separation. (10)
3) **pH Measurement**

   A digital pH meter is used to assess the pH of the prepared emulgel formulations. Prior to measurement, the device is calibrated using a standard buffer solution. To prepare the sample, 1 g of the formulation is dispersed in distilled water and stirred until a uniform suspension forms. The mixture is then left undisturbed for 2 hours. After this period, the glass electrode is immersed in the suspension, and the pH value is recorded.
4) **Rheological Analysis**

   The viscosity of the emulgel formulation is evaluated at **37°C** using a **cone and plate Brookfield viscometer** to ensure consistency and flow properties. (11)

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