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Review

A Review on Emulgel: Promising Novel Carrier for Transdermal Drug Delivery System

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Abstract:

Emulgels are a novel method of drug administration that takes advantage of the special qualities of gels to benefit hydrophobic medicinal moieties. In dermatological pharmacology, they are employed in conjunction with hydrophilic cornified cells to offer a barrier against hydrophilic and hydrophobic chemicals. Transparent gels are becoming more and more common in medicinal and cosmetic formulations. Because polymers can gel, they may be used as thickeners and emulsifiers to create stable emulsions and creams. Emulgels are perfect for topical medication administration since they have benefits in both traditional and innovative vesicular systems. They can also be expanded to include antifungal and analgesic medications. Topical drug delivery refers to the administration of medications via the skin, ocular, vaginal, and rectal channels, among others. Emulgels improve bioavailability and patient compliance because of their dual control and continuous release pattern, enhanced permeability, precise stability, and other characteristics. They are also thermodynamically strong.

Keywords: *Emulgel, Hydrophobic, Dermatological, Bioavailability, Innovative Vesicular.*

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Introduction

In the past, many delivery methods—such as sublingual, oral, rectal, topical, parenteral, inhalation, etc.were employed to treat various illnesses.[01, 02, 03] Topical delivery—applying the necessary medication to the skin—is favored when a person has cutaneous problems including acne, eczema, psoriasis, etc.[05, 06, 08] Although there is a long history of using this administration route, new techniques and technologies are being researched and developed to improve patient compliance. Since the skin is the most accessible organ and allows for the delivery of medications with more efficacy than other routes of administration, topical therapy is the ideal choice for cutaneous objectives. Topical treatments are often used topically to provide localized effects at the application site.[06 to 10]

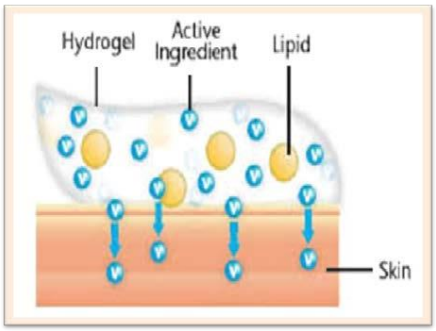

Figure 1 Emulgel

Advantages of emulgel[08 to 10]

i. Increased load capacity and stability.
ii. It is possible to incorporate hydrophobic medicines into the gel basis rapidly by using water/oil/water emulsions
iii. Simple to produce and an inexpensive method.
iv. Refrain from sonication.
v. The first metabolism is circumvented.
vi. Steer clear of gastric intolerances.
vii. Monitor the body's medication delivery system.

Disadvantages of emulgel[10 to 15]

i. In patients with contact dermatitis, the medication and/or excipients may cause skin irritation.
ii. The skin's permeability to some drugs is poor.
iii. Potential for allergic responses.
iv. It is difficult for medications with larger particle sizes to penetrate the skin.

Method of preparation

The production of emulgel consists of three key steps:

Step 1

Preparation of the emulsion, which might be W/O or O/W.

Step 2

Creating a gel basis by mixing water and gelling chemicals continuously while adjusting their pH.

Step 3

Emulsion incorporation into gel base while heating and stirring continuously.

Emulgel preparation is a relatively easy and economical process. It incorporates the medication as needed. The gel base must next be formed. This is done by combining filtered water with a solvent fixing agent, or soluble component, and heating it to 70 degrees Celsius. Additionally, it contains emulsifying agents such as tween.

The oil phase is taken into account after the aqueous phase is ready. Dissolving surfactants like spans is how it is made. Once a hydrophobic medication is added, it is heated to the same temperature. Currently, the gel is made by evenly distributing the polymer in filtered water while maintaining a moderate pace of mixing. At this moment, the pH is adjusted between 6 and 6.5. Preservatives were introduced in the aqueous phase as the final step. After heating the oil and aqueous phases to 70 to 80 degrees Celsius, respectively, the oily phase was introduced to the aqueous phase and stirred continuously. Ensure that it has reached room temperature. The emulsion is added to the gel base with a ratio of 1:1 for the formation of emulgel.[19 to 26]

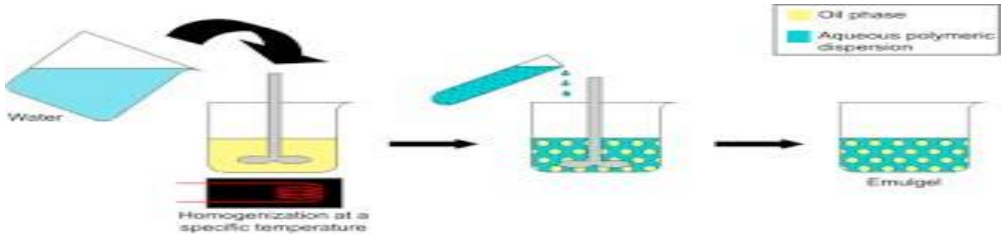

Figure 1 Formation of Emulgel

Evaluation of emulgel

Following emulgel preparation, assessment is required. Here are a few methods for evaluating Emulgel.

