EMULGEL- A FORMULATION FOR TOPICAL DELIVERY OF HYDROPHOBIC DRUGS
Neethusha J Mathew*, Flowerlet Mathew2, Merin P Eldhose3
Nirmala College of Pharmacy, Muvattupuzha, Kerala, pin 686681.

KEYWORDS:
Gel, Epidermis, Penetration Enhancers.

ABSTRACT
Gels are created by entrapment of large amounts of aqueous or hydro alcoholic liquid in a network of colloidal solid particles. Gel formulations provide faster drug release compared with conventional other topical formulations. A major limitation of emulgel is the difficulty in delivery of hydrophobic drugs. So to overcome these, emulgels are prepared. When gels and emulsions are used in combined form, the dosage forms are referred as Emulgels. Emulsions are easily washed off whenever desired and have a high ability to penetrate the skin. Emulgels for dermatological use have several favourable properties such as being greaseless, easily spreadable, easily removable, emollient, water-soluble, bio-friendly, transparent & pleasing appearance. Other important factor is to extend the drug release of even hydrophilic drugs by making w/o emulgel.
INTRODUCTION

Topical drug administration is a localized drug delivery system anywhere in the body through ophthalmic, rectal, vaginal and skin as topical routes. The main advantage of topical delivery system is to bypass first pass metabolism. Avoidance of the risks and inconveniences of intravenous therapy and of the varied conditions of absorption like pH changes, presence of enzymes, gastric emptying time are other advantages of topical preparations. These are applying a wide spectrum of preparations for both cosmetic and dermatological, to their healthy or diseased skin. Dermatological products are diverse in formulation and range in consistency from liquid to powder but the most popular products are semisolid preparation. Within the major group of semisolid preparations, the use of transparent gels has expanded both in cosmetics and in pharmaceutical preparations.

PHYSIOLOGY OF SKIN

Most of the topical preparations are meant to be applied to the skin. So basic knowledge of the skin and its physiology function are very important for designing topical. The skin of an average adult body covers a surface area approximately 2m² and receives about one third of the blood circulating through the body. An average human skin surface is known to contain, on the average 40-70 hair follicles and 200-300 sweat ducts on every square centimeter of the skin. The pH of the skin varies from 4 to 5.6. Sweat and fatty acid secreted from sebum influence the pH of the skin surface. The skin can be considered to have four distinct layers of tissue as shown in figure.

1. Non-viable epidermis
2. Viable epidermis
3. Viable dermis
4. Subcutaneous connective tissue

1. Non-viable epidermis

Stratum corneum is the outer most layer of skin, which is the actual physical barrier to most substance that comes in contact with the skin. The stratum corneum is 10 to 20 cell layer thick over most of the body. Each cell is a flat, plate like structure - 34-44 μm long, 25-36 μm wide, 0.5 to 0.20 μm thick - with surface area of 750 to 1200 μm stocked up to each other in brick like fashion. Stratum corneum consists of lipid (5-15%) including phospholipids, glycosphingo lipid, cholesterol sulfate and neutral lipid, protein (75-85%) which is mainly keratin.

2. Viable epidermis

This layer of the skin resides between the stratum corneum and the dermis and has a thickness ranging from 50-100 μm. The structures of the cells in the viable epidermis are physiochemically
similar to other living tissues. Cells are held together by tonofibrils. The density of this region is not much different than water. The water content is about 90%.

3. Dermis

Just beneath the viable epidermis is the dermis. It is a structural fibrin and very few cells are like it can be found histological in normal tissue. Dermis thickness ranges from 2000 to 3000 μm and consists of a matrix of loose connective tissue composed of fibrous protein embedded in an amorphose ground substance.

4. Subcutaneous connective tissue

The subcutaneous tissue or hypodermis is not actually considered a true part of the structured connective tissue which is composed of loose textured, white, fibrous connective tissue containing blood and lymph vessels, secretary pores of the sweat gland and cutaneous nerves. Most investigators consider drug permeating through the skin enter the circulatory system before reaching the hypodermis, although the fatty tissue could serve as a depot of the drug. Cross section of skin is shown in figure I.

**Factors affecting topical absorption of drug:**[7, 8]

(A) Physiological Factors
1. Skin thickness.
2. Lipid content.
3. Density of hair follicles.
5. Skin pH.
8. Inflammation of skin.
(B) Physiochemical Factors
1. Partition coefficient.
2. Molecular weight (<400 dalton).
3. Degree of ionization (only unionized drugs gets absorbed well).
4. Effect of vehicles.

