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FORMULATION AND EVALUATION OF CLOTRIMAZOLE TOPICAL EMULGEL

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ABSTRACT

Topical drug delivery systems are dosage forms that are applied to the skin when other routes of drug delivery fail or occur in skin diseases. Tropical drug delivery systems have the advantage of negotiating first-pass metabolism. It also helps to avoid the risks and inconveniences of I.V therapy. The main advantages of tropical drug delivery systems are avoidance of first-pass metabolism, avoidance of gastrointestinal incompatibility, specific site selectivity, improved patient compliance, possible and easy self-medication, short half-life and narrow therapeutic index. The function is used to easily terminate the medication if necessary. Disadvantages of topical drug delivery systems are skin irritation in contact dermatitis,allergic reactions, poor drug permeability through the skin, and large particle size drugs are not easily absorbed through the skin. Emulgels are oil-in-water or water-in-oil emulsions that are gelled by mixing with a gelling agent. Emulsifying gels are excellent stable vehicles for hydrophobic or poorly water-soluble drugs. In simple words, emulgel is a combination of emulsion and gel. Emulgel is manufactured as both an oil-in-water and water-in-oil emulsion mixed with a gel. Oil-in- water is used for lipophilic drugs and water-in-oil is used for hydrophobic drug delivery. Commercial emulgels include Cataflam emulgels, Denacin emulgels and Dicromax emulgels.

KEYWORDS: Topical Drug Delivery System, Emulgel, Clotrimazole.

1.1.INTRODUCTION

Topical delivery may be defined as the application of a medicated formulation to the skin for the direct treatment of skin disorders [e.g. acne, psoriasis] with the intention of blocking pharmacological effects or other effects of drug on the surface or inside the skin. Topical

drug administration through various routes applied a wide spectrum of preparation for both cosmetic and dermatological, to their health and diseased skin. Topical drug administration is a drug delivery system confined to the whole body via ocular, rectal, vaginal, and cutaneous topical routes. A major advantage of local delivery systems is bypassing first-pass metabolism. Avoiding the risks and disadvantages of parenteral therapy and various absorption conditions such as pH changes, the presence of enzymes, and gastric emptying time are also advantages of topical formulations.[1]

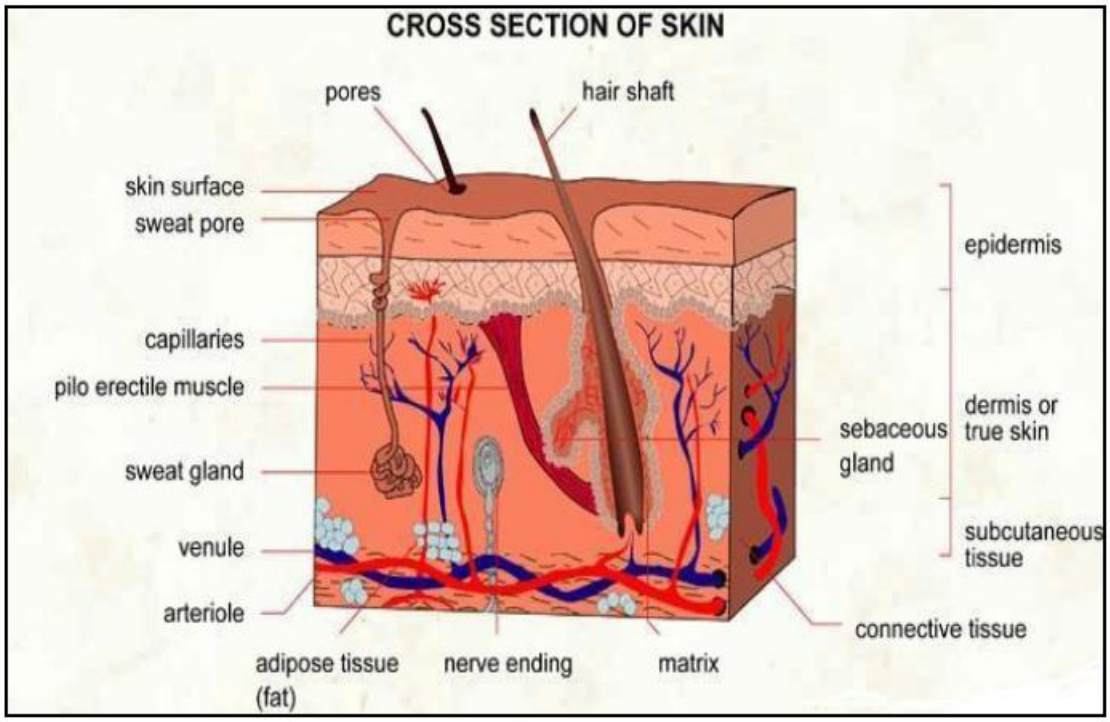

Fig: Cross Section of Skin.

