

Review On Emulgel

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Abstract—Several advantages of gels A significant problem is the way hydrophobic drugs are delivered. In order to get over this restriction, an emulsion-based strategy is being employed, which allows even a hydrophobic medicinal component to benefit from gels' special qualities. Emulgel is the term used to describe a dosage form that combines gels and emulsions. The usage of new polymers has generated a lot of attention in recent year. The direct accessibility of the skin as a target organ for testing and therapy is a distinctive feature of dermatological pharmacology. A barrier against both hydrophilic and hydrophobic molecules is created when hydrophilic cornified cells are combined with hydrophobic intercellular material. Transparent gels have become increasingly used in pharmaceutical and cosmetic preparations within the main category of semisolid preparations. Polymers can be used as thickeners and emulsifiers because of their gel-like ability, which lowers surface and interfacial tension while simultaneously increasing the viscosity of the aqueous phase to create stable emulsions and creams. In actuality, a conventional emulsion becomes an emulgel when a gelling agent is present in the water phase. In actuality, a traditional emulsion becomes an emulgel when a gelling compound is present in the water phase. These emulgels offer significant benefits in a number of areas for both traditional and new vesicular systems. Since different permeability enhancers can intensify the effect, emulgels may be a more effective topical medication delivery method than current ones. Emulgels can also be used in fungicide and pain relievers.

Index Terms—Topical medication delivery, emulgels , Softening agent, cohesive agent, etc.

I. INTRODUCTION

Topical drug administration is a localised drug delivery method that can be applied topically to the skin, vagina, rectal, or ocular routes[1]. For both healthy and skin that is damaged, these individuals

apply a broad range of cosmetic and hygienic preparations. The physicochemical character of these formulations varies from solid to semisolid to liquid. Usually, medicinal products are administered in combination with one or more non-medicated chemicals that serve a variety of specialised pharmaceutical functions, rather than alone, as part of a formulation[2]. Drugs are applied topically to produce systemic effects or to act at the application site. If the drug material is in solution, has an useful lipid/water partition coefficient, and is a nonelectrolyte, its absorption via the skin is increased[3]. Pharmaceutical preparations applied to the skin are often designed to offer extended local contact with low systemic drug absorption since they are meant to have some local activity[4]. Pharmaceutical preparations used to the skin are often designed to offer extended local contact with low systemic drug absorption since they are meant to have some local activity. Antiseptics, antifungal agents, skin emollients, and protectants are among the medications applied to the skin for their local action[5]. The main advantage of topical administration is that it avoids first-pass metabolism. Numerous benefits of gels One significant drawback is the way hydrophobic medications are delivered[6]. In order to get over this restriction, an emulsion-based strategy is being employed, which allows even a hydrophobic medicinal component to benefit from gels' special qualities[7]. The term "emulgel" refers to a dosage form that combines gels and emulsions. The application of new polymers has attracted a lot of attention in recent years[8].

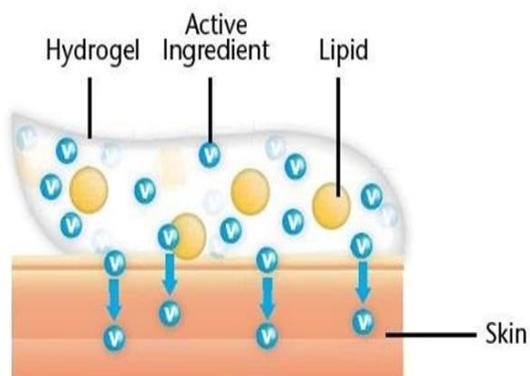


Fig 1: Structure of Emulgel

Drug delivery across the skin:-

The stratified keratinised epidermal surface that makes up the epidermis, the skin's outermost layer, varies in thickness depending on the body part. With elastic fibres, it is thickest[9]. The deeper and more fragile structures have been protected by the skin's comparatively waterproof covering. In extremely muscular vascular connections, blood is also delivered straight from the tiny arteries to the plexus in the body's most at risk regions—the hands, feet, and ears. The direct accessibility of the skin as a

target organ for diagnostic and treatment is a distinctive feature of dermatological pharmacology. To stop water and electrolyte loss or absorption, the skin serves as a two-way barrier[10]. Topical medication absorption occurs primarily through three mechanisms: hair-like, intercellular, and transcellular. The majority of medications go through the lipid bilayer and around cell membranes before reaching the skin's viable layers[11].

Physiology of skin :

Nowadays, the majority of preparations are intended for skin application. Therefore, designing the right dosage form requires a fundamental understanding of the skin and its physiological function[12]. The adult body's skin receives one-third of the blood that circulates throughout the body and covers an area of the epidermis that is inaccessible, approximately 2 square meters[13]. There are 200–300 sweat ducts and 40–70 hair follicles per square centimetre of skin on the normal human skin surface. The skin's pH ranges from 4 to 5.6. The pH of the skin's surface is influenced by sweat and the fatty acids released by sebum. There are four layers of tissue that make up the skin[14].