Method To Enhance Drug Penetration:[9]
1. Chemical enhancement
2. Biochemical enhancement
3. Physical enhancement
4. Super saturation enhancement

EMULGELS [10, 11,12]
Emulgels are emulsions, either of the oil-in-water or water in oil type, which are gelled by mixing with a gelling agent. Emulsified gel is stable one and superior vehicle for hydrophobic or poorly water soluble drugs. In short emulgels are the combination of emulsion and gel. In spite of many advantages of gels a major limitation is in the delivery of hydrophobic drugs. So to overcome this limitation an emulsion based approach is being used, so that even a hydrophobic therapeutic moiety can enjoy the unique properties of gels. In recent years, there has been great interest in the use of novel polymers which can function as emulsifiers and thickeners because the gelling capacity of these compounds allows the formulation of stable emulsions and creams by decreasing surface and interfacial tension and at the same time increasing the viscosity of the aqueous phase. In fact, the presence of a gelling agent in the water phase converts a classical emulsion into an emulgel. Emulgels for dermatological use have several favourable properties such as being thixotropic, greaseless, easily spreadable, easily removable, emollient, nonstaining, water-soluble, greater shelf life, bio-friendly, clear & pleasant appearance.

Emulgel is composed of two parts:
1. Emulsion.
2. Gel.

Emulsion:
Emulsions are biphasic system in which one immiscible liquid is dispersed into other; due to this the system becomes unstable which is stabilized by emulsifying agents. Emulsion can be either o/w or w/o these are used as vehicles to deliver drug. Emulsions are stabilized by use of emulsifying agents. They can be easily washed off from skin and have good penetration capability.
Gel

The term “gel” represents a physical state with properties intermediate between those of solids and liquids. However, it is often wrongly used to describe any fluid system that exhibits some degree of rigidity. A gel consists of a polymer which swells in the presence of fluid and perhaps it within its structure. The rigidity of the gel is determined by the amount of fluid it entraps. These gels are wet and soft and look like a solid material. These are capable of undergoing large deformation in their physical state i.e. from solid to liquid.

**Advantages of Emulgels[13,14]**

1. Hydrophobic drugs can be easily incorporated into gels using w/o/w emulsions
2. Better stability
3. Better loading capacity
4. Production feasibility and low preparation cost
5. No intensive sonication
6. Controlled release.
7. Avoidance of first pass metabolism.
9. More selective to a specific site.
10. Improve patient compliance and suitability for self medication.
12. Ability to easily terminate medication when needed.

**Disadvantages of Emulgels**

1. Skin irritation of contact dermatitis may occur due to the drug and/or excipients
2. Poor permeability of some drugs through the skin.
3. Possibility of allergenic reactions.
4. Drugs of larger particle size not easy to absorb through the skin.

**Factors to be considered when choosing a topical preparation[15-17]**

1. Effect of the vehicle: An occlusive vehicle enhances penetration of the active ingredient and improves efficacy.
2. The vehicle itself may have a cooling, drying, emollient, or protective action Match the type of preparation with the type of lesions. For example; avoid greasy ointments for acute weepy dermatitis.
3. Match the type of preparation with the site of application. For example; gel or lotion is mostly apply on hairy areas.
4. Irritation or sensitization potential: Generally, ointments and w/o creams are less irritating, while gels are irritating. Ointments do not contain preservatives or emulsifiers if allergy to these agents is a concern.

5. The medication should not affect the skin type.

**Important Constituents Of Emulgel Preparation[18- 20]**

1. Vehicles
   Emulgel contains both aqueous and oily vehicles, so both hydrophilic as well as hydrophobic drugs incorporated in to it. The aqueous phase of emulsion is made up of aqueous material like water, alcohols etc

2. Oils:
   These agents form the oily phase if the emulsion. For externally applied emulsions, mineral oils, either alone or combined with soft or hard paraffins, are widely used both as the vehicle for the drug and for their occlusive and sensory characteristics. Widely used oils in oral preparations are non biodegradable mineral and castor oils that provide a local laxative effect, and fish liver oils or various fixed oils of vegetable origin (e.g., Arachis, cottonseed, and maize oils) as nutritional supplements.