Dermatological products come in a variety of formulations and concentrations, from liquids to powders, but semi-solid formulations are the most popular. Among the major groups of semi-solid formulations, the use of transparent and translucent gels is increasing in both cosmetics and pharmaceuticals. Gels are new classes of dosage forms formed by enclosing large amounts of aqueous or hydro alcoholic fluids within colloidal solid particle complexes. Gel formulations typically provide faster drug release compared to traditional ointments and creams. Instead of numerous advantages of gels, the main limitation is the difficulty of providing hydrophobic medicines. To minimize this limitation, emulgels are designed to ensure that even hydrophobic medicines can take advantage of the unique properties of gels. When gel and emulsion are used in combination, the dosage form is called emulgel. Indeed, the presence of a gelling agent in the aqueous phase turns a classic emulsion into an

emulsion. Oil-in-water systems are used to entrap lipophilic drugs, while hydrophilic drugs are entrapped in water-in-oil systems.[2]

The emulsion has a certain amount of elegance to it and is easy to wash off when needed. It also has high skin penetration. Dermatological emulgels have several properties such as thixotropic, easily spreadable, non-greasy, easily removable, emollient, non-staining, longer shelf life, bio-friendly, clear and attractive appearance.[3]

Mechanism of Skin Penetration

Skin penetration enhancers are reversible molecules to eliminate stratum corneum barrier resistance. They allow drugs to penetrate viable tissues more easily and enter the systemic circulation. Intercellular pathway facilitators can interact at the polar headgroups of the lipids in the aqueous regions between the lipid headgroups and between the hydrophobic tails of the barrier. A common mechanism is to protect the body from unwanted particles from the environment. The skin's main barrier lies in the outermost layer of the skin, the epidermis. Since the lipid areas of the stratum corneum form the only continuous structure, substances applied to the skin must always pass through these areas. A major obstacle to topical drug delivery is the slow diffusion rate of drugs across the stratum corneum. Several methods have been investigated to temporarily increase the penetration rate of drugs.[4]

Topical Drug Delivery System

Topical drug delivery systems are dosage forms that are applied to the skin when other routes of drug delivery fail or occur in skin diseases. Topical drug delivery systems have the advantage of negotiating first-pass metabolism. It also helps avoid the risks and inconveniences of I.V therapy.[5]

There are two basic types of topical drug delivery products: topical agents for external use and topical agents for internal use. Topical drugs used externally are spread, sprayed, or otherwise applied onto the tissue to protect the affected area, while topical drugs used internally are used orally, applied to vaginal or rectal tissue. The main advantages of topical drug delivery systems are avoidance of first-pass metabolism, avoidance of gastrointestinal incompatibility, specific site selectivity, improved patient compliance, possible and easy self-medication, short half-life and narrow therapeutic range. The facility will be used to easily discontinue medication if necessary.[6]

Disadvantages of topical drug delivery systems are skin irritation in contact dermatitis, allergic reactions, poor drug permeability through the skin, and large particle size drugs are not easily absorbed through the skin. The skin is thick and has a complex structure. Molecules moving from the external environment must penetrate the stratum corneum and surface substances of endogenous or exogenous origin. They pass through the viable epidermis, dermal papillae, and capillary walls to reach the bloodstream or lymphatic compartment, where they are removed from the skin by blood or lymphatic flow. Factors affecting topical drug delivery systems may be physiological factors. Physico-chemical factors such as skin thickness, hydration, inflammation and pH, lipid content, hair follicle and sweat gland density, blood flow, etc., and effects of partition coefficient, molecular weight, ionization degree. When you touch your skin, you come into contact with cell debris, microbes, sebum, and more. Drug diffusion occurs in a variety of ways through hair follicles, sebaceous glands, and sweat ducts across the continuous stratum corneum.[7]

Clotrimazole

This medicine is an antifungal agent that inhibits the growth of pathogenic dermatophytes. It shares first-line status with econazole and miconazole for the topical treatment of tinea pedis, tinea pedis, and tinea corporis due to Candida albicans. It is effective in the topical treatment of vulvovaginal and oropharyngeal candidiasis. A wide range of vehicles, including solid, semi-solid and liquid formulations, are available to physicians and patients for skin care and topical treatment of skin disorders. Among the main groups of semi-solid formulations, the use of clear emulsions is expanding in both cosmetics and pharmacy. Emulgel or gelled emulsions are excellent stable carriers for hydrophobic or water-insoluble drugs such as clotrimazole. Emulsions have the advantages of both emulsions and gels, so they are very popular with patients. Therefore, they have recently been used as vehicles for the delivery of various drugs to the skin.[8,9]

Classification of topical drug delivery system

1. **Solid**: Powders, Plasters Ointments
2. **Semi Solid**: Creams, Poultices, Gels, Pastes
3. **Liquid**: Liniment, Lotions, Emulsions, Suspensions, Paints
4. **Others**: Transdermal drug delivery systems, rubbing alcohol, liquid cleansers and topical aerosols.[10]

The challenges in formulating topical emulgel are.

- Determination of systems that are non-toxic, non-irritating, non-comedogenic andnon-sensitizing.
- Emulgel formulations should have good physiological tolerance and high biocompatibility.
- Excellent emulsion gel formula for cosmetics.

Factors Affecting Topical Absorption of Drugs[11,12]

I. Physiochemical Factors of Drug Substances

1. Molecular Weight (400 Daltons)
2. Diffusion coefficient
3. Water/lipid partition coefficient
4. Permeability coefficient ionization - unionized drugs are well absorbed.
5. Protein binding capacity.

II. Physiological Factors

1. Skin thickness
2. Lipid content
3. Lipid content
4. Hair follicle density
5. Sweat gland density
6. Skin pH
7. Blood flow
8. Skin hydration Inflammation of the skin

III. Vehicle

1. Solubility and polarity
2. Volatility
3. Concentration
4. Distribution in stratum corneum
5. Excipients
6. Penetration enhancer
7. pH

IV. Site of application

1. Area skin dose (film thickness, concentration)
2. All areas of skin in contact with the vehicle
3. Duration of exposure

The topical absorption of drugs is influenced by several factors, including.

1. **Skin condition:** Healthy skin, damaged skin, or skin diseases (e.g., psoriasis, eczema) can affectabsorption.
2. **Drug concentration:** Higher concentrations can increase absorption.
3. **Vehicle:** The base or solvent used in the formulation (e.g., cream, gel, ointment) can impactabsorption.
4. **pH:** The skin's natural pH and the drug's pKa can influence absorption.
5. **Permeability:** The drug's ability to penetrate the skin's layers.
6. **Solubility:** The drug's solubility in the vehicle and in the skin's lipids.
7. **Particle size:** Smaller particles can improve absorption.
8. **Occlusion:** Covering the application site can increase absorption.
9. **Skin temperature:** Increased temperature can enhance absorption.
10. **Humidity:** High humidity can improve absorption.
11. **Dosing frequency:** Multiple applications can lead to increased absorption.
12. **Skin age and location:** Absorption can vary depending on skin age and location (e.g., face, arm,leg).
13. **Drug molecular weight:** Smaller molecules are generally absorbed better.
14. **Ionization:** The drug's ionization state can impact absorption.
15. **Enzyme activity:** Skin enzymes can metabolize drugs, affecting absorption.

Understanding these factors is crucial for optimizing topical drug formulations and achieving effective drug delivery.

1.2.Emulgel

Emulgel are oil-in-water or water-in-oil emulsions that are gelled by mixing with a gelling agent. Emulsifying gels are excellent stable vehicles for hydrophobic or poorly water-soluble drugs. In simple terms, the emulsion is a combination of emulsion and gel. Emulgel is manufactured as both an oil-in-water and water-in-oil emulsion mixed with a gel. Oil-in-water is used for lipophilic drugs and water-in-oil is used for hydrophobic drug delivery.[13]

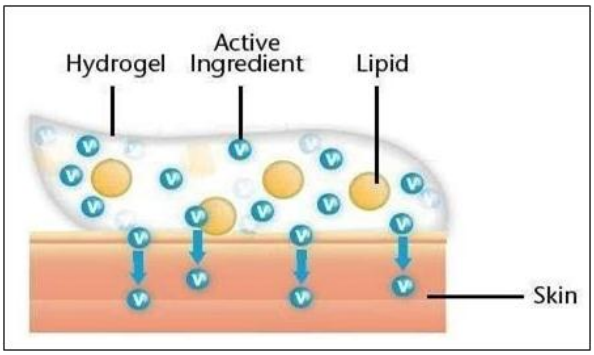

Fig: Structure of Emulgel.

Emulgel is a developing field of topical drug delivery, and with few products on the market todate, it is both thoughtful and challenging to focus on emulgel formulations. Before starting with the concept of emulgel, we should know the concepts of emulsions and gels used for drug delivery. Emulsions are ordered drug delivery systems containing two immiscible phases, one dispersed in the other (the internal phase) and the other (the external phase), using emulsifiers to stabilize the system. Emulsions are either oil-in-water or water-in-oil, where drug particles trapped in the internal phase pass through the external phase and are slowly absorbed into the skin for a controlled effect. According to USP, a gel is a semi-solid system consisting of a dispersion in a liquid of large organic molecules or small inorganic particles. Gels contain a bulk of an aqueous or hydro alcoholic liquid entrapped in a network of colloidal solid particles, in which small drug particles are entangled to maintain controlled release of the drug. The liquid phase forms a three-dimensional polymer matrix- like structure that provides a physically or chemically cross-linked network. A continuous structure that behaves like a solid is homogeneous and well-defined. Both emulsions and gels are involved in the controlled release of active ingredients from the system.[14]

Types of Emulgel

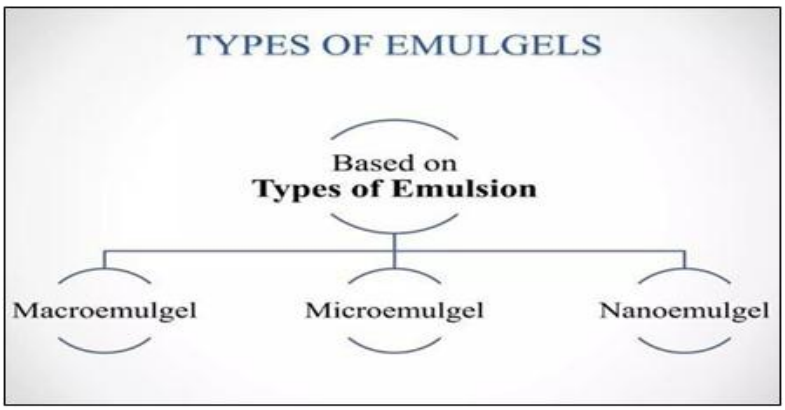

Fig: Types of Emulgel.

Emulgels are classified into 3 types on the basis of type of emulsion

1. Macroemulgel
2. Microemulgel
3. Nanoemulgel

Macroemulgel

These are the most common type of emulsifiers with emulsion droplet particle size greater than 400 nm. Although they are visually opaque, individual droplets can be easily observed under a microscope. Macroemulsions are thermodynamically unstable, but can be stabilized by surfactants. For example, a mefenamic acid emulgel was prepared using Carbopol 940 as the gelling agent. Liquid paraffin was used for the oil phase. Peppermint oil and clove oil served as penetration boosters. It was then evaluated for rheological studies, diffusion coefficient studies, skin irritation testing and in vitro release.[15]

Microemulgel

Microemulsions are transparent, have droplet size ranging from 10 to 100 nm, do not coalesce and are thermodynamically stable. Microemulsions contain specific proportions of oil, co-surfactant, and water. Microemulsion components can facilitate drug permeability by reducing the diffusion barrier of the stratum corneum. However, the low viscosity of microemulsions limits their application in the pharmaceutical industry due to low skin retention. To overcome this drawback, gelling agents such as Carbopol 940, xanthan gum and carrageenan were added to microemulsions to form microemulsion-based gels and increase viscosity. This may be suitable for topical application. Additionally, microemulsion- based gels prevent drugs from being absorbed into the bloodstream, ensuring higher drug accumulation in the skin for efficient action.[16]

Nanoemulgel

When a nanoemulsion is incorporated into a gel, it is called a nanoemulgel. Nanoemulsions are thermodynamically stable transparent (translucent) dispersions of oil and water, stabilized by an interfacial film of surfactant and co-surfactant molecules with droplet sizes <100 nm. Nanoemulsion formulations have improved transdermal and dermal delivery properties in vitro and in vivo. This has improved transdermal penetration of many drugs over traditional topical formulations such as emulsions and gels.[17]

Advantages and Disadvantages of Emulgel

Advantages

1. Improving patient acceptance.
2. Provides targeted drug delivery.
3. Termination of treatment is possible at any time.
4. Improved bioavailability and low dosage are effective compared to other traditional semi-solid formulations.
5. Lowering the surface interfacial tension increases the viscosity of the aqueous phase, making the formulation more stable than transdermal formulations with relatively low stability.
6. Hydrophobic drugs can be easily incorporated into emulsified gels by using the emulsion as a drug barrier and will eventually be dispersed into the gel.
7. Provides a controlled effect that helps prolong the effects of drugs with short half-lives.
8. Easy to formulate and inexpensive preparation.
9. Drug loading capacity is superior to other new dosage forms such as niosomes and liposomes.
10. Both hydrophilic and hydrophobic properties enhance skin penetration.[18]

Disadvantages

1. Poor uptake of macromolecules.
2. Entrapment of air bubbles in the formulation.
3. Hydrophobic drugs are ideal for such delivery systems.
4. Skin irritation or allergic reaction in contact dermatitis.
5. Can only be used for drugs that require very low plasma concentrations to be effective.
6. Epidermal enzymes denature drugs.[19]

1.3. Marketed Emulgels

Table: List of Marketed Emulgels.[20]

Sr. No.	Brand Name	Active Ingredient	Manufacturer	Use
1.	Cataflam emulgel	Diclofenac potassium	Novartis	Anti-inflammatory
2.	Dosanac emulsion gel	Diclofenac diethylammonium	Siam bheasach	Anti-inflammatory
3.	Denacine emulgel	Clindamycin phosphate	Beit jala pharmaceuticalcompany	Antiacne
4.	DermafeetEmulgel	Urea 40%	Herbitas Intense	Moisturizing and Exfoliation

				Activity
5.	Miconaz-H-emulgel	Miconazole nitrate, Hydrocortisone	Medical union Pharmaceuticals	Topical corticosteroid and antifungal
6.	Diclomax Emulgel	Diclofenac sodium	Torrent pharma	Anti-inflammatory
7.	Diclon emulgel	Diclofenac diethylamine	Medpharma	Anti-inflammatory

1.4. Formulation of Emulgel

1) Vehicle

Features of vehicle are

- Delivery of drugs to target sites.
- Maintain therapeutic drug levels in target tissues for a period of time sufficient to produce a pharmacological effect.
- Release drug for unimpeded movement to the site of action.

a) Aqueous material

This forms the aqueous phase of the emulsion. The widely used agents are water and alcohol.

b) Oils

These agents form an oil phase. For topically applied emulsions, mineral oil is widely used alone or in combination with soft or hard paraffin. In oral formulations, non-biodegradable mineral and ricin oils with local laxative effects, as well as fish liver oil or various vegetable fat oils, (e.g. peanut, cottonseed, corn oil) as a dietary.

2) Emulsifier

Emulsifiers are used both to promote emulsification at the time of manufacture and to check stability during shelf life. e.g., polyethylene glycol 40 stearate, sorbitan monooleate (Span 80), polyoxyethylene sorbitan monooleate (Tween 80), stearic acid, sodium stearate.

3) Gelling agent

These are used to increase consistency of dosage form and provide gelled behavior. Two types of gelling agents are available: natural and synthetic. Incorporating gelling agent into a system makes it a thixotropic. It is observed that there exists an inverse relationship between concentration of gelling agent and extent of drug released. Then get hydrated and swell. Besides its hydrophilic character, its cross-linked structure and its insolubility of water make carbopol a potential candidate for use in the fight against controlled drug release systems.

HPMC offers a better release of the drug than Carbopol. Ex: carbopol-934 (1%), HPMC-2910 (2.5%).

4) Preservatives

E.g: Propyl paraben, methyl paraben.

5) Antioxidants

E.g: Butylated Hydroxyl Toluene (BHT), Ascorbyl palmitate, Butylated hydroxyanisole (BHA), etc.

6) Humectants

To avoid leakage of moisture.

E.g: glycerin, propylene glycol, etc.

7) Gelling Agents

They are the agents used to enhance the consistency of any dosage form can also be used as a thickening agent.

E.g: Carbopol 934, Carbopol 940, HPMC, HPMC-2910, Sodium CMC.

8) Permeation enhancer

These are substances that are distributed among skin components and interact with them to produce a temporary and reversible increase in skin permeability. For example: Oleic acid, lecithin, isopropyl myristate, urea, eucalyptus oil, pigweed oil, pyrrolidone, laurocapran, dimethylsulfoxide, linoleic acid, menthol.

Properties of Permeation Enhancer

- They should be non-toxic, non-irritating and non-allergenic.
- Ideally, they will act quickly and the action and duration of the effect should be both predictable andreproducible.
- They have no pharmacological effect in the body, meaning they do not bind to receptor sites.
- Permeation enhancers must be unidirectional, meaning they must allow therapeutic agents to enter thebody while preventing endogenous loss from the body.
- Penetration enhancers must be suitable for formulation into various topical formulations and musttherefore be compatible with both excipients and the drug.
- They must be aesthetically pleasing and have the right “feel” to the skin.

1.5. Method of preparation

Materials

1. Clotrimazole Powder
2. Carbopol 940
3. Liquid Paraffin
4. Tween 20
5. Span 20
6. Propylene glycol
7. Ethanol
8. Methyl Paraben
9. Propyl Paraben
10. Triethanol amine
11. Purified water

Equipments

1. Weighing Balance
2. Magnetic Stirrer
3. Water Bath
4. Beakers
5. Measuring Cylinders
6. Brookfield Viscometer
7. UV

Procedure

1. Preparation of Emulsion

A] Preparation of Aqueous Phase

Aqueous phase of emulsion was prepared by dissolving tween 20 in distilled water.

B] Preparation of Oil Phase

Span 20 dissolved in liquid paraffin. Methylparaben and propylparaben were dissolved in propylene glycol, drugs were dissolved in ethanol, and both solutions were mixed with the aqueous phase. Both the oil and aqueous phases were heated separately to 75° C, and the oil phase was added to the water phase with continuous stirring until cooled.

2. Preparation of Gel

Different polymer concentrations were independently dispersed in distilled water while being continuously stirred at a moderate speed using a magnetic stirrer to create the gel base. Triethanolamine (TEA) was used to adjust the pH of all formulations to 6-6.5.

3. Preparation of Emulgel

The resulting emulsion was mixed with the gel under gentle stirring to obtain an emulgel.

1.6. Formulation Table

Table: Formulation Table.

Ingredients	Formulations						
	F1	F2	F3	F4	F5	F6	F7
Clotrimazole	0.25	0.5	0.75	1	1	1	1
Carbopol 940	0.25	0.5	0.75	1	1	1	1
Liquid Paraffin	2.5	5	5	7.5	5	5	5
Tween 20	0.5	0.1	0.3	0.5	0.5	0.1	0.6
Span 20	0.5	0.1	0.3	0.5	0.8	0.1	0.9
Propylene glycol	2.5	5	5	5	5	5	5
Ethanol	2.5	2.5	3.5	5	5	5	5
Methyl Paraben	0.02	0.05	0.1	0.2	0.4	0.3	0.5
Propyl Paraben	0.02	0.05	0.1	0.2	0.4	0.3	0.5
Purified water	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.

1.7. Evaluation Parameter

1. Physical Appearance: The prepared Emulgel is checked visually for their color, homogeneity, consistency and phase separation.

2. Determination of pH Value: Many topical formulations have a pH in the range of 5-6 as measured with a pH meter.

To measure pH, take 1 g of product and dissolve in 10 ml of water. Run the pH of each formulation in triplicate to minimize error.

3. Determination of Rheological Characteristics: 20g of prepared emulsion filled in a 25 ml beaker was used to measure viscosity using pin number S64 of the Brookfield viscometer.

4. Determination of Emulgel Spreadability: Spreadability of emulgel is measured in terms of diameter of emulgel circle produced when emulgel is placed between two glass plates of definite weight. Take a pre-weighed amount of emulgel (350 mg), place it on a glass dish and place another glass dish 5 cm apart. The diameter of the spread emulgel circle is measured. It is calculated by using the formula.

S=M.L/T

Where, S= spreadability, M= weight tied to upper slide,

L= length of glass slide, T= time taken to separate the slides completely.

