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EMULGEL: A TOPICAL DRUG DELIVERY

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ABSTRACT

Several benefits of gels Hydrophobic medication delivery are severely constrained. Therefore,an emulsion-based technique is being employed to get around this restriction so that even a hydrophobic medicinal moiety can benefit from gels special qualities. The dose form is referred to when gels and emulsions are used together like emulgel. The usage of new polymers has garnered a lot of attention recently. The direct accessibility of the skin as a target organ for diagnostic and treatment makes dermatological pharmacology special. Both hydrophilic and hydrophobic substances are blocked by the interaction of hydrophilic cornified cells with hydrophobic intercellular material. The use of translucent gels in both pharmaceutical and cosmetic preparations has increased within the main category of semisolid preparations.

Polymers can act as emulsifiers and thickeners because their ability to gel enables the creation of stable emulsions and creams by lowering surface and interfacial tension and simultaneouslyraising the aqueous phases viscosity. These emulgel have significant benefits over both innovative vesicular systems and conventional systems in a number of ways. Different permeation enhancers can intensify the impact, making emulgel a superior topical drug delivery technology than the ones now in use. Emulgel can be added to analgesic and antifungal. Gels appear to be more favourable than other semisolid formulations for both medicinal and cosmetic treatments. Emulgel is the term used to describe the combination of gel and emulsion.The promising drug delivery method for hydrophobic medicines is emulgel.

Emulgel a unique topical medication delivery method, has two different types of release controls: gel and emulsion. Emulgel appear to be more favourable than other semisolid formulations for both medicinal and cosmetic treatments. Emulgel is the term used to describe the combination of gel and emulsion. The promising drug delivery method for hydrophobic medicines is emulgel. Emulgel benefits include being transparent, emollient, greaseless, and readily spreadable and detachable. Emulgel is made using the inclusion method. Emulgel are frequently employed for the administration of analgesics, anti-inflammatory, anti-fungal, anti-acne and different cosmetic compositions. Emulgel benefits include being transparent, emollient, greaseless and readily spreadable and detachable.

KEYWORD: Emulgel, vesicular, emollient, analgesics, detachable.

INTRODUCTION

Topical drug administration is a localised method of administering medication through the skin, vagina, rectal, and ocular cavities as topical routes. They apply a wide range of aesthetic and dermatological preparations to their healthy or damaged skin.[1] By physicochemical definition, these formulations are either solid, semisolid or liquid. Instead of being given alone, drug substances are frequently combined with one or more non-medicated substances that perform distinct and particular medicinal roles. Depending on the drug's intended usage, drugs are applied topically for local or systemic effects.[2] If the drug substance is in solution, if it has a favourable lipid/water partition coefficient and if it is a nonelectrolyte, drug absorption via theskin is increased. Pharmaceutical preparations applied to the skin are often meant to have a local effect as a result, they are made to have a sustained local interaction with little systemic drug absorption. Antiseptics, antifungal agents, skin emollients and protectants are drugs that are applied to the skin for their local action. The ability to avoid first pass metabolism is one of topical delivery systems primary benefits. The absence of intravenous therapy risks and inconveniences as well as the diverse conditions for absorption such as pH changes, the presence of enzymes and gastric emptying time are additional advantages of topical formulations.[3,4] When other drug delivery techniques fail or when a fungal infection is present, the topical medicine delivery device is commonly used. The human skin is a specially designedorgan that prolongs terrestrial life by controlling body temperature and water loss while blocking the entry of harmful substances or microbes. It is by far the largest organ in the human body accounting for roughly 10% of the average person's body mass and occupying an area of 1.7 m^2 compared to the ointment or cream basis, they feature a