3. Emulsifiers:
   Emulsifying agents are used both to promote emulsification at the time of manufacture and to control stability during a shelf life that can vary from days for extemporaneously prepared emulsions to months or years for commercial preparations. eg Polyethylene glycol 40 stearate, Sorbitan monooleate (Span 80), Polyoxyethylene sorbitan monooleate (Tween 80), Stearic acid, Sodium stearate.

4. Gelling Agent:
   Table I enlists the compounds used to increase the consistency of any dosage form.

<table>
<thead>
<tr>
<th>Gelling agent</th>
<th>Quantity</th>
<th>Dosage Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbopol-934</td>
<td>1%</td>
<td>Emulgel</td>
</tr>
<tr>
<td>Carbopol-940</td>
<td>1%</td>
<td>Emulgel</td>
</tr>
<tr>
<td>HPMC-2910</td>
<td>2.5%</td>
<td>Emulgel</td>
</tr>
</tbody>
</table>

   Table I

5. Permeation Enhancers:
   Table II enlists the compounds that can enhance partition into and interact with skin constituents to induce a temporary and reversible increase in skin permeability.
<table>
<thead>
<tr>
<th>Penetration enhancer</th>
<th>Quantity</th>
<th>Dosage form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oleic acid</td>
<td>1%</td>
<td>Emulgel</td>
</tr>
<tr>
<td>Clove oil</td>
<td>8%</td>
<td>Emulgel</td>
</tr>
<tr>
<td>Menthol</td>
<td>5%</td>
<td>Emulgel</td>
</tr>
</tbody>
</table>

Table II

Types of emulgels:[21 - 24]

1. Macroemulsions gel:
   These are most common type of emulgels where the particle size of droplets of emulsion is more than 400nm. They are visually opaque but the individual droplets can be easily observed under microscope. Macroemulsion are thermodynamically unstable, but can be stabilized using surface active agents. E.g. Khullar R. et al, mafenamic acid emulgel was prepared using Carbopol 940 as gelling agent. Liquid paraffin was used as oil phase. Mentha oil and clove oil was used as penetration enhancer. Then it was evaluated for rheological studies, spreading coefficient studies, skin irritation test, in-vitro release, etc.

2. Nanoemulgel:
   When nanoemulsion is incorporated into gel it is called as nanoemulgel. Nanoemulsions are thermodynamically stable transparent (translucent) dispersions of oil and water stabilized by an interfacial film of surfactant and cosurfactant molecules having a droplet size of less than 100 nm. Nanoemulsion formulations possess improved transdermal and dermal delivery properties in vitro as well as in vivo. Nanoemulsions have improved transdermal permeation of many drugs over the conventional topical formulations such as emulsions and gels. e.g. Singh B. P et al, prepared Carvedilol nanoemulgel using oleic acid and isopropyl myristate (3:1) as oil phase. Tween 20 and Carbitol were used as surfactant and cosurfactant respectively. Carbopol 934 was used as gelling agent.

3. Microemulsion:
   Microemulsions are transparent and thermodynamically stable as their droplet size range from 10 to 100 nm and they do not coalesce. Microemulsions are composed of oil, surfactant, cosurfactant and water in specific proportions. The ingredients of microemulsion could facilitate the permeation rate of the drug by reducing the diffusion barrier of the stratum corneum. However, due to low viscosity of microemulsion, their less retention capacity in the skin restrains its application in the pharmaceutical industry. To overcome this disadvantage, gelling agents such as Carbopol 940, xanthan gum and carrageenan have been added into the microemulsion for forming microemulsion based gel in order to increase its...
viscosity which could be suitable for topical application. Moreover, microemulsion based gel prevents the absorption of drug in the blood stream and provide higher drug accumulation in the skin for efficient action. E.g. Bachhav Y. G et al, prepared clotrimazole microemulsion based vaginal using Capryol 90 as oil phase and Cremophor EL as surfactant. Carbopol ETD 2020 is used as gelling agent.

**Method of Preparation[28,29,30]**

STEP1: Formulation of Emulsion either O/W or W/O

STEP2: Formulation of gel base

STEP3: Incorporation of emulsion into gel base with continuous stirring with addition of gluteraldehyde.