5. Determination of % Drug Content: 1 g of the emulgel prepared is mixed with 25 ml of methanol. Sonicate this resulting solution for 30 minutes. From this solution, drug content was analyzed using an appropriate analytical method.

6. Swelling Index: Apply 1 g of the prepared emulgel to a porous aluminum foil and disperse it in 10 ml of 0.1 N NaOH solutions. Samples were taken at various time intervals andweights were recorded until the weights stopped changing:

Swelling Index (SW) % = [[Wt-Wo]/Wo]*100Where, (SW) % = Percentage swelling,

Wo = Original weight for the emulsion

Wt = Weight of swollen emulsion at time t.

1.8.RESULT AND DISCUSSION

1. Physical Examination: The prepared clotrimazole emulgel formulations when subjected for color appearance were transparent, white, creamy in Carbopol 940 with a smooth homogenous texture and glossy appearance. Results have been discussed in table.

Table: Physical Properties.

Sr. No.	Formulation	Color	Phase Separation	Homogeneity	Consistency
1	F1	Transparent	None	++	+
2	F2	White	None	+++	++
3	F3	White	None	++	+
4	F4	Creamy	None	+++	+++
5	F5	White creamy	None	+++	+++
6	F6	White creamy	None	+++	+++
7	F7	Creamy	None	++	++

+++ Excellent, ++ Good, + Satisfactory

2. Determination of pH value: The pH values of all the prepared formulation was ranging from 5.8- 6.0, which is considered acceptable to avoid the risk of irritation upon application to the skin.

Table: Measurement of pH.

Sr. No.	Formulation	pH
1	F1	5.24
2	F2	5.83
3	F3	6.0
4	F4	5.45
5	F5	5.81
6	F6	5.76
7	F7	1.93

3. Rheological Studies

The viscosity of the different emulsion formulations was determined at room temperature using a Brook field viscometer. The emulsions were rotated at 10 (min) and 100 (max) revolutions per minute with spindle 4.

Table: Rheological Studies.

Sr. No.	Formulation	Viscosity (Centipoise)
1	F1	1739.45
2	F2	1395.44
3	F3	2288.56
4	F4	1325.87
5	F5	1556.32
6	F6	1265.61
7	F7	1186.41

4. Spreadability Coefficient

The spreadability values show that the emulsion can spread easily when the shear is low. The spreading ability of F4 was 5.7 cm/s, indicating that the spreading ability of clotrimazole-containing emulgel was as good as a commercial gelcompound.

Table: Spreadability.

Sr. No.	Formulation	Diameter (CM)
1	F1	4.2
2	F2	4.8
3	F3	4.1
4	F4	5.7
5	F5	4.0
6	F6	4.9
7	F7	4.4

5. Determination of Drug Content: Drug content of each formulation was determined and data was shown in table. As shown in the tablet of drug content uniformly. The drug content uniformity of all the formulations was found to be ranging from 80% to 95% was observed

that as the concentration of emulsifying agent increasing the drug content increased.

Table: Drug Content.

Sr. No.	Formulation	Drug Content
1	F1	89%
2	F2	90%
3	F3	95%
4	F4	86%
5	F5	92%
6	F6	94%
7	F7	93%

6. Swelling Index: The swelling index of different formulations was observedand the data was shown in Table.

Table: Swelling Index.

Time (min)	F1	F2	F3	F4	F5	F6	F7
0	1	1	1	1	1	1	1
15	1.15	1.12	1.22	1.13	1.15	1.08	1.10
30	1.10	1.14	1.30	1.19	1.17	1.21	1.11
45	1.20	1.10	1.16	1.1	1.15	1.04	1.12
60	1.4	1.22	1.29	1.25	1.20	1.3	1.07
120	1.2	1.8	1.98	1.26	1.23	1.29	1.42

1.9.CONCLUSION

In the coming years, topical drug delivery will be widely used to improve patient compliance. Emulgel is a modern tool for topical delivery of hydrophobic drugs that combines the advantages of emulsions and gels to improve patient acceptance. Emulgel improves spreadability, adhesion, viscosity, and extrudability. It is used in both pharmaceutical and cosmetic applications and allows the incorporation of herbal formulations. It will become a popular drug delivery system. In addition, they will become a hydrophobic drug loading solution into a water-soluble gel matrix.

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