A REVIEW ON EMULGEL: AN EFFECTIVE NOVEL DRUG DELIVERY SYSTEM

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Abstract: The combination of emulsion and gel together refers as emulgel. Emulgel is one of the most effective topical delivery system of the drug now a day. Due to the incorporation of emulsion into gel makes it a double control release system and also induced their stability .Emulgel is one of the most recent technology of the new drug delivery system (NDDS), and have the both characteristic of control release i.e. emulsion and gel property. Emulgel have the both characteristics of hydrophobic as well as lipophilic. Emulgel have the high ability to penetrate the skin. It is used to treat basically pains caused by various type of cold, headache, arthritis and different type of injuries as topically.

Keywords: Emulgel, Topically drug delivery, Skin disease, Gelling agent.

INTRODUCTION:

Now a day ,the topically drugs delivery system is one the most convenient drug delivery system ,these are mostly useful when the other route of drug system is fail to show their effect on cutaneous layer. The main advantage of topical drug delivery system is, there is no first pass metabolism, so directly effect on the affected or infected area and its route is easy to apply for show their therapeutics effect on the cutaneous layer. It has no side effect as much as other route of drug. There is no any barrier of time to apply on the skin like after /before of meal or at the condition of empty stomach, so it can be use anytime, advised by the physician [1]. Skin is a key site for systemic and local drug administration and molecule penetrates in the skin mainly by three routes: through corneum, sweat duct, and through, sebaceous follicles.

The topically administration of the drug is simplest and easy route to localized drug delivery everywhere in the body such route as ophthalmic ,rectal, and vaginal and skin. These are used as wide spectrum of preparation in the case of the both cosmetic and dermatological, to the healthy and diseased skin.

Since last few years, there is a huge interest to use novel polymers because they have extensive properties like emulsifier, thickeners, gelling property and suspending properties etc. These polymers are used to make stable emulsion, suspension, creams and gels etc and they open the doors for many researchers to make new dosage forms by modifying the release profile, compatibility, stability and other biopharmaceutical and pharmacokinetic parameters of the existing dosage forms [2].

EMULGEL:

Emulgel is the recent most effective and useful drug delivery system .It is applied topically on the skin and has the great therapeutic action due to its extraordinary features or advantages .The word emulgel is derived by combining two words i.e. emulsion and gel .Emulgel are suitable for the both O/W and W/O type of emulsion used as the vehicle to deliver the drug to the various infected area of the skin. They have better ability to penetrate the skin because of lipophillicity as well as hydrophicity. Due to the presence of the gelling agent in the aqueous phase convert a classical emulsion into an emulgel. Emulgel has several dermatological properties such as being thixotropic, greaseless, easy spreadable, easy removable, water-soluble, longer shelf-life, bio-friendly and transparent [3].

Emulgel have the ability to easily terminate medication when needed. Emulgel is the promising drug delivery of hydrophobic drugs .Emulgel has the double release control property because of emulsion and gel. At the time of the development of semi-solid preparation for the coetaneous use whose formulation should contains antimicrobial preservatives; the need for the potency of the chosen preservative shall be proved to the command. Since last few years, there is a huge interest to use novel polymers because they have extensive properties like emulsifier, thickeners, gelling property and suspending properties etc. These polymers are used to make stable emulsion, suspension, creams and gels etc and they open the doors for many researchers to make new dosage forms by modifying the release profile, compatibility, stability and other biopharmaceutical and pharmacokinetic parameters.

Fig: A marketed product of emulgel

Advantages:

There are few advantages of emulgel which made it popular and effective

- Suitable for self-medication
- Avoiding gastrointestinal incompatibility
- More selective for the specific sites
- Good stability
- Good capacity of loading
- Easy to use
- less expensive
- Easy to manufacturing
- Suitable for hydrophobic as well as hydrophilic drugs
- No need of any trained person for their use
- No any complication with the first pass metabolism
- Better solubility profile
- Best option for drugs with short biological shelf-life and narrow therapeutic window.
- Greater Patient Compliance
- No need of any intensive sonication.

