IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Review on Emulgel

Mr. Sohan Harishchandra Joshi, Mr. Gaurav Patil
Mr. Amit Dhankani,
Mrs.Mansi.A. Dhankani
Dr. Sunil Pawar
Assistant professor
PSGVPMS College of pharmacy, Shahada

Abstract:

Emulgel is the newest technology in Novel drug used superficially on skin, having Advantage of both i.e. Emulsion as well as Gel, in which Emulsion and gel simultaneously, uses in combination which is emulgel, Pharmaceutical scientist currently give attention Emulgel dosage form because of their ample potential to function as drug delivery vehicle for wide range of drug moiety. When compare with other dosage form such as semisolid and solid dosage form the utilization of emulgel is beneficial both in pharmaceutical & in cosmetics. Emulgel is excellent drug delivery systems for delivery of hydrophobic drugs. Main disadvantage of topical drug delivery is poor absorption and penetration inside the skin but Emulgel prove Economical here as it has property of both i.e. Gel as well as emulsion , which help not only to penetrate but also for absorption which improve patient compliance. Emulsion has some other advantage like greaseless, Easily spreadable, easily removable, emollient and transparency. Various penetration enhancer can increase the effect of emulgel, Emulsion was generally use for the delivery of analgesics, anti-inflammatory

Introduction:-

Over the last decade, researcher and scientists show there sapidity in pharmaceutical semisolid dosage forms, more specifically on emulgel , pharmaceutical semisolid dosage form are generally administered by topical route particularly by skin ,for topical administration skin is one of the most easily available parts of human body. Drug moiety diffuse in the skin by three routes by stratum corneum, by sweat gland and through sebaceous gland, Few drugs do not Infiltrate the skin. To improve penetration of those impermeable drug a multiphase nanotechnology is used. In next couple of years topical drug delivery system will be used broadly to ameliorate patient obedience [1]. The biggest disadvantage of emulgel over many advantages is the delivery of lipophilic drug, to conquer

the limitation an emulsion-based approach is used, so that lipophilic drug can be diffuse readily [2]

Emulgel was Fusion of emulsion and gel , emulgel get advantage of both emulsion and gel ,emulsion give its spreading property while gel give its diffusive property to emulgel so in other words emulgel is hybrid dosage form of emulsion and gel. gel is foolproof and prime dosage form for delivering active pharmaceutical moiety to site of action, gel entrap small drug particle and promote their controlled release[3]

Gel has many Lucrative property like thixotropic ,spreadability, non-staining ,greaseless but despite these it create barrier in delivering of liphophilic dosage form across the skin. when active pharmaceutical dosage form is of liphophilic nature it make inappropriate drug release which is due to insolubility of active moiety in water , hence not compatible to incorporate in gel base ,[4]to minimize loop hole of gel, emulsion- gel based drug delivery system is used

Emulgel is preparation that consist of emulsion and gel. emulsion are thermodynamically unstable biphasic dosage form having two immiscible
Liquids

Advantage of Emulgel [9-11]

- ✓ In gel base, Lipophilic drugs cannot be Harmonize directly since solubility act as a Obstacle and problem arises throughout the liberation of the drug. Lipophilic drugs Consolidate in to the oily part of Emulgel and then oily globules are Butterfingered in aqueous phase Emerge in o/w emulsion, subsequently this emulsion can be mixed into gel base. This may be providing Preferable stability and release of drug than simply inclusive drugs into gel base.
- ✓ Superior stability: Different topical preparations are relatively less stable than emulgel. As powder exhibit hygroscopicity, creams demonstrate breaking or phase inversion and ointment shows rancidity due to oily base.
- ✓ Emulgel preparation is Foolproof and short steps which Enhance the Practicability of the output. There are no Unique instruments needed for the Manufacture of emulgels. Materials which are Utilized for the production of emulgel are readily accessible and Inexpensive. Hence, minimize the Manufacture expense of emulgels.
- ✓ No need of intensive sonication: Sonication is Required for the Manufacture of vesicular molecules which may aftermath in drug degradation and effusion. But this issue is not Found throughout the production of emulgels, as no sonication is required.