The flowchart for the preparation of emulgel is shown in Figure III

![Flowchart](image)

**Figure III**

**Characterization Of Gellified Emulsion[25-27]**

**Physical appearance:**

The prepared Emulsion formulations were inspected visually for their colour, homogeneity, consistency and pH. The pH values of 1% aqueous solutions of the prepared Gellified Emulsion were measured by a pH meter (Digital pH meter DPH 115 pm).

**Spreadability:** Spreadability is determined by apparatus which is suitably modified in the laboratory and used for the study. It consists of a wooden block, which is provided by a pulley at one end. By this method, spreadability is measured on the basis of ‘Slip’ and ‘Drag’ characteristics of emulgels. A ground glass slide is fixed on this block. An excess of emulgel (about 2 gm) under
study is placed on this ground slide. The emulgel is then sandwiched between this slide and another glass slide having the dimension of fixed ground slide and provided with the hook. A 1 Kg weight is placed on the top of the two slides for 5 minutes to expel air and to provide a uniform film of the emulgel between the slides. Excess of the emulgel is scrapped off from the edges. The top plate is then subjected to pull of 80 grams. With the help of string attached to the hook and the time (in seconds) required by the top slide to cover a distance of 7.5 cm be noted. A shorter interval indicates better Spreadability. Spreadability was calculated by using the formula.

\[ S = \frac{M \times L}{T} \]

Where,

\[ S = \text{spreadability}, \]

\[ M = \text{Weight tied to upper slide}, \]

\[ L = \text{Length of glass slides} \]

\[ T = \text{Time taken to separate the slides completely from each other}. \]

**Extrudability study:**

It is a usual empirical test to measure the force required to extrude the material from tube. The method applied for determination of applied shear in the region of the rheogram corresponding to a shear rate exceeding the yield value and exhibiting consequent plug flow. In the present study, the method adopted for evaluating emulgel formulation for extrudability is based upon the quantity in percentage of emulgel and emulgel extruded from lacquered aluminium collapsible tube on application of weight in grams required to extrude at least 0.5 cm ribbon of emulgel in 10 seconds. More quantity extruded better is extrudability. The measurement of extrudability of each formulation is in triplicate and the average values are presented. The extrudability is then calculated by using the following formula:

\[ \text{Extrudability} = \frac{\text{Applied weight to extrude emulgel from tube (in gm.)}}{\text{Area (in cm}^2)} \]

**Globule size and its distribution in emulgel:**

Globule size and distribution was determined by Malvern zetasizer. A 1gm sample was dissolved in purified water and agitated to get homogeneous dispersion. Sample was injected to photocell of zetasizer. Mean globule diameter and distribution was obtained.

**Rheological Study:**

The viscosity of the different emulgel formulations is determined at 25°C using a cone and plate viscometer with spindle 52 (Brookfield Engineering Laboratories,) and connected to a thermostatically controlled circulating water bath.
Swelling Index:
To determine the swelling index of prepared topical emulgel, 1 gm of gel is taken on porous aluminium foil and then placed separately in a 50 ml beaker containing 10 ml 0.1 N NaOH. Then samples were removed from beakers at different time intervals and put it on dry place for some time after it reweighed. Swelling index is calculated as follows:
Swelling Index (SW) % = [(Wt – Wo) / Wo] × 100.
Where, (SW) % = Equilibrium percentage swelling,
Wo = Original weight of emulgel at zero time after time t,
Wt = Weight of swollen emulgel

Ex–vivo Bioadhesive strength measurement of topical emulgel:
(MICE SHAVEN SKIN): The modified method is used for the measurement of bioadhesive strength. The fresh skin is cut into pieces and washed with 0.1 N NaOH. Two pieces of skin were tied to the two glass slide separately from that one glass slide is fixed on the wooden piece and other piece is tied with the balance on right hand side. The right and left pans were balanced by adding extra weight on the left-hand pan. 1 gm of topical emulgel is placed between these two slides containing hairless skin pieces, and extra weight from the left pan is removed to sandwich the two pieces of skin and some pressure is applied to remove the presence of air. The balance is kept in this position for 5 minutes. Weight is added slowly at 200 mg/ min to the left-hand pan until the patch detached from the skin surface. The weight (gram force) required to detach the emulgel from the skin surface gave the measure of bioadhesive strength. The bioadhesive strength is calculated by using following:
Bioadhesive Strength = Weight required (in gm) / Area (cm2)

