



A REVIEW ON MICROEMULSION BASED GEL: A RECENT APPROACH FOR TOPICAL DRUG DELIVERY SYSTEM.

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Abstract:

Micro emulsions, that area unit optically isotropic and thermodynamically stable systems of water, oil, surfactant, and/or co-surfactant, are studied as drug delivery systems thanks to their capability to solubilize poorly water soluble drugs further as their sweetening of topical and general convenience. It helps to solubilize the lipophilic drug moiety and it shows speedy and economical penetration to the skin. thus it's useful for topical drug delivery. For topical delivery, micro emulsion is incorporated in compound gel base to prolong the native contact to the skin. several wide used topical agents like ointments, creams, lotions have several disadvantages like sticky in nature, inflicting uneasiness to the patient once applied, have lesser spreading coefficient thus applied by rubbing and that they conjointly exhibit the matter of stability. Micro emulsion has stability downside thanks to having low body however will be overcome by incorporation into topical DDS causes improved body and hydrating stratum corneum which is able to increase drug dermal permeation and therefore the skin flux. thanks to of these factors at intervals the foremost cluster of solid preparations, the use of transparent gels has enlarged in pharmaceutical preparations.

Index Term– Micro emulsion primarily based gel, Topical drug delivery, Polymers

1. INTRODUCTION:

Hoar and Schulman proposed the concept of micro-emulsions in the 1940s. It is described as an optically isotropic and thermodynamically stable liquid micro dispersion made up of water, oil, and amphiphile. The vehicle for increasing the administration, effectiveness, and bioavailability of numerous medications in the micro-emulsion. Micro-emulsions are thermodynamically stable transparent, isotropic, low viscosity colloidal dispersions that comprise oil and water and are stabilized by a surfactant/co-surfactant interfacial coating. Topical delivery administration is a localized drug delivery technique that can be used to administer drugs to any part of the body via ophthalmic, rectal, vaginal, and cutaneous channels. The invention of numerous pharmaceuticals, medicines, and delivery systems has resulted from efforts to cure ailments. The method of administration is determined by the nature and severity of the condition.

The topical approach is preferable for skin disorders. A topical drug delivery system is described as the application of a formulation containing medication directly to the skin in order to achieve a localized pharmacological effect.

Topical medication distribution is a possible way for delivering a drug with minimal side effects as compared to other dose forms. Due to the lack of metabolic clearance of the drug before it reaches the targeted region, drug concentration can be tuned to a low concentration. There are many traditional topical dosage forms such as ointment, cream, and gel, but they show fluctuations in drug bioavailability and are associated with other limitations, such as gel's limited ability to deliver hydrophilic drugs and ointment's limited ability to deliver hydrophobic drugs, so there have been novel approaches in recent years.^[1]

Microemulgel droplets range in size from 10 to 100 nanometers, making them transparent and thermodynamically stable. While microemulgel, a hybrid of microemulsion and gel, combines the benefits of both microemulsion and gel. Thixotropic, greaseless, easily spreadable, easily removable, emollient, non-staining, long shelf life, bio-friendly, translucent, and appealing appearance are only a few of the advantages of micro-emulgel for dermatological use.^[2]

II. Topical Drug Delivery System

Topical delivery administration is a localized drug delivery technique that can be used to administer drugs to any part of the body via ophthalmic, rectal, vaginal, and cutaneous channels. Efforts to cure diseases have led to the development of a wide range of pharmaceuticals, medicines, and delivery systems. The method of administration is determined by the nature and severity of the condition. The topical approach is preferable for skin problems. A topical drug delivery system is described as the application of a formulation containing medication directly to the skin in order to achieve a localized pharmacological effect.

The capacity to administer drugs more selectively to specific sites is one of the advantages of topical drug delivery systems. Avoiding gastro-intestinal incompatibility and metabolic degradation associated with oral treatment is the most compelling argument for adopting topical application. Furthermore, topical application increases bioavailability by bypassing first-pass metabolism by the liver and allows for consistent delivery throughout time.

The physiochemical features of the carrier and the medication used have a direct impact on drug release rates from topical preparations. A gel is a semisolid system that consists of at least two interpenetrating phases: a gelling agent and a liquid. The dosage forms are referred to as microemulsion based gel when gel and microemulsion are mixed. Microemulsion-based gels have emerged as one of the most intriguing topical drug delivery systems since they have both a gel and a microemulsion control system. The microemulsion-based gel for dermatological use is thixotropic, greaseless, readily spreadable, easily removable, emollient, non-staining, and water-soluble, has a longer shelf life, is biodegradable, transportable, and has a nice look, among other qualities.