larger aqueous component thatallows for improved drug solubility and easy drug migration via an almost liquid-like medium.[7] Greater usefulness and patient acceptance are offered by them. Gels have several advantages, but hydrophobic drug delivery is a severe disadvantage. Emulgel are created and used to get over this restriction so that even a hydrophobic medicinal moiety can benefit from the special qualities of gels. In reality, a traditional emulsion becomes an emulgel when a gelling ingredient is present in the water phase. Emulgel for dermatological usage offer a number of beneficial characteristics, including being thixotropic, greaseless, readily spreadable, easily removable, emollient, nonstinging, long shelf life, bio-friendly, clear and having a beautiful look.[1] It is important to understand the variables that affect percutaneous absorption while using topical medications.[14] Molecules can enter the skin through the intact stratum corneum, sweat ducts, or sebaceous follicles respectively. More than 99% of the entire skin surface that is opento percutaneous medication absorption is on the stratum corneum surface.[15] For percutaneous absorption, passing through this outermost layer is the rate-limiting step. The establishment ofa concentration gradient which provides the force for drug movement across the skin, drug release from the vehicle (partition coefficient) and drug diffusion across the layers of skin (diffusion coefficient) are the main steps in percutaneous absorption. Low molecular mass (600 Da), good solubility in oil and water and a high partition coefficient are all desirable propertiesof topical medications. Water soluble ions and polar molecules cannot pass through intact stratum corneum with the exception of very minute particles. The barrier function of the skin can be altered by topical formulations; for instance, topical antibiotics and antibacterial can help a compromised barrier ward off infection. A dried horny layer can be made more pliable with emollient preparations. The horny layer shields the living tissues from ultraviolet exposure.[16] The requirement for and the effectiveness of the selected preservative must be proven to the satisfaction of the competent authority during the development of semi-solid preparations for cutaneous application whose composition comprises an antimicrobial preservative. In Efficacy of Antimicrobial Preservation, a suitable test procedure and criteria for evaluating the formulations preservative qualities are given. To assure sterility, prevent theadmission of impurities and the growth of microorganisms and ensure sterility, sterile semi- solid formulations are made for cutaneous application.[17] The active ingredient in the preparation the formulation in which it is included, the container and closure utilised, or other factors can increase or decrease an antimicrobial preservatives effectiveness. Topical preparations must be microbiological in quality and must pass a sterility test. Total viable aerobic count (aerobic bacteria plus fungus) per gramme shouldn't exceed 102 microorganisms.

It shouldn't contain more than 101 enterobacteria, a specific number of gram-negative bacteria, or any Pseudomonas aeruginosa or Staphylococcus aureus.[18-19] This experiment aims to demonstrate that neither the material nor the process employed imparts any microbiological contamination, and that the 0.2% methyl paraben used is adequate to maintain its sterility. Miniature biology and the formation of a fibre-like macromolecular network from a little amount of a gelatine material. Despite the fact that gels have many benefits, hydrophobic medication delivery is a significant drawback. Thus, an emulsion-based technique is being employed to get around this restriction so that even a hydrophobic medicinal moiety can be successfully integrated and administered through gels.[20]

Fig. 1: An emulgel marketed product.

Skin and its Anatomy[48]

The skin which has a surface area of roughly $2m^2$ and receives about one-third of the blood that circulates through the body, is the biggest organ in the human body. It acts as a permeability barrier to prevent different chemical and biological substances from being absorbed trans dermally. It protects against UV ray penetration and acts as a barrier between the body's internal blood circulation system and the outside world. It also helps to regulate blood pressure and acts as a defence against chemical, physical and microbial attacks. Skin has a significant role in regulating several elements of medication distribution, such as penetration and absorption of the dermis with a medication. The skin's anatomy and ultrastructure have a significant impact on its diffusional resistance. The following primary layers can be used to categorise the human skin’s structure.