Drug Content Determination:
Drug concentration in Gellified Emulsion was measured by spectrophotometer. Drug content in Gellified Emulsion was measured by dissolving known quantity of Gellified Emulsion in solvent (methanol) by Sonication. Absorbance was measured after suitable dilution in UV/VIS spectrophotometer

In Vitro Release Study:
Franz diffusion cell (with effective diffusion area 3.14 cm2 and 15.5 ml cell volume) was used for the drug release studies. Gellified Emulsion (200 mg) was applied onto the surface of egg membrane evenly. The egg membrane was clamped between the donor and the receptor chamber of diffusion cell. The receptor chamber was filled with freshly prepared PBS (pH 5.5) solution to solubilize the drug. The receptor chamber was stirred by magnetic stirrer. The samples (1.0 ml
aliquots) were collected at suitable time interval. Samples were analysed for drug content by UV visible Spectrophotometer after appropriate dilutions. Cumulative corrections were made to obtain the total amount of drug release at each time interval. The cumulative amount of drug released across the egg membrane was determined as a function of time.

Microbiological assay:
Ditch plate technique was used. It is a technique used for evaluation of bacteriostatic or fungistatic activity of a compound. It is mainly applied for semisolid formulations. Previously prepared Sabouraud’s agar dried plates were used. Three grams of the Gellified emulsion are placed in a ditch cut in the plate. Freshly prepared culture loops are streaked across the agar at a right angle from the ditch to the edge of the plate. After incubation for 18 to 24 hours at 25°C, the fungal growth was observed and the percentage inhibition was measured as follows.

% inhibition = \( \frac{L2}{L1} \times 100 \)

Where \( L1 \) = total length of the streaked culture
\( L2 \) = length of inhibition.

Skin irritation test:
A 0.5 gm sample of the test article was then applied to each site (two sites per rabbit) by introduction under a double gauze layer to an area of skin approximately 1” x 1” (2.54 x 2.54 cm²). The Gellified Emulsion was applied on the skin of rabbit. Animals were returned to their cages. After a 24 hour exposure, the Gellified Emulsion is removed. The test sites were wiped with tap water to remove any remaining test article residue.

Accelerated stability studies of Gellified Emulsion:
Stability studies were performed according to ICH guidelines. The formulations were stored in hot air oven at 37 ± 2°, 45 ± 2° and 60 ± 2° for a period of 3 months. The samples were analysed for drug content every two weeks by UV-Visible spectrophotometer. Stability study was carried out by measuring the change in pH of gel at regular interval of time.

Drug Release Kinetic Study
To analyze the mechanism of drug release from the topical gel, the release data were fitted to following equations

Zero – order equation:
\( Q = k_0 t \)

Where \( Q \) is the amount of drug released at time \( t \), and \( k_0 \) is the zero – order release rate.
First – order equation:
In (100 – Q) = In 100 – k1t Where Q is the percent of drug release at time t, and k1 is the first – order release rate constant.

Higuchi's equation:
Q = k2√t
Where Q is the percent of drug release at time t and K2 is the diffusion rate constant.

STABILITY STUDIES:
The prepared emulgels were packed in aluminium collapsible tubes (5 g) and subjected to stability studies at 5°C, 25°C/60% RH, 30°C/65% RH, and 40°C/75% RH for a period of 3 months. Samples were withdrawn at 15-day time intervals and evaluated for physical appearance, pH, rheological properties, drug content, and drug release profiles.

EMULGELS IN MARKET
Table IV shows the emulgels available in the market.