Microemulsions have gotten a lot of attention as a way to distribute hydrophobic drugs for both systemic and local treatment. Gels, on the other hand, are a more recent type of dosage form that is formed by trapping large amounts of aqueous or hydroalcoholic liquid in a network of colloidal solid particles. Which can include inorganic compounds such as aluminum salts, as well as natural and manmade organic polymers.

Because the gelling capacity of three compounds allows the creation of stable microemulsions, there has been a lot of interest in the application of new polymers with complicated roles as emulsifiers and thickness in recent years. & opposite creams reduce surface and interfacial tension while increase the viscosity of the aqueous phase, transforming a classical microemulsion into a microemulgel.

Semisolid preparations are preferred over solid and liquid dose forms for topical administration. Because of their ability to solubilize poorly water-soluble medicines and boost topical absorption, microemulsions, which are optically isotropic and thermodynamically stable systems of water, oil, surfactant, and co-surfactant, can be utilized as a drug delivery system. Microemulsion is added into the gel basis for topical application to prolong local contact with the skin.^[2]

Human skin is a specially designed organ that allows for terrestrial existence by controlling heat and water loss while blocking the intrusion of harmful chemicals and microbes. Many commonly used topical treatments, such as ointments, creams, and lotions, have a number of drawbacks. When administered, they are usually highly sticky, causing the patient discomfort. They also have a lower spreading coefficient and must be applied by rubbing. They also have stability issues among the principal category of semisolid preparations as a response of all of these considerations; the use of transparent gels has increased in both cosmetics and pharmaceutical preparations.^[3]

ADVANTAGES OF TOPICAL DRUG DELIVERY SYSTEM: [3]

- Avoidance of metabolism's initial pass.
- Convenient and simple to use.
- Avoiding the risks and drawbacks of intravenous therapy, as well as a variety of absorption variables such as pH fluctuations, enzyme presence, and gastric emptying time.
- Easily stop taking the drugs if necessary.
- Deliver medicine to a specific spot with greater precision.
- Preventing gastrointestinal incompatibility.
- Enabling the use of medicines with a short biological half-life and a limited therapeutic window.
- Patient compliance has improved.
- Make it possible to self-medicate.
- Continuous drug input achieves efficacy with a lower total daily dose of medicine.
- Prevents medication level fluctuations, as well as inter- and intra-patient fluctuations.
- In comparison to the buccal or nasal cavity, the application area is fairly large.
- Ability to administer medications to a specified location with greater precision.

DISADVANTAGES OF TOPICAL DRUG DELIVERY SYSTEM: [2]

- Dermatitis skin irritation can be caused by the drug or its excipients.
- Allergic reactions are a possibility.
- The main drawbacks of microemulsion-based gels are inadequate micro particle absorption through the skin and bubble entrapment during formulation.
- Some larger-particle medicines are difficult to absorb through the skin.
- Some medications have a low permeability through the skin.

III. RATIONALE:

Many medicinal items are applied to the skin or mucous membrane in order to improve or restore a basic skin function or to pharmacologically adjust an operation in the highlighted tissues. Many topical agents, such as ointments, creams, and lotions, have several disadvantages.

They are quite sticky when administered, causing discomfort in the sufferer. They also have a lower spreading coefficient and must be applied by rubbing, in addition to a stability issue. As a result of all of these considerations, the usage of translucent gels in cosmetics and medicinal preparations has expanded within the major category of semisolid preparations. Despite all of the advantages of gels, one significant disadvantage is the delivery of hydrophobic drugs. A gel is a water-based colloid that is immobilized by surface tension between it and a macromolecular network of fibers generated by a little amount of a gelating substance. An emulsion-based technique is being used to successfully combine and deliver even a hydrophobic Ki medicinal moiety using gels hydrophobic medicines to circumvent this constraint. ^[4]

Many commonly used topical treatments, such as lotion, cream, and ointment, have numerous drawbacks. They are quite sticky and make the patient feel uneasy when used. Additionally, they have a lower spreading coefficient and must be applied by rubbing. They also have a problem with stability.

The usage of transparent gels in pharmaceutical preparation and cosmetics has increased as a result of all of these elements within the principal group of semisolid preparation. A colloid is a 99 percent weight liquid that is trapped by surface tension between a macromolecular network of fibers generated from a little quantity of gelatin substance present and itself. Despite the numerous benefits of gels, one significant drawback is the delivery of hydrophobic medicines. As a result, an emulsion-based technique is used to circumvent this barrier, allowing even a hydrophobic medicinal moiety to be successfully integrated and given in the form of gels. ^[5]

IV: IDEAL PROPERTIES OF MICROEMULSION BASED GEL: [6]

- It must be inert and compatible with other ingredients.
- There should be no microbiological contamination.
- It must be non-toxic.
- It should be cost-effective.
- All of the gel's rheological qualities should be preserved.
- It should be cleansed with water and free of any stains.
- It should be simple to use and handle.
- The storage condition should be stable.

ADVANTAGES OF MICROEMULSION BASED GEL: [6]

1. Better stability:

Other transdermal formulations, in comparison to microemulsion-based gel, are less stable. Creams display phase inversion or breaking, ointment indicates rancidity due to oily basis, and normal topical emulsion shows creaming effect, just like powders. The microemulsion-based gel does not have any of the foregoing issues and is more stable.

2. Better loading capacity:

Other innovative techniques, such as niosomes and liposomes, are Nano scale and may leak due to vesicular features, resulting in lower trapping efficiency. However, due to their extensive network, gels have a higher drug loading capacity.

3. Production feasibility and low preparation cost:

The preparation of a microemulsion-based gel consists of fewer and shorter steps, increasing the production feasibility. The manufacturing of microemulsion-based gels does not necessitate the use of specialist equipment. Furthermore, the materials are readily available and inexpensive. As a result, the cost of producing microemulsion-based gels is reduced.

4. Incorporation of hydrophobic drugs:

Most hydrophobic medications, especially class VI pharmaceuticals, cannot be integrated directly into the gel base due to solubility, which acts as a barrier and causes a problem during drug release. The inclusion of hydrophobic medicines into the oil phase is aided by a microemulsion-based gel, which then disperses oily globules in an aqueous phase, resulting in an o/w emulsion. This emulsion can also be added to a gel base. It's possible that this will provide better drug stability and release than merely integrating medicines into a gel foundation. Example. Ketoconazole, fluconazole, etc.

5. No intensive sonication:

Intensive sonication is required for the production of vesicular molecules, which can lead to drug degradation and leakage. However, because no sonication is required in the creation of microemulsion-based gels, this issue does not arise.

6. Controlled release:

A gel based on microemulsions can be used to extend the impact of medications with a shorter half-life.

Other benefits:

7. To avoid the first-pass effect, which refers to the medication substance's initial passage through the systemic and partial circulation after gastrointestinal absorption, avoiding deactivation by digestive and liver enzymes.
8. They can avoid problems with gastrointestinal drug absorption caused by stomach pH and enzymatic activity, as well as drug interactions with food and beverages.
9. Using a microemulsion as a delivery mechanism can increase a drug's efficacy by lowering the overall dose and thereby reducing side effects.
10. Microemulsions improve the rate of penetration across the epidermal barrier, increasing absorption and bioavailability.
11. As a medicine in the oil phase of an o/w microemulsion is not exposed to water or air, it is protected against hydrolysis and oxidation.
12. They are less oily and may be removed easily from the skin.
13. Microemulsion gel is a non-invasive treatment that improves patient compliance.
14. Dose reduction comparable to that of an oral dosage form

MICROEMULSION-BASED GEL DISADVANTAGES: [6]

1. Drugs with larger particle sizes are more difficult to absorb via the skin.
2. Some medications have a low permeability through the skin.
3. Can only be used for medications that require a very low plasma concentration to work.
4. Allergic reactions are a possibility.
5. Drugs may be denatured by an enzyme in the epidermis.

V. FACTORS AFFECTING TOPICAL ABSORPTION OF DRUG: [7]**Physiological factors:**

1. **Skin Thickness:** The thickness of the skin varies from the epidermis to the subcutaneous layer. The epidermis is thick, with a thickness of 100–150 m. Diffusion is high on the sole and palm of the hand.
2. **Lipid content:** It is an excellent water barrier, and when the lipid weight in the stratum corneum is low, percutaneous penetration increases.