Disadvantages:

Every dosage form has few disadvantages, similarly emulgel also have disadvantages but as compare with its advantages, these following disadvantages are negligible and condition dependent-

- Skin irritation in case of contact dermatitis
- Chances of allergic reaction
- Large particles of the drug should not easilypenetrate
- Occurrence of bubbles at the time of formulation of emulgel
- Some drugs with very poor permeability are not suitable for emulgel [4]

SOME IMPORTANT CONSTITUENTS OF EMULGEL:

EMULSION INDUCER (Emulsifier):

The compound or the substance that are used in the formulation of emulsion and as stabilizer for the emulsion. Preventing liquid that ordinarily mix from separating. Emulsion can be increased because these are physically unstable. Surfactant contain HLB value more than 8 such as the non-ionic surfactant are used in the making of the oil in water emulsion, but the mineral oil like liquid paraffin having the HLB value less than 8, therefore are used in the preparation of water in oil emulsions .The mixture of non-ionic individually result the better /greater stability of the emulsion [5].

AQUEOUS MATERIAL:

The most popularly used aqueous phase of emulsions is Water and alcohol.

GELLING AGENT:

Gelling agents are the agent that is used to increase the consistency of any kind of the dosage form and may also be used as a thickening agent in the liquid dosage formulation.

OILS:

Some of the oil likes castor oil and mineral oil or olive oils are the non-biodegradable is utilized as a local laxative effect. Oils are obtained from the various plants, having different used in the preparation of emulgels.

PERMEATION ENHANCER:

These are used to increase the permeability of the drug substances in the skin reversibly .They are urea, menthol, clove oil, linoloic acid etc [6].

FACTOR AFFECTING TOPICAL ABSORPTION OF DRUGS:

1. Physiological factors:

- Thickness of skin
- content of liquids
- skin hydration
- skin inflammation
- pH of skin
- rate of blood flow
- hair follicles density
- sweat gland density

2. Physiochemical factors:

- The drug which are unionized are well absorb only
- molecular weight
- partition coefficient [7]

PHYSIOLOGY OF SKIN:

The skin is the largest organ amongst all organ of our body system. Mainly the topically preparation are mostly means to be apply on the skin. So the basic function and knowledge of the skin is most required for the preparation of the topically dosage form. All the body system is covered with 2m square of the skin that circulate about one -third of the blood of whole body. Skin contains about 15% total adults body weight. The skin is composed of three layers: epidermis, dermis and subcutaneous tissue. And also contain sweat glands. And contain about 4-4.5 pH value. Skin has been considered as the basically four layering of tissue [8].

Non-viable epidermis:

The outer most layer of the skin is stratum corneum; this is the first physiological barrier that comes in the contact of the skin. Stratum corneum is about 10-20 layer of cell thickness over most of the body. Stratum corneum containing lipid, phospholipid, cholesterol sulphate, lipoprotein and glycosphingolipid.

Viable epidermis:

Viable epidermis is the layer of the skin that situated below the stratum corneum.Ii is the stratified, squamous and keratinizing epithelium and is responsible for the barrier of the skin. The cell of the viable epidermis is same as the other different type of the tissue. These cells are joined together by the tonofibrils. They contain about 90% of water [9].

Dermis:

The demis is present lower the viable epidermis. Dermis contain structural fibrin .The thickness of the dermis layer is about 2000-3000 micrometer. It is formed from the connective tissue and the matrix contains callagen fibres. Collagenfibres bind with the water and gives the skin its tensile strength. Macrophages and the mast cell is the main cell that is found in the dermis layer.

Subcutaneous connective tissue:

Subcutaneous connective tissue is the deepest layer of the skin that lies closest to the muscles. It is the layer that acts as a layer of the insulation to protect our internal organs and the muscles from the shock and changes in the temperature. It is composed of loose textured, white, fibrous, and connective tissue contain blood and lymph vessels, secretary pores of the sweat gland cutaneous nerves [10].