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Brand Name</th>
<th>Content</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Voltaren Emulgel</td>
<td>Diclofenac Diethyl Amine</td>
<td>Novartis Pharma Switzerland</td>
</tr>
<tr>
<td>2.</td>
<td>Miconaz–H Emulgel</td>
<td>Miconazole Nitrate and Hydrocortisone.</td>
<td>Medical Union Pharmaceuticals Egypt</td>
</tr>
<tr>
<td>3.</td>
<td>Excex gel</td>
<td>Clindamycin</td>
<td>Adapalene Zee laboratories</td>
</tr>
<tr>
<td>4.</td>
<td>Pernox gel</td>
<td>Benzoyl peroxide</td>
<td>Cosme Remedies Ltd</td>
</tr>
<tr>
<td>5.</td>
<td>Lupigyl gel</td>
<td>Metronidazole</td>
<td>Lupin Pharma</td>
</tr>
<tr>
<td>6.</td>
<td>Clindagel</td>
<td>Clindamycin phosphate Allantoin</td>
<td>Stiefel Pharma</td>
</tr>
<tr>
<td>7.</td>
<td>Topinate gel</td>
<td>Clobetasol propionate Allantoin</td>
<td>Systopic Pharma</td>
</tr>
<tr>
<td>8.</td>
<td>Kojivit gel</td>
<td>Kojic acid, Dipalmitate Arbutin, Octinoxate</td>
<td>Micro Gratia Pharma</td>
</tr>
<tr>
<td>9.</td>
<td>Acent gel</td>
<td>Aceclofenac, Methylsalisylate, Capsaicin</td>
<td>Intra labs India Pvt Ltd</td>
</tr>
<tr>
<td>10.</td>
<td>Avindo gel</td>
<td>Azithromycin</td>
<td>Cosme Pharma laboratories</td>
</tr>
<tr>
<td>11.</td>
<td>Cloben gel</td>
<td>Clotrimazole, Beclomethasone Dipropionate, Neomycin</td>
<td>Indoco Remedies</td>
</tr>
<tr>
<td>12.</td>
<td>Nadicin cream</td>
<td>Nadifloxacin</td>
<td>Psychoremedies</td>
</tr>
<tr>
<td>13.</td>
<td>Zorotene gel</td>
<td>Tezaratene</td>
<td>Elder Pharmaceuticals</td>
</tr>
</tbody>
</table>

Table IV
CONCLUSION
Emulgels are the current trend in delivery of hydrophobic drugs topically. Most of the drugs available today are hydrophobic in nature and problem arises due to their solubility and thus poor bioavailability during topical administration. Despite of various advantages emulgels face problem of bubble formation during its formulation and stratum corneum is permeable to small molecules so concerning these facts we can incorporate microsponge that are are highly porous microsized particles with unique ability to entrap pharmaceutical ingredient into an emulgel base. Characteristics such as better loading capacity than other vesicular system, less sticky nature and better spreading of emulgel formulation promise them as a better available option for dermatological use. Various herbal oils with medicinal properties can also be incorporated into the emulgel formulation that may act as synergistic approach for treating a disease. Emulgels as offering various dermatological advantages can be a better alternative for delivery of sun shielding agents by formulating sunscreen in emulgel base. One such research was carried by M.Vettor et al who studied the uv filter distribution and release in skin layer of octyl-methoxycinnamate loaded poly(D,L-lactide) nanoparticles in emulsion gel base but till date no such sunscreen based on emulsion gel base is prepared or studied. So this can offer a great field for study in emulgel evolution field. Microsizing and Nanosizing the particles of emulsion and then dispersing them into gel base can further be studied and these may cause enhancement of topical release of drugs with poor penetration ability. Addition of different penetration enhancers of natural as well as synthetic origin can be further explored for increasing topical penetrability of drugs through emulgel base. Buccal emulgels can also be made by incorporating mucoadhesive polymers and can provide relief in oral infections.

Considering the various advantages and disadvantages of various dermatological topical preparation it is concluded that emulgels serve as the better alternative of the present available marketed topical formulation for delivery of hydrophobic drugs. Emulgels show good spreadability, ease of application better loading capacity and good patient compliance. Emulgels have property of both emulsion and gels and thus can be used for controlling release rate of drugs with short half-life. They provide stability to the emulsion by providing it a gel base. Incorporation of various active pharmaceutical ingredient into emulgels is used in treatment of various diseases like fungal infection, as topical antiinflammatory infection, psoriasis etc. Most of the drugs available and available for topical use are hydrophobic in nature and can be easily incorporated into the emulgels and show stability and better drug release. Currently very few marketed emulgel formulation are available in market however it offers a vast field for development and research. However regarding
various advantages and future prospective emulgels offer a wide utility in derma care. Due to lack of excessive oily bases and excipients it shows better drug release and thus could be formulation of choice in various dermatological diseases.

REFERENCES

3. Sharma S. Topical preparations are used for the localized effects at the site of their application by virtue of drug penetration into the underlying layers of skin or mucous membranes. Pharmaceutical reviews 2008; 6:1
13. Jacob SW, Francone CA. Structure and Function of Man, (2).Mohamed MI. Optimization of