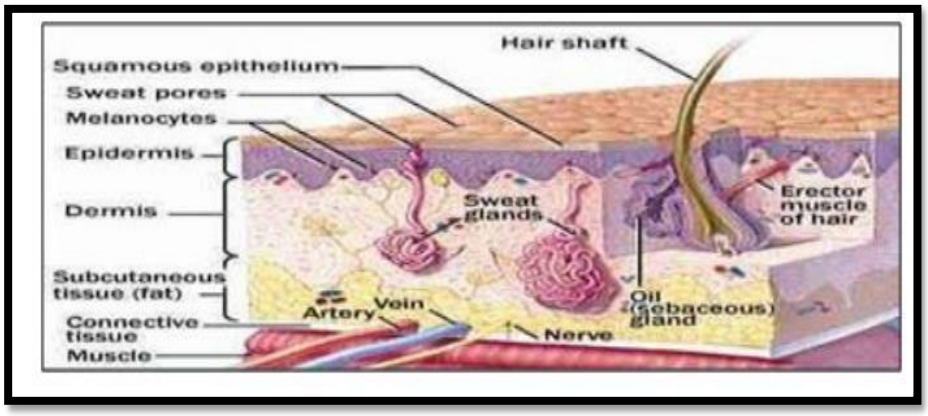

Fig. 2: The skin and its appendages.

1. Epidermis

The epidermis is a continuously self-renewing, stratified squamous epithelium that covers the whole outside of the body. It is largely made up of two layers: the viable epidermis or living layer and the stratum corneum or horny layer, the viable epidermis is further divided into four different layers.

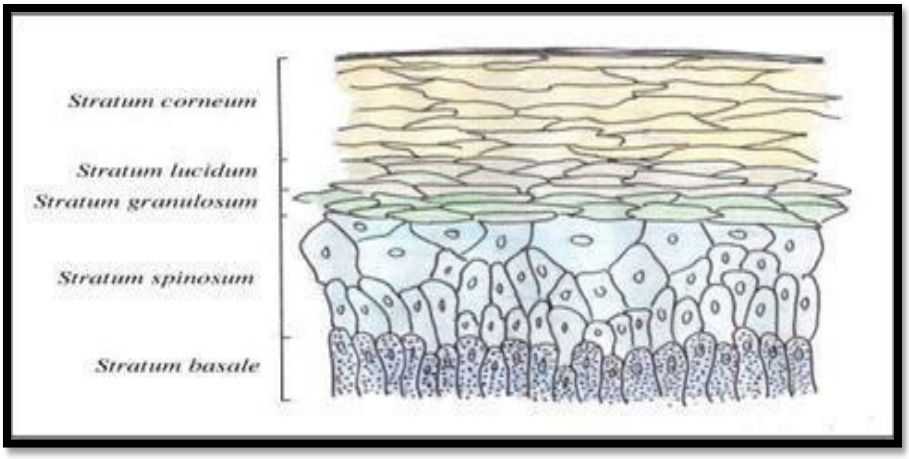

Fig. 3: Epidermis anatomy.

The outermost layer of skin, known as the stratum corneum or horny layer, acts as a rate-limiting barrier to prevent the passage of chemicals both within and outward. The horny layer's ability to act as a barrier depends on its composition, which consists of 75–85% proteins (mostly keratin) and 5–15% lipids (phospholipids, cholesterol).

2. Viable epidermis

Underneath the stratum corneum, there is viable epidermis that ranges in thickness from 0.06 to 0.8 mm. Stratum lucidum, Stratum granulosum, Stratum spinosum, and Stratum basale are

some of the many layers that make up this structure. The epidermis is constantly renewed by cell division in the basal layer, which makes up for the loss of horny dead skin cells from the skin's surface. The basale layers own cells undergo morphological and histochemical changes as they proliferate outward, undergoing keratinization to create the Stratum corneum top layer.

3. Dermis

The dermis, the skin layer just below the epidermis, is 3-5 mm thick and made up of a connective tissue matrix that houses lymphatic blood and nerve vessels. The cutaneous blood supply is crucial for plays a part in controlling body temperature. In addition to giving the skin nutrition and oxygen, it also gets rid of waste and pollutants. Most molecules that penetrate the skin barrier sink in capillaries, which are located 0.2 mm from the skin's surface. Because of this the blood supply maintains a very low dermal concentration of permeate. The ensuing concentration differential across the epidermis therefore acts as the primary driving factor for transdermal permeation. The dermal barrier may be substantial when delivering highly lipophilic compounds, however in the case of transdermal drug delivery this layer is frequently seen as simply gelled water and so provides a minor barrier to the transport of most polar medicines.