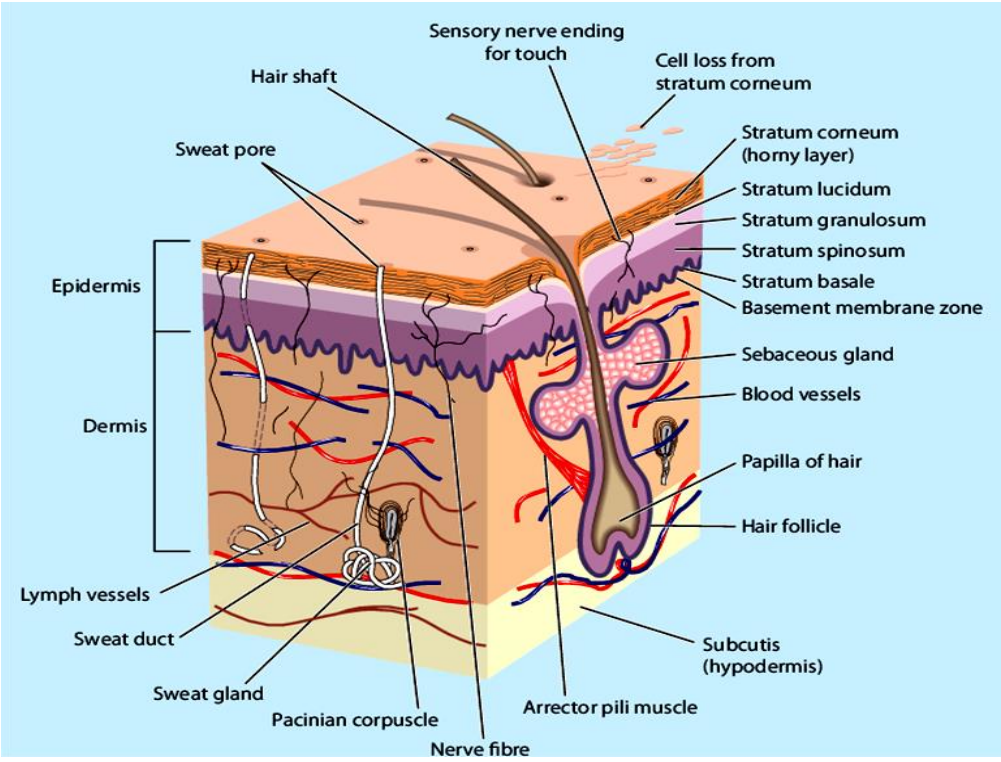


Fig- Anatomy of skin

ROUTE OF DRUG ABSORTION IN THE SKIN:

The route of drug absorption through the skin is mainly occurs in two ways i.e.

A. Tran follicular route:-

- In this the drugs or any substance are absorbed in skin through the hair follicle site.
- Human skin manly contains 40-70 hair follicles, 200-250 sweat glands /m^2 on the skin.
- Hair follicles and sweat gland acts as a shunt i.e. easy pathway for diffusion through rate limiting stratum cornium.
- Mainly water soluble substance diffuses faster.

B. Trnasepidermal route:-

- This route the drugs substances are absorbed through the stratum cornium layer of skin also known as Horney layer.
- It contains many of capillaries so that the molecules are easily penetrating trough this site.
- Within the stratum cornium the drug may be penetrate either by transcellular or intercellular route.

FORMULATION OF EMULGEL:

Step 1: By using the gelling agent:

i. Weighted the accurate amount of carbopol 940(1%w/w).
ii. Sprink on the water bath with continuous stirring.
iii. About 1-2 hour hydrate the dispersion**.**
iv. Other substance like glycerol(10%w/w) and propylene glycol(10%w/w) were added with the vigorously stirring,
v. The required amount of drugs (1%w/w) was added and badly dispersed.
vi. Neutrilised pH at by using triethanolamine of dispersion.
vii. By using distilled water maintain the final weight.
viii. Sonicate the product for the 15 minutes and store overnight for removing of the bubbles

Step 2: Preparation of emulsion:

i.Emulsion is prepared depending on the W/O and O/W formulation.

Step 3: Fusion of the emulsion into gel base:

i. At the ending emulsion is incorporated into gel to form emulgel [11].

EVALUATION OF EMULGEL:

Physical evaluation:

Emulgel physically examined by visualizing colour, consistency and the separation of phase of drug.

Viscosity measurement:

The measurement of viscosity of the drug was determined by using the viscometer (Brookfield viscometer -USA) attached with propeller. The formulation of the drug whose viscosity was too determined was to add in a beaker and left it for 25-30 minutes for settle down perfectly and temperature was set 25 degree Celsius before measuring. And the propeller was set perpendicularly in the centre of the beaker ,care it that the propeller should not be touch the bottom of the beaker and allowed it to rotate at the speed of 100 rpm for the 5 minutes. The viscosity was successfully noted [12].

Spread ability testing:

The emulgel sample was poured between the two glass slides and 100 gram of the weight was placed on the glass slide for 5 minutes to compress the sample to a uniform thickness. Weight 250 gram was added to the pain .The time in the seconds require to separate the two slide was taken as the measurement of the spread ability.

S=M.L/T

Where, S=Spread ability,

M=Weight trid to upper slide
L=Length of glass slide
T=Time taken to separate the slides completely from each other

Globule size and its distribution in emulgel:

The globule size and their distribution were determined by using the Malvern zetasizer. To get the homogeneous mixture, added 1 g sample was dissolve in the water and agitated. The sample was penetrated in photocell of zetasizer .That means the globule diameter and distribution was obtained [13].

pH examination:
The device ,pH meter is used for the determination of the pH of formulation .The electrode rod of pH meter was washed by distilled water and then the formulation was depth into it and this process was repeated 3 times.

Swelling index:
The determination of the swelling index of the topical prepared emulgel, was determined by taking 1g of gel on porous a1luminum foil and then placed separately in a 50 ml beaker containing 10 ml 0.5 N NaOH .After that the sample was removed from beaker at different time intervals at put it on dry area for some time later it reweighed. Swelling index was determined by as follows.
Swelling index % = [(Wt-Wo)/Wo] x100
Where, Wo =Oreginal weight of emulgel at zero time after time t,
Wt=Weight of swollen emulgel

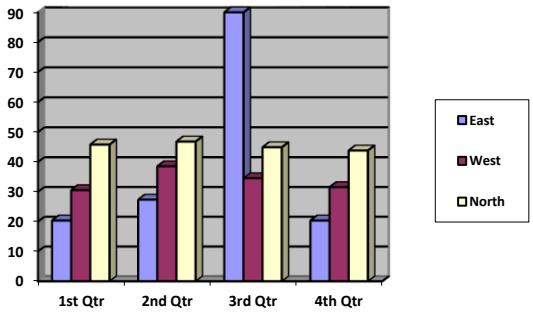
Study of in vitro release of drug:
The device Franz diffusion cell was used for the drug release study .Gellified Emulsion (200 mg) was carefully applies on the surface of egg membrane evenly. The egg membrane was clam ped between the donor and to the receptor chamber of diffusion cell [14]. The receptor chamber was filled fresh prepared PBS (pH 5.5) solution to solubilising the drugs. Stir the receptor chamber with the help of magnetic stirrer. Then the sample (0.1 ml aliquots) was collected with suitable time intervals. The sample was analyzed for drug content by UV visible spectrophotometer. After the appropriate dilution cumulative correction were made to obtain the total amount of drug release at the each time of the interval. The cumulative amount of drug released across the egg membrane was determined as a function of time [15].

Microbiology assay:
Microbiology assay was done by using Ditch plate technique .This technique was used for the evaluation of bacteriostatic and fungi static activity of a compound [16].This used for only semisolid formulations. Previous prepared Sabouraud,s agar dried plates were uesd. The three Gram of the Gellefied emulsion is 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 [17].

Skin irritation test:
Skin irritation test was done (on rabbit) by using a 0.5 g of sample of the test articles was then applied to each site (two site per rabbit) was introduction under a double gauze layer to an area of skin approx (2.54x2.54 cm2) .The gellified emulsion was applied on the skin of the rabbit .Animals were returned to their cages .After the spend of 24 hours, the Gellified emulsion is removed .The test sites were wiped with tap water to remove any remaining test article residue [18].

Stability testing:
A prepared emulgels are packed in aluminium collapsible tubes (5gm) and subjected to stability studies at 5degree C ,25 degree C /60%RH,30^0 C /65%RH,and 40 degree C /75%RH for a period of 3 month .The samples were withdraw at 15 days' time intervals and evaluated for physical appearance ,pH, rhelogical properties ,drug content ,and drug release profiles.

CONCLUSION:
The role of emulgel as topically drug system will be used mostly because of their better patient compliances .Theemulgel will becomes the popular drug delivery system that show better action without showing side effect as compare to other route of drugs delivery.Emulgel will provide a solution for topical delivery of hydrophobic drugs.And all the aspect that proven as most convenient, better, and effective drug delivery system.



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