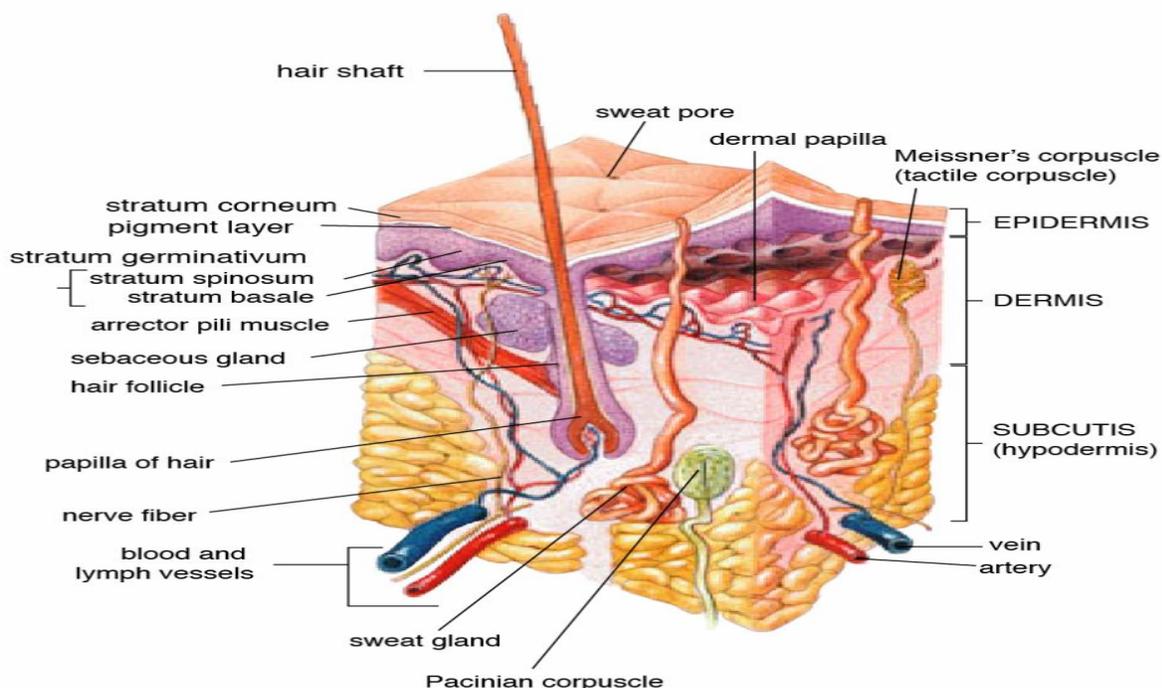


Fig 1.1: Skin of Physiology

Factors affecting the quality of emulgel:

Temperature, pH, water activity, ionic strength, and viscosity all affect the emulgel's quality. Emulsion gels are destabilised by flocculation, coalescence, sedimentation, and phase inversion[15].

1.Viscosity:

The amount of resistance a fluid shows during flow is measured by its viscosity. By preventing and limiting the development of protein–protein interactions, the compounds in the starch hydrolysate may potentially affect the viscosity values of the samples. According to Kim Shin's research, beef batters with higher fat content could show more viscosity and emulsion than samples with lower fat content[16]. Additionally, it

was reported that the stabilizer-produced emulgels had higher viscosities.

2.Temperature:

The physical characteristics of water, oil, and interfacial coatings are all impacted by temperature, as is the solubility of surfactants in both water and oil phases[17]. The viscosity of emulsions is primarily affected by temperature; as temperatures rise, emulsion viscosity decreases. The temperature of emulgels is higher than the usual laboratory range of 20 to 25 °C, as several studies have shown[18]. According to the authors et al., the phenomena may be explained by the impact of friction that occurs during sample homogenization.

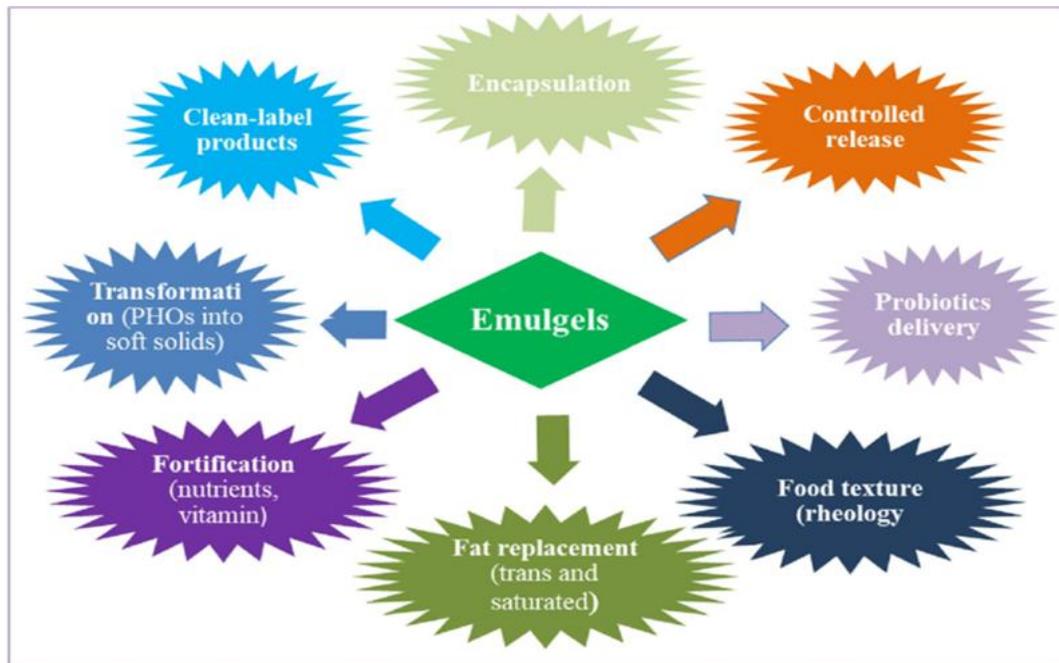


Fig 1.2 Emerging industrial food applications of emulgels, this figure is readapted with permission from Abdullah et al. [1], along with minor modification

3.PH:

One important aspect that significantly affects the creation and properties of multilayer colloids is the pH of the solution, both before and after the interface forms[19]. The final surface charge density and the ionisation of surface groups are both influenced by the pH of the solution. The effectiveness of muscle protein function is influenced by the pH level. In meat systems, higher pH values encourage emulsion stability and improve their capacity to bind water. According to the study, meat with a high pH had

advantageous gel-forming and emulsifying qualities. On the other hand, meat with a low pH produced a more tender cooked product[20].

4.Water Activity:

The relationship between temperature and water activity has been extensively studied by numerous academics. As a result, when food products get hotter, their water activity rises[21]. The water activity level of the majority of food products is greater than 0.95, which offers enough moisture for the growth of mould, yeast, and bacteria. Emulgel

stabilisers work as thickening and binding agents, ensuring that a significant volume of water is bonded to the gels. Stabilising polysaccharides increase the emulsion's stability and the continuous phase's viscosity.

5. Charged ions (Zeta potential):

The presence of an electrical charge on the surface of a droplet plays a crucial role in determining an emulsion's stability and physicochemical properties[22]. The zeta potential (ζ -potential), a measure of the electric charge on the surface of the droplets in the oil-water emulsion, provides information about the strength of the repulsive force between the droplets. Emulsions with a high ζ -potential exhibit electrical stability, whereas emulsions with a low ζ -potential (positive or negative) are more susceptible to flocculation or coagulation[23].

6. Flocculation:

The process of droplet flocculation occurs when an emulsion's droplets are drawn to one another and create flocs, while the stabilising layer at the interface stays intact. Brownian forces, centrifugation, gravity, and other factors can all contribute to a situation where the repulsive energy is smaller than the van der Waals energy. This unwanted feature encourages cream separation, lessens the likelihood of a hazy appearance from larger particle sizes, and encourages droplets to merge because of their closer proximity[24].

II. ADVANTAGES OF EMULGEL

1. Increased acceptance among patients.
2. Provide tailored medication administration.
3. Therapy can be stopped at any moment[25].
4. Increase absorption and the effectiveness of low doses when compared to other traditional semi-solid preparations.
5. Compared to transdermal preparations, which are somewhat less stable, this formulation became more stable by increasing the viscosity of the aqueous phase through a decrease in surface interfacial tension.
6. Using emulsion as the drug barrier that is ultimately disseminated into gel makes it simple to include hydrophobic drugs into emulgel form.
7. Offer a regulated effect that aids in extending the effects of medications with brief half-lives.

8. Cost-effective preparation and ease of formulation [26].

9. Compared to other innovative dosage forms like liposomes and neosomes, the drug loading capacity is superior.

10. Both hydrophilic and hydrophobic properties improve skin penetration.

III. DISADVANTAGES OF EMULGEL

1. Contact dermatitis causes skin inflammation.
2. During the emulgel formulation process, bubbles developed.
3. The possibility of allergic reactions[27].
4. It is difficult for drugs with big particle sizes (>400 Daltons) to get past the epidermal barrier or be absorbed.
5. Some medications have poor skin permeability[28].

IV. CONCLUSION

Emulgel is a new method that has been shown to be the most effective, convenient, and high-quality delivery technique. When compared to traditional topical delivery systems, it provides gel-like qualities and excellent drug release due to its non-greasy nature and absence of oily bases. Emulgel is efficient at delivering drugs to the intended location and has a high drug loading capacity. Because of its small particle size, a medication can effectively penetrate the skin. Emulgel offers a dual control release effect and is created by mixing emulsion into the gel base. The emulgel technique aids in the resolution of several issues, including phase separation, creaming, and stability gets better. Emulgel can be used to administer hydrophobic medications, which can then be mixed with gel and added to the oil phase of the emulsion. This method raises the drug's bioavailability in particular regions and enhances patient compliance.

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