4. Hypodermis

The dermis and epidermis are supported by the hypodermis, or subcutaneous fat tissue. It functions as a place to store fat. This layer aids in providing mechanical protection, regulating temperature, and nutritional support. Drugs used for transdermal medication administration must pass through all three of these layers to enter the bloodstream.

DRUG DELIVERY ACROSS THE SKIN

The thickness of the stratified, keratinized squamous epithelium that makes up the epidermis, the skin's outermost layer, varies depending on where on the body it is located. The area with elastic filaments is the thickest. The deeper and more fragile structures are shielded by the relatively waterproof covering that the skin creates. There are many blood vessels all over the skin. A continuous venous plexus that receives blood supply from skin capillaries is particularly significant. Blood is also given to the plexus directly from the tiny arteries in the body's most exposed regions—the hands, feet, and ears through highly muscular arteriovenous anastomoses. The direct accessibility of the skin as a target organ for diagnostic and treatment makes dermatological pharmacology special. The skin functions as a two-way barrier to stop the absorption and loss of electrolytes and water. Topical medication absorption

mostly occurs through three mechanisms: transcellular, intercellular, and follicular. Most medications navigate the tortuous journey around corneocytes and through the lipid bilayer to reach the skin's viable layers. The pilosebaceous route is the second most typical (and possibly underappreciated in the clinical situation) method of distribution. As shown by about identical rates of chemical penetration through isolated stratum corneum or whole skin, the barrier is located in the epidermis uppermost layer, the stratum corneum. Improves effectiveness are creams and gels that are the vehicles own actions could be cooling, drying, emollient.

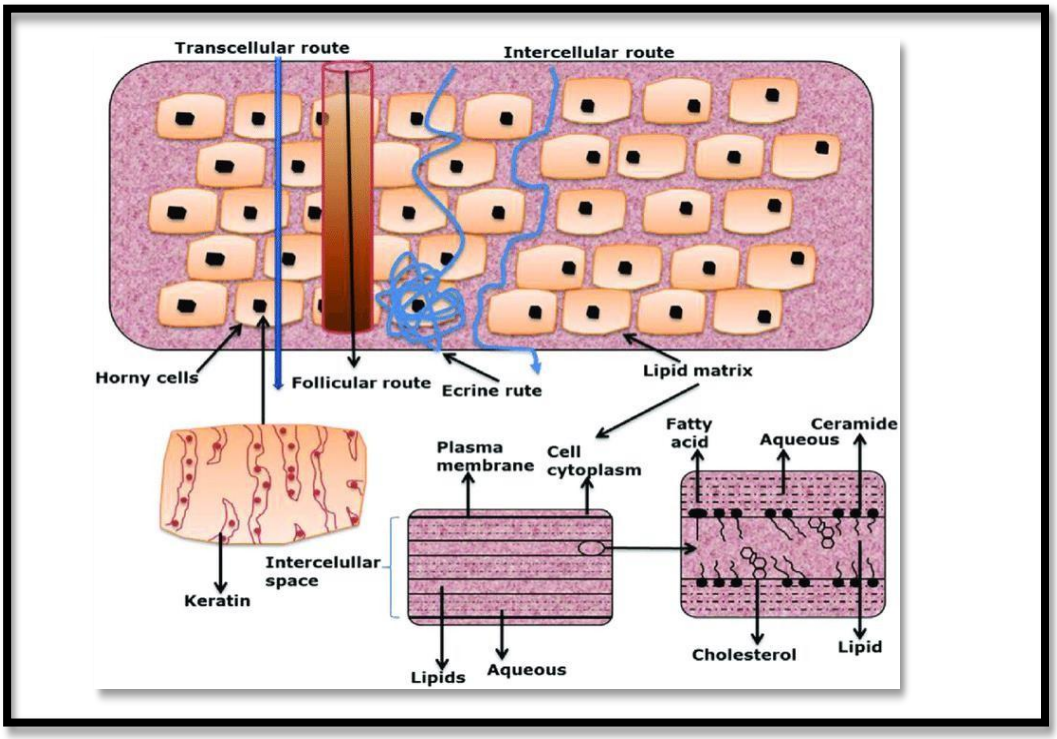

Fig. 4: Drug delivery through the skin.