3. Hair follicle density: The hair follicle infundibulum has a 10 times larger storage capacity than the stratum corneum.

4. The number of sweat glands in the body.

5. Skin pH: Sweat and sebum-secreted fatty acids affect the pH of the skin's surface.

6. Blood flow

7. Skin hydration: It can help with drug penetration.

8. Skin inflammation: This breaks the stratum corneum continuity, increasing permeability.

9. Skin temperature: As the temperature rises, the rate of skin permeability rises as well.

Physicochemical factors:

1. Partition coefficient: The higher the value of log p, the easier the medicine will be absorbed through the skin.

2. The molecular mass (about 400 Dalton).

3. The ionization level (only unionized drugs gets absorbed well).

4. Vehicle effect: Hydroalcoholic gel absorbs the most effectively via the skin.

VI. PARTS OF MICRO EMULGEL:[8]

1. Micro-emulsion

2. Gel

3. Emulsion

EMULSION:

Emulsions are biphasic systems in which one immiscible liquid is distributed into another; as a result, the system becomes unstable, and emulsifying chemicals are used to stabilize it. The emulsion might be o/w or w/o. These are employed as drug delivery vehicles. Emulsifying compounds are used to stabilize emulsions. They are easy to remove from the skin and have a high penetration rate.

TYPES OF EMULSIONS:

MACRO EMULSIONS:

These are the most frequent type of emulsions, with droplet sizes greater than 400nm. They are optically opaque, yet under a microscope, the individual droplets can be seen clearly. Macro emulsions are thermodynamically unstable, however surface active substances can help to stabilize them.

They are divided into two categories o/w and w/o. The nature of the emulsifier, as well as the ratio of components involved and the method of emulsification, determine the type of emulsion formed.

1. MICROEMULSIONS:

Microemulsions are isotropic dispersions of aqueous and hydrocarbon liquids that are stabilized by an interfacial coating of surfactant molecules. They are thermodynamically stable, optically clear, and thermodynamically stable. The diameter of the mono distributed spherical droplets ranges from 20nm to 200nm. Emulsion with two layers Small droplets of one phase (for example, oil) are dispersed in bigger droplets of the second phase (for example, water), with the latter being further dispersed in the former (for example, oil) as the continuous medium.

2. GEL:

The term gel refers to a physical condition that has qualities that are halfway between solids and liquids. However, it is frequently misused to refer to any fluid system with a degree of stiffness. A gel is made up of a polymer that swells when exposed to fluid and perhaps within its structure. The amount of fluid entrapped in the gel determines its stiffness. These gels are moist and squishy, and they appear to be solid. In their physical condition, i.e. from solid to liquid, these are capable of undergoing significant deformation.

TYPES OF MICRO-EMULGEL:[9,11]

1. MACRO EMULSION GEL:

These are the most prevalent micro-emulgels, with droplet sizes greater than 400nm. They appear to be opaque to the naked eye, yet beneath a microscope, the individual droplets may be seen clearly. Surface active compounds can help stabilize macro emulsions, which are thermodynamically unstable. For example, Khullar R. et al used Carbopol 940 as a gelling agent to make a mefenamic acid microemulgel. Oil phase consisted of liquid paraffin. As a penetration enhancer, Mentha and clove oil were utilized. Then it was subjected to rheological tests, spreading coefficient tests, skin irritation tests, in-vitro release tests, and other tests.

2. NANO-EMULGEL:

Nano-emulgel is a term used to describe when Nano-emulsion is mixed into a gel. Nano-emulsions are transparent (translucent) oil-water dispersions that are thermodynamically stable and are stabilized by an interfacial coating of surfactant and cosurfactant molecules with droplet sizes less than 100 nm. Nano-emulsion formulations have improved transdermal and dermal delivery properties in vitro and in vivo. Nanoemulsions have superior transdermal absorption than typical topical formulations like emulsions and gels for many drugs. To create Carvedilol Nano-emulgel, Singh B. P. et al employed oleic acid and isopropyl myristate (3:1) as the oil phase. Tween 20 and Carbitol were used as the surfactant and cosurfactant, respectively. Carbopol 934 was used as a gelling agent.

3. MICRO EMULSION GEL:

Because their droplet sizes range from 10 to 100 nm because they do not coalesce, micro emulsions are transparent and thermodynamically stable. Oil, surfactant, cosurfactant, and water in particular proportions make up micro emulsions. The components in micro emulsion could help the medicine permeate faster by lowering the stratum corneum diffusion barrier. However, because of their low viscosity, micro emulsions have a limited retention capacity in the skin, which limits their use in the pharmaceutical business.

Gelling agents such as Carbopol 940, xanthan gum, and carrageenan have been added to the micro emulsion to create a micro emulsion-based gel with a viscosity suitable for topical administration. Furthermore, a micro emulsion-based gel reduces medicine absorption into the bloodstream, allowing for more drug accumulation in the skin for more effective action.

For example, Bachhav Y. G et al. created a Clotrimazole micro emulsion-based vaginal gel with Capryol 90 as the oil phase, Cremophor EL as the surfactant, and Carbopol ETD 2020 as the gelling agent using Capryol 90 as the oil phase, Cremophor EL as the surfactant, and Carbopol ETD 2020 as the gelling age.

VII. PHYSIOLOGY OF SKIN:[13,14]

The majority of topical medicines are designed to be administered to the skin. For creating topical, a basic understanding of the skin and its physiology function is essential. The average adult's skin is around 2mm thick and gets about one-third of the blood that circulates throughout the body. There are 40-70 hair follicles and 200-300 sweat ducts per square centimeter of human skin. The pH of the skin ranges from 4 to 5.6. The pH of the skin's surface is affected by sweat and sebum-secreted fatty acids. The skin is made up of four different layers of tissue, as shown in the diagram.

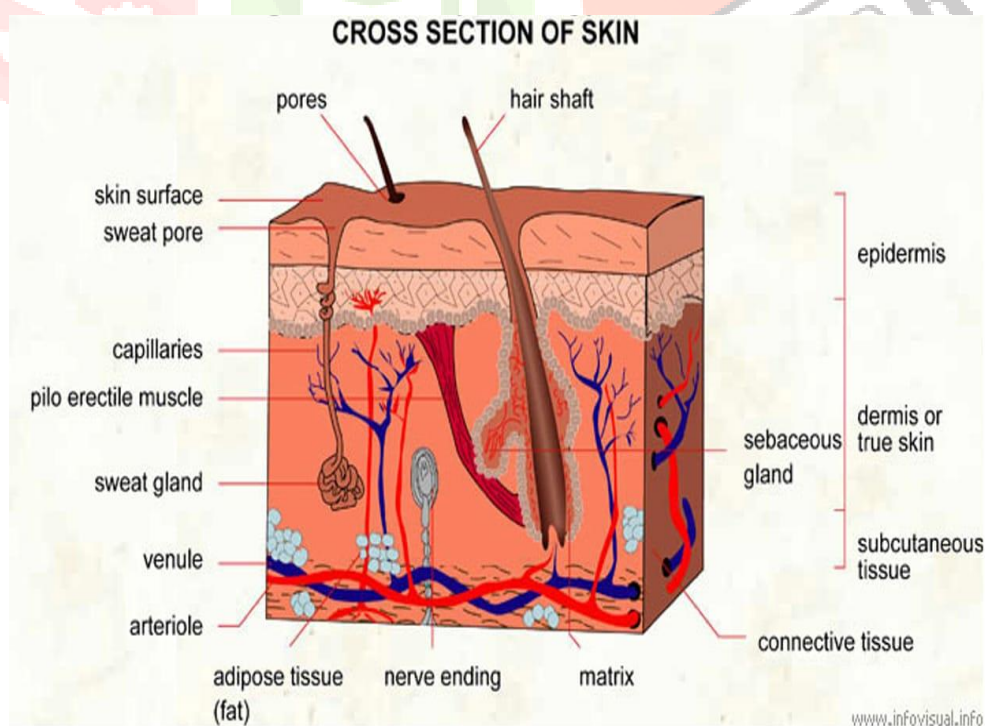


Figure 1. Physiology Of Skin

1) NON-VIABLE EPIDERMIS:

The stratum corneum is the skin's outermost layer, acting as a physical barrier to most substances that come into touch with it. Over the majority of the body, the stratum corneum is 10 to 20 layers thick. Each cell is a flat, plate-like structure 34-44 μm long, 25-36 μm broad and 0.5 to 0.20 μm thick - with a surface area of 750 to 1200 μm^2 stacked in a brick-like way. The stratum corneum is made up of lipids (5-15%), which include phospholipids, glycosphingolipids, cholesterol sulphate, and neutral lipids, as well as protein (75-85%), which is mostly keratin.

2) VIABLE EPIDERMIS:

This layer of the skin is located between the stratum corneum and the dermis and ranges in thickness from 50 to 100 micrometers. The cells of the live epidermis have structures that are physiochemically comparable to those of other living tissues. Tonofibrils are the glue that holds cells together. The density of this region is similar to that of water. The water content is approximately 90%.

3) DERMIS:

The dermis is located just beneath the viable epidermis. It is a structural fibrin, and only a few cells similar to it can be seen in normal tissue histologically. The dermis is made up of a matrix of loose connective tissue made up of fibrous protein embedded in an amorphous ground substance with a thickness ranging from 2000 to 3000 μm .

4) SUBCUTANEOUS CONNECTIVE TISSUE:

The hypodermis, or subcutaneous tissue, is not considered a true part of the structured connective tissue, which is made up of loose textured, white, fibrous connective tissue that contains blood and lymph arteries, sweat gland secretory pores, and cutaneous nerves. Most researchers believe that drugs that pass through the skin enter the circulatory system before reaching the hypodermis, while fatty tissue could act as a drug depot.

VIII. DRUG DELIVERY ACROSS THE SKIN:

Arthritis pain are just a few The epidermis is the skin's most superficial layer, made up of stratified keratinized squamous epithelium that varies in thickness across the body. Elastic filaments make it the thickest. The deeper and more delicate parts of the skin are protected by a somewhat waterproof layer formed by the skin. Underneath the skin, there are numerous blood vessels. A continuous venous plexus fed by blood influx from skin capillaries is especially significant. Blood is also given to the plexus directly from the tiny arteries in the most exposed regions of the body the hands, feet, and ears via highly muscular arteriovenous anastomoses. The direct accessibility of the skin as a target organ

The skin works as a two-way barrier, preventing water and electrolyte absorption and loss. Topical medication absorption is mediated by three mechanisms:

Transcellular.

Intercellular.

Follicular.

The majority of medications navigate the tortuous road past corneocytes and through the lipid bilayer to reach the skin's viable layers. The pilosebaceous route is the next most common (and potentially under-recognized in the clinical setting) method of administration. Chemical penetration rates through isolated stratum corneum and entire skin are nearly equal, indicating that the barrier is located in the epidermis' outermost layer, the stratum corneum. For years, rubbed-in creams and gels have been used to deliver pain medication and infection-fighting pharmaceuticals to an affected area of the body. Gels and creams for vaginal yeast infections, topical creams for skin infections, and creams to relieve examples. Other medications can iagnostic and treatment is a distinctive feature of dermatological pharmacology.

now be absorbed through the skin thanks to new technologies (transdermal). These can be used to treat the entire body, not just the damaged parts (for example, the skin) (systemic)

IX. COMPONENTS OF MBG:[12,15]

1. OILS:

The oils employed in microemulsion preparation have the ability to solubilize the medication. Mineral oils, either alone or in combination with soft or hard paraffin, are commonly utilised as the drug's vehicle as well as for their occlusive and sensory properties in externally applied microemulsions. Non-biodegradable mineral and castor oils, which have a local laxative effect, as well as fish liver oils and other fixed vegetable oils, are commonly used in oral preparations.

E.g., Arachis, cottonseed, and maize oils) as nutritional supplements. Some are as light liquid paraffin, isopropyl myristate, isopropyl stearate, isopropyl palmitate, propylene glycol, etc. Examples: Olive oil, Peanut oil, Sesame oil, Soybean oil, Sunflower oil, Triacetin, Paraffin oil, oleic acid, castor oil, corn oil, ethyl oleate, polyoxy castor oil, etc.

2. AQUEOUS MATERIAL:

The aqueous phase of the microemulsion is formed by this. Water is the most often utilised aqueous phase. Because of its significant impact on the phase behaviour of microemulsions, the pH of the aqueous phase must always be adjusted. Water, alcohols, and other common agents are used.

3.SURFACTANT (EMULSIFIER):

The polar head group area and the non-polar head group region make up surfactant molecules. According to the type of the hydrophilic group inside the molecule, they are divided into four categories: An anionic surfactant, a cationic surfactant, a non-ionic surfactant, and an ampholytic surfactant are all types of surfactants. Surfactant lowers the interfacial tension between two immiscible liquids, allowing them to mix together. When surfactants are mixed with oil and water, their polar heads self-associate with the water phase, while their non-polar tails self-associate with the oil phase, or they can fast locate at the interface, which is thermodynamically stable.