Rheological studies

A Brookfield viscometer, model number 96, with a spindle rotating at 1.5 rpm, is used to measure the viscosity of the emulgel formulation at 25°C. The assembly was attached to a water bath that was kept at 25°C and was

thermostatically regulated. The beaker is filled with the emulgel whose viscosity is to be tested, the spindle is free to move, and the reading is recorded.[22 to 24]

pH measurement

The procedure involved dipping the glass electrode into the emulgel while utilizing a digital pH meter.[20]

Spreadability

It is one of the requirements for an emulgel to fulfill the perfect attributes. Spreadability is a phrase used to describe how easily a medicine distributes over the skin's surface after application. It is established via the device known as Mutimer. It is made out of a glass slide set on top of a wooden block with a pulley linked to one end of the wooden block. The ground slide was covered with an excess of emulgel, and emulgel preparation was then sandwiched between the two sides. It was determined how long it took the top slide to travel five centimeters. The spreadability coefficient is better the shorter the period.[24 to29]

In vitro drug release study:

This is done with a Franz diffusion cell. It facilitates figuring out the medication release.[28]

Microbiological assay:

The ditch plate technique is applied in this process. This technique is used to assess fungiststic or bacteriostastic activity[30].

Accelerated stability studies:

According to ICH rules, it is done. For three months, the stability test is conducted in a hot air oven at 37 ± 2 ºC, 45 ± 2 ºC, and 60 ± 2 ºC.[29]

Drug content:[33,37]

UV spectroscopic examination determines the drug content. The formula that is applied is

Drug content = (Concentration × Dilution factor × Volume taken) × Conversion factor.

Globule size and distribution in emulgel:

Malvern Zetasizer makes the final choice. The emulgel is placed into the apparatus, agitated, and then dissolved in water to determine the value.[35]

Centrifugation study:

This method is used to find the stability of emulgel. It's done just after a week of preparation. For the duration of this experiment, a minicentrifuge running at 3000 rpm was utilized.

Swelling index:

One gram of emulgel is taken and placed separately in a porous aluminum foil container in a 50 ml beaker containing 10 ml of 0.1 N NaOH. Following that, the samples are removed at different times and weighed once more. The swelling index may be calculated using the following formula:

$$\text{Swelling index (SW)} \% = [(Wt-Wo)/Wo] \times 100$$

Where, Wt = Weight of swollen emulgel after time t,

Wo = Original weight of emulgel at zero time.

Stability studies:

The emulgel was placed in collapsible aluminum tubes, kept in harsh environments, and had its stability examined.[36,37]

Packaging of Emulgels

Emulgels are frequently supplied in membrane-sealed lacquered aluminum tubes with an inner layer of phenoxy-epoxy based lacquer, or in laminated aluminum tubes sealed with a molded seal and a propylene screw cap.[38 to 42]

Summary

Preparing emulgel is a quick, easy, and efficient way to apply medication topically. By mixing emulsion into gel, it solves problems including phase separation, creaming, and stability problems. Emulgels are made in three steps: emulsion preparation, gel preparation, and incorporation. Emulgels require ingredients such as emulsion and gel preparation. Photomicroscopy, spreadability, rheological analysis, and in-vitro drug release studies are some of the procedures used for evaluation. Emulgels are extensively utilized; the most often used ones are Miconaz-H, Isofen, and Diclon. Usually, these emulgels are used as anti-inflammatory medications. Emulgels may be evaluated using around twenty-five different types of assessment techniques.

Conclusion

Emulgel is a novel topical drug delivery method that improves spreadibility, adhesion, viscosity, and extrusion, making it appropriate for hydrophobic medicines. Compared to conventional topical transport structures, it is a more practical, better, and more effective transport system that provides gel-like properties and exceptional drug release. Emulgel's tiny particle size makes it possible for medications to enter the skin and work effectively. This releasing impact, known as twin-control, enables unique issues such as segment separation, creaming, and enhanced balance. Emulgel can be used to distribute hydrophobic tablets by incorporating them into the emulsion's oil phase and blending them with the gel. Due to its capacity to enhance patient compliance and raise the medication's bioavailability in certain areas, this method will be widely used for drug administration in the future.

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