Disadvantages of Emulgel [12-13]

- ✓ Skin irritation on contact dermatitis
- ✓ Bubbles formed during emulgel formulation.

- ✓ Possibility of allergenic reactions.
- ✓ Drugs having large particle size (>400 Daltons) are not easily absorb or cross through the skin barrier.

Rationale of Emulgel [14]

Topical agents commonly utilized such as cream, lotion, ointment has numerous limitations. They have very Glutinous causing Disobedient to the patient when employed due to few reasons. Besides they, may also have Brevier spreading coefficient and need to install with rubbing which leads to dermatitis. And they show the issue of stagnation also. Due to of all these Reason within the major kind of semisolid dosage form, the use of pellucid gels has extended both in pharmaceuticals & cosmetics. A gel is colloid which is typically 99% wt liquid, which was gravitate by surface tension amid it rubbed into the skin have been utilized for years to dispense pain killer drugs to an required site of the body. These include others, gels and creams for vaginal yeast infections, topical creams for dermis infections and creams to assuage arthritis pain. Novel advanced technologies now permit drugs to be absorbed via Dermis (skin). These can be utilized to cure not just the intended areas (for example, the skin) but the full body (systemic). these can be employed to hairy skin without any discomfort caused by other topical formulations.

Physiology of Skin The skin has following layers.

It is made up of three tissue layers mainly:

- The epidermis
- The dermis
- The subcutaneous fat tissues

Epidermis [15-16]

Outer most layer of the skin which is made up of stratified squamous epithelial cells. These are hold together mainly by mightily convoluted interlocking bridges which are responsible for the specialized integrity of skin.

Dermis

It is an integrated system of fibrous, filamentous and amorphous connective tissue that accommodates stimulus induced entry by nerve, vascular-networks, appendages, fibroblasts, mast cells. Its thickness ranges from 2000−3000μm. The principal component of the dermis is collagen and represents 70% of the skin's dry weight.

Subcutaneous Connective Tissue [17-18]

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

Factors Affecting Topical Absorption of Drug [19]

Physiological Factor

- ✓ Skin thickness varies from epidermis to subcutaneous layer. Epidermis has high thickness about 100-150µm. Skin on the sole and palm has a high rate of diffusion.
- ✓ Lipid content: it is an effective water barrier, percutaneous penetration increases when lipid weight in stratum corneum is low.
- ✓ Density of hair follicles: hair follicle infundibulum has a large storage capacity about 10 times more than the stratum corneum.
- ✓ Density of sweat glands
- ✓ Skin pH: sweat and fatty acid secreted from sebum influence the pH of the skin surface.
- ✓ Hydration of skin: can enhance permeation of drug
- ✓ Inflammation of skin: that disrupts the continuity of stratum corneum increases permeability.
- ✓ Skin temperature: increase in temperature gives rise to increase in rate of skin permeation
- ✓ Blood flow

Physicochemical Factors [20-22]

- ✓ Partition coefficient: more the value of log p more easily will be the percutaneous absorption of the drug.
- ✓ Molecular weight (< 400 dalton)
- ✓ Degree of ionization: only unionized drug molecules get absorbed well
- ✓ Effect of vehicles: hydroalcoholic gel provides the most efficient absorption through skin

- **Important Constituents of Emulgel Preparation [23]**

❖ **Aqueous Material**

This forms the aqueous phase of the emulsion. Commonly used agents are water, alcohols

❖ **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 nonbiodegradable 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

❖ **Emulsifiers [24]**

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 [25-26]

❖ Gelling Agent [27]

These are the agents used to increase the consistency of any dosage form can also be used as thickening agent

❖ Permeation Enhancers

These are agents that partition into and interact with skin constituents to induce a temporary and reversible increase in skin permeability [28-29]

PROPERTIES OF PANITRATION ENHANCER [30]

- They should have no pharmacological activity within the body i.e., should not bind the receptor sites.