Eg: Tween 80, Tween 20, Cremophor RH40, Labrafil M1944CS, Cremophor EL, Span 80.

4. CO-SURFACTANT (CO – EMULSIFIER):

To make a viable microemulsion for the topical drug delivery system, a relatively high concentration (typically more than 30% w/w) is required. Organic solvents (ethanol, propylene glycol (PG), polyethylene glycol (PEG), and others) may aid in the dissolution of significant volumes of either the hydrophilic surfactant or the medication in the lipid basis. In microemulsion systems, these solvents can play an important function as a co-surfactant. To boost the solubilizing capacity of formulations, polymeric liquid and semi-solid excipients can be used alone or in combination with other lipid excipients. PEGs are a flexible, well-characterized, and commonly used class of polymeric glycol-based excipients that are available in both liquid and thermally softening semisolid forms.

Examples: Propylene glycol, PEG 200, PEG 400, Ethanol, Transcutol HP.

X. POLYMERS:

Polymer present in 5 to 40% w/w, which is not ionizable at physiological pH and able to form a matrix. Examples are Hydroxypropyl ethyl cellulose, ethyl cellulose, etc.

GELLING AGENTS:[16]

When a gelling agent is added to certain formulas, the result is a gelled structure. There are two types of gelling agents: natural and synthetic. Gelling transforms a system into a thixotropic one. Thixotropy is defined as "the property of a viscous (viscid) or gel-like product turning more liquid as time passes and the more vigorously it is distorted (i.e., stirring)," according to the Swedish national encyclopedia. Thixotropy is a fluid phenomenon that exhibits a reversible structure. Acrylic acid polymers cross linked with polyalkenyl ethers or divinyl glycol are known as carbopol polymers. They are made from primary polymer particles with a smaller diameter. Each particle can be thought of as a network of polymer chains that are linked together via crosslinking. Carbomers absorb water quickly and expand as a result. Carbopol is a prospective option for use in a controlled release drug delivery system due to its hydrophilic nature, cross-linked structure, and insolubility in water. The effect of a gelling agent on the drug release rate from a microemulsion-based gel has been investigated. It has been

discovered. The concentration of gelling agent and the amount of drug released have an inverse relationship. Other types of gelling agents, such as synthetic, semi-synthetic, and natural gelling agents, can also be used.

XI. PENETRATION ENHANCERS:[17]

Penetration enhancers are substances that improve the drug's ability to penetrate the skin. Vehicles often include penetration enhancing ingredients that temporarily disrupt the highly ordered structure of the stratum corneum skin barrier, fluidize the lipid channels between corneocytes, alter the partitioning of the drug into skin structures, or otherwise enhance delivery into the skin to promote drug absorption through the skin barrier.

Permeation enhancers work by one or more of the following mechanisms:

- a. Disrupting the highly desired structure of stratum corneum lipids.
- b. Interacting with intercellular proteins.
- c. Medication apportionment from the dissolvable into the stratum corneum is improved.

XII. PRESERVATIVES:

Propyl and Methyl parabens, Benzalkonium chloride, Benzyl Liquor, Benzoic corrosive, and other preservatives are commonly used.

XIII. ANTIOXIDANTS[18]

Antioxidants such as Butylated hydroxyl anisole, Butylated hydroxyl toluene, and Ascorbyl palmitate are used as cell reinforcements to prevent oxidation of the formulation.

XIV. HUMECTANTS

Humectants include glycerin, propylene glycol, and other similar substances.

CONCLUSION: [19,20]

Microemulsion based mostly gel system have established as most convenient, higher and effective topical delivery system. Nowadays gels have gotten a lot of common as a result of they're more stable and can also give controlled unharness. Due to its non-greasy gel like property and lacks of oily bases it provides a more robust unharness of medication as compared to alternative topical drug delivery system. Incorporation of microemulsion into gel makes it a twin controlled unharness system more drawback like part separation, creaming associated with microemulsion gets resolved and its stability will improve. Microemulsion based mostly gel loaded with specific medication has been found effective in some topical disorders like fungous and inflammatory disease disorders and it's emerging as a possible drug delivery system.

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