RATIONALE

Topical medications including ointments, creams, and lotions are frequently used yet have significant drawbacks. When administered, they are extremely sticky and make the patient uncomfortable. Additionally, they need to be applied with rubbing because they have a lower spreading coefficient. Additionally, they display the stability issue. The usage of transparent gels has increased in both pharmaceutical and cosmetic preparations as a result of all these aspects within the main group of semisolid preparations. Since many years ago, gel a colloid that is characteristic in 99% weight liquid and symbolised by the surface tension between it and the skin-has been employed to transport painkillers and antibiotics to the body's damaged

areas. Among these are topical creams for skin infections, creams to relieve arthritis pain, and gels and creams for vaginal yeast infections. Other medications can now be absorbed trans-dermally or via the skin. These can be used to treat the entire body as well as the problematic parts (such as skin).

FACTORS AFFECTING TOPICAL ABSORPTION OF DRUG[21,22]

Physiological factors

1. Skin thickness
2. Lipid content
3. Density of hair follicles
4. Density of sweat glands
5. Skin pH
6. Blood flow
7. Hydration of skin
8. Inflammation of skin

Physiochemical Factors

1. Partition coefficient
2. Molecular weight (<400 Dalton)
3. Degree of ionization (only unionized drugs gets absorbed well)
4. Effect of vehicles

Factors to be Considered When choosing a Topical Preparation[23]

1. The vehicles effect, such as how an occlusive vehicle increases the active ingredient's penetration and increases effectiveness. The vehicle's own actions could be cooling, drying, emollient or protecting.
2. Align the preparation type with the kind of lesions. For acute weepy dermatitis for instance, stay away from greasy ointments.
3. Align the preparation method with the location. (Example: gel or lotion for places with hair).
4. The possibility for irritation or hypersensitivity. Ointments and creams without alcohol typically cause less irritation than gels. If a preservative or emulsifier allergy is a concern, ointments are free of these ingredients.

Method to Enhance Drug Penetration and Absorption[25]

1. Chemical enhancement
2. Physical enhancement
3. Biochemical enhancement
4. Supersaturation enhancement

Advantages

1. D/o/w emulsions make it simple to include hydrophobic medications into gels. Most hydrophobic medications cannot be added directly to gel bases because their solubility acts as a barrier and causes issues with drug release. In order to create an oil-water emulsion, hydrophobic medicines must first be incorporated into the oil phase. Emulgel aids in this process. This emulsion can also be incorporated into a gel base. Compared to merely mixing medications into a gel foundation, this may result in higher drug stability and release.
2. Greater loading capacity: Other cutting-edge methods, such as noisome and liposomes are nanosized and may leak due to vesicular features, which lowers trapping efficiency. But gels have a far higher loading capacity due to their extensive network.
3. Production feasibility and cheap preparation costs: Emulgel preparation involves only a few straightforward procedures, which improves production feasibility. Emulgel manufacture does not require any specialised equipment. Additionally, the materials are inexpensive and readilyavailable. Reduces the price of making emulgel as a result.
4. Avoid intensive sonication: Vesicular molecules require intense sonication during production, which may cause drug degradation and leakage. However, since emulgel manufacturing does not require sonication this issue is not present.

Important constituents of emulgel preparation

1. **Aqueous Material**: This contributes to the emulsion's aqueous phase. Alcohols and water are often used agents.[28]
2. **Oils:** These substances contribute to the emulsion's oily phase. Mineral oils are frequently utilised for topically applied emulsions, both as the drugs delivery system and for their occlusive and sensory properties. They can be used alone or in combination with soft or hard paraffins. Non-biodegradable castor and mineral oils, which have a local laxative action, fish liver oils, and other fixed oils are commonly employed in oral formulations as dietary supplements, oils of vegetable origin (such as arachis, cottonseed, and maize

oils).[29-30]

Table 1: Use of oils.

Chemical	Quantity	Dosage form
Light Liquid Paraffin	7.5%	Emulsion and Emulgel
Isopropyl myristate	7-7.5%	Emulsion
Isopropyl stearate	7-7.5%	Emulsion
Isopropyl palmitate	7-7.5%	Emulsion
Propylene glycol	3-5%	Gel

3. **Emulsifiers:** Emulsifying compounds are used to control stability during a shelf life that can range from days for impromptu made emulsions to months or years for commercial preparations. They are also used to enhance emulsification at the time of creation. Stearic acid[34], Sodium stearate, Polyethylene glycol 40[31] stearate, Surbiton monooleate[32] (Span 80), Polyoxymethylene sorbitol monooleate (Tween 80), etc.[35]

4. **Gelling Agent:** These are substances that make any dose form more consistent and can alsobe employed as thickeners.[36-37]

Table 2: Use of gelling agents.

Gelling agent	Quantity	Dosage form
Carbopol-934	0.5%-2%	Emulgel
Carbopol-940	0.5%-2%	Emulgel
HPMC-2910	2.5%	Emulgel
HPMC	3.5%	Gel
Sodium CMC	1%	Gel

5. **Permeation Enhancers:** These chemicals partition into and interact with skin cells toincrease skin permeability temporarily and irreversibly.[38]

Table 3: Use of penetration enhancers.

Penetration enchancer	Quantity	Dosage form
Oleic acid	1	Gel
Lecithine	5	Gel
Urea	10	Gel
Isopropyl myristate	5	Gel
Linoleic acid	5	Gel
Clove oil	8	Emulgel
Menthol	5	Emulgel

Emulgel preparation

Emulgel was made using, with a few minor modifications, the technique described by

Mohammad et al (2004). Carbopol 934 and Carbopol 940 were dissolved in purified water while being continuously stirred at a moderate speed to create the gel in the formulations. Triethanolamine (TEA) was then used to bring the pH to a range of 6 to 6.5. The aqueous portion of the emulsion was made by dissolving Tween 20 in clean water, while the oil phase was made by combining Span 20 with light liquid paraffin. While medication was dissolved in ethanol, methyl and propyl parabens were dissolved in propylene glycol, and both solutions were combined with the aqueous phase. Separately heated to between 70 and 80 degrees Celsius, the oily and aqueous phases were combined while being continuously stirred until the mixture reached room temperature. To create the emulgel, combine the gel and emulsion in a 1:1 ratio while adding the glutaraldehyde.[39]

Characterization of gelified emulsion

1. **Physical appearance:** The colour, homogeneity, consistency, and pH of the created emulsion compositions were visually assessed. A pH metre (Digital pH metre DPH 115 pm) was used to determine the pH levels of 1% water solutions of the gelatinized emulsion that hadbeen made.[40]

2. **Spreadability:** Spread ability is assessed using Multimer et al. (1956)-recommended equipment that has been appropriately adjusted for use in the study. It is made up of a wooden block that has a pulley at one end. Using this method, the 'Slip' and 'Drag' properties of emulgelare used to gauge spread ability. On this block is fastened a ground glass slide. On this groundslide, extra emulgel (approximately 2 gm) is being studied. The emulgel is then placed betweenthis glass slide and another glass slide with a hook and a fixed ground slide dimension. To remove air and create a consistent emulgel coating between the slides, a 1 kg weight is placedon top of the two slides for five minutes. The edges are scraped clean of extra emulgel. After that an 80 gramme pull is applied to the top plate. With the use of a thread fastened to the hook, record the amount of time (in seconds) needed for the top slide to travel 7.5 cm. Better spreadability is indicated by a shorter interval.

Spreadability was determined using the following formula

$$S=M.L/T$$

M=Weight secured to the top slideL=Length of glass slides

T=is the duration needed to totally separate the slides from one another Where, S=spreadability.

3. **Extrudability study:** This common empirical test determines the amount of force needed to extrude the substance from a tube. The technique used to determine the amount of applied shear in the area of the renogram where the yield value is exceeded and plug flow is as a result. The method used in the current study to assess the extrudability of an emulgel formulation is based on the percentage of emulgel and emulgel extruded from a lacquered aluminium collapsible tube on application of the weight in grammes required to extrude at least a 0.5 cm ribbon of emulgel in 10 seconds. Extrudability is improved by greater extrusion volume. Eachformulation's extrudability is measured three times and the average results are given. After that, the extrudability is determined using the following formula:

Extrudability is calculated as follows: Applied weight in grammes to extrude emulgel from tube / area in cm^2.

4. **Globule size and its distribution in emulgel**: Malvern zettaliter was used to determine globule size and dispersion. To achieve uniform dispersion, a 1.0 gramme sample was dissolved in filtered water and stirred. A sample was inserted into the zettaliter's photocell. It was discovered the mean globule distribution and diameter.[43]

5. **Rheology study:** Using a cone and plate viscometer with spindle 52 (Brookfield EngineeringLaboratories) coupled to a thermostatically controlled circulating water bath, the viscosity of the various emulgel compositions is assessed at 25°C.

6. **Swelling Index:** 1 gramme of prepared topical emulgel is taken on porous aluminium foil and then placed separately in a 50 ml beaker containing 10 ml of 0.1 N NaOH in order to calculate the swelling index of the gel. After then, samples were taken out of the beakers at various intervals and placed on a dry surface for a while before being reweighed. These steps are used to compute swelling index:

Swelling Index (SW)% is calculated as [(Wt. - Wo)/Wo] x 100.

Where Wo is the original weight of the emulgel at time t, (SW)% is the equilibrium percent swelling, and Wt. is the weight of the emulgel after it has swelled.

7. **Ex- vivo bio adhesive strength measurement of topical emulgel:** The modified approachis employed to gauge the bio adhesive strength (MICE SHAVEN SKIN). After being divided into pieces, the fresh skin is cleaned with 0.1 N NaOH. Separately, two

pieces of skin were fastened to two glass slides; one glass slide was secured to a wooden piece, while the other wasfastened to the balance on the right side. By placing more weight on the left-hand pan, the right and left pans were brought into balance. The two slides containing the hairless skin sections are sandwiched with 1 g of topical emulgel, additional weight from the left pan is removed, and pressure is applied to remove any air pockets. For five minutes, the balance is held in thisposture. Weight is gradually added to the left-hand pan at a rate of 200 mg/min until the patchseparates from the skin's surface. The bio adhesive strength was determined by the mass (gramme force) needed to pull the emulgel away from the skin's surface. The following formulas are used to compute the bio adhesive strength: Weight required (in gms) / Area (in cm2) = Bio adhesive strength.

8. **Drug content determination:** A spectrophotometer was used to calculate the drug content in the gelified emulsion. Gelified emulsions drug content was determined by sonicating a known quantity of the emulsion into a solvent (methanol). After an appropriate dilution, absorbance was measured using a Uv-visible spectrophotometer (UV-1700 CE, Shimadzu Corporation, Japan).[46]

9. **In vitro release study:** For the drug release studies, a Franz diffusion cell (15.5 ml cell volume, 3.14 cm2 effective diffusion area) was employed. A uniform coating of gelatinized emulsion (200 mg) was applied to the egg membrane surface. Between the donor and the receptor chamber of the diffusion cell, the egg membrane was clamped. To solubilize the medication, newly prepared PBS solution (pH 5.5) was injected into the receptor chamber. A magnetic stirrer was used to stir the receptor chamber. At appropriate intervals, the samples (1.0 ml aliquots) were collected. Samples were subjected to UV visible drug content analysis spectrophotometer following the proper dilutions. To determine the overall amount of drug release at each time interval, cumulative adjustments were done. It was determined how much medication was cumulatively released over the egg membrane as a function of time.[47]

10. **Microbiological test:** The ditch plate method was employed. It is a technique used to assess a compound's bacteriostatic or fungistatic activity. It is mostly used for compositions that are semisolid. Used were previously prepared Sabouraud’s agar dried plates. A ditch is cut in the plate, and three grammes of the gelified emulsion are added to it. Freshly made culture loops are streaked in a right angle over the agar from the ditch to the plates edge. The fungal growth was examined after 18 to 24 hours of incubation at 25°C, and the %

inhibition was calculated.

11. **Skin irritation test:** A 0.5 gm sample of the test substance was then applied to each site (two sites per rabbit) via introduction under a double layer of gauze to a skin region that was approximately 1" x 1" (2.54 x 2.54 cm2) in size. The rabbit's skin is treated with the gelified emulsion. The creatures were put back in their cages. After being exposed for 24 hours, the jellified emulsion is removed. To get rid of any last bits of test article residue, the test locationswere cleaned with tap water.

Marketed formulations

Sr.No.	Drug	Product name	Manufacturer
1.	Miconazole nitrate, hydrocortisone	Miconaz-H-emulgel	Medical union pharmaceuticals
2.	Diclofenac diethyl ammonium	Voltaren emulgel	Novartis pharma
3.	Metronidazole	Lupigyl gel	Lupin pharma
4.	Clindamycin, Adapalene	Excex gel	Zee laboratories
5.	Benzoyl peroxide	Pernox gel	Cosme Remedies Ltd
6.	Aceclofence, Methyl salicylate, Capsaicin	Acent gel	Intrea labs India Pvt Ltd
7.	Kojic acid, Dipalmitate arbutin, Octinoxate	Kojivit gel	Micro gratia pharma
8.	Clindamycin phosphate allantoin	Clinagel	Stiefel pharma
9.	Clobetasol propionate	Topinate gel	Systopic pharma
10.	Tezarotene	Zorotene gel	Elder pharmaceuticals
11.	Clotrimazole, Beclomethasone Dipropionate, Neomycin	Cloben gel	Indoco remedies

Future prospects

One of the most frequent issues encountered during the formulation and development of any novel formulation is the hydrophobic behaviour of pharmaceuticals. Poor medication bioavailability and water solubility are caused by this behaviour. It has been difficult to deliver many medications to the biological system because of their hydrophobic nature. Different delivery techniques, including ointments, lotions, creams, and pastes, are used for topical drug delivery. These topical formulations typically contain a lot of hydrophobic oleaginous bases like petrolatum, bees wax, or vegetable oils, which prevent the addition of water or an aqueous phase. They become a superb emollient but the drug release is delayed, and the product becomes thick and oily. In contrast, gel delivers drugs in an aqueous environment that promotes their dissolution and allows for a speedier release of the drug than other topical delivery methods. Such hydrophobic medications can be integrated into an emulsion-based gel's oily

phase and given to the skin using this medium. Emulgel is superior to conventional topical delivery techniques in all these ways, making it more effective and efficient. In the future, more topical medications will be delivered using Emulgel thanks to these qualities.

CONCLUSION

The extensive research has led to the conclusion that emulgel appear to be a more superior and efficient drug delivery mechanism when compared to other topical drug delivery systems. A thorough examination of the rheological and releasing characteristics will shed light on the possible application of the Emulgel formulation as a medication delivery method. As the topical medication delivery technique of choice recently, emulgel. It goes without saying that this method is excellent for delivering a combination of hydrophilic and hydrophobic medications. Topical drug delivery will be employed frequently in the future to improve patient compliance. because emulgel has a competitive advantage in spread ability, adhesion, viscosity, and extrusion. They will become a well-liked medicine delivery method. Additionally, they will serve as a means of encapsulating hydrophobic pharmaceuticals in water-soluble gel bases.

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