- They should be nontoxic, non-allergic, and non-irritating. The panitration enhancer should be appropriate for formulation into diverse topical preparations, thus should be compitible with both exipient and drugs.

- The penitration enhancer should work unidirectional i,e. should allow therapeutic agant into the body whilst preventing the loss of endogenous material from the body when removed from the skin, barrier properties should return both rapidly and fully

- They should be cosmetically acceptable with skin and should cause irritation.

❖ Preparation of Emulgel [31]

Emulgel was prepared by dispersing Carbopol 934 in purified water with constant stirring at a moderate speed and Carbopol 940 in purified water with constant stirring at a moderate speed then the pH are adjusted to 6 to 6.5 using Tri ethanol amine (TEA) The oil phase of the emulsion were prepared by dissolving Span 20 in light liquid paraffin while the aqueous phase was prepared by dissolving Tween 20 in purified water32. Methyl and Propyl paraben was dissolved in propylene glycol whereas drug was dissolved in ethanol and both solutions were mixed with the aqueous phase. Both the oily and aqueous phases were separately heated to 70° to 80°C; then the oily phase were added to the aqueous phase with continuous stirring until cooled to room temperature. And add glutaraldehyde during mixing of gel and emulsion in ratio 1:1 to obtain the emulgel.

❖ Characterization of Emulgel

Physical Appearance

The prepared Emulsion formulations were examined by their colour, homogeneity, consistency and pH value. 1% aqueous solutions of prepared Gellified Emulsion pH value were measured by a pH meter (Digital pH meter) [30-32].

❖ Study of Extrudability

It is a common empirical test to evaluate the force required to extrude the material from tube. The method which used for characterization of applied shear in the region of the rheogram corresponding to a shear rate exceeding the yield value and exhibiting consequent plug flow. Now a days, the method adopted for determination emulgel formulation for extrudability is based upon the quantity in % of emulgel and emulgel extruded from lacquered aluminum collapsible tube on application of weight (grams) required to extrude min 0.5cm ribbon of emul gel in 10 seconds. More quantity extruded best is extrudability. The calculation of extrudability of each formulation is in triplicate and the average values are presented. Following formula used for calculation of extrudability:

- **Formula of Extrudability = Applied weight to extrude emulgel from tube in gm /Area in cm^2**

❖ Rheological Studies

Many types of viscosity in 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.

❖ Spreading Coefficient

Spreadibility is evaluated by apparatus suggested by Mutimer which is suitably modified in the laboratory and used for the study. It composes of a wooden block, which is provided by a pulley at one end. By this method, spreadibility is measured on the basis of 'Drag' and 'Slip' characteristics of emul gels.

❖ Skin Irritation Test (Patch Test)

The preparation is applied on the properly shaven skin of rat and its adverse effect like change in color, change in skin morphology should be checked up to 24 hours. The total set of 8 rats can be used of the study. If no irritation occurs the test is passed. If the skin irritation symptom occurs in more than 2 rats the study should be repeated.

❖ CONCLUSION

Emulgel is the newly developed technique for the topical drug delivery it is best suitable for hydrophobic drugs and obviously it is a better technique for drug delivery of combination of both hydrophilic and lipophilic drugs. The hydrohobic drug formulation can be prepared using emulgel technique because it consist both oil and aqueous phase while hydrogels are not suitable for hydrophobic drugs. In future, topical drug delivery will be used extensively to impart better patient compliance. so Emulgel is helpful in increasing Spreadability, adhesion, viscosity and extrusion, this novel drug delivery will become a famous formulation in future

❖ References:

[1] Ashara K, Soniwala M, Shah K. Emulgel : A novel drug delivery system. J Pakistan Assoc Dermatologists. 2016; 26(3): 244–9.

[2] Benson HAE, Grice JE, Mohammed Y, Namjoshi S, Roberts MS. Topical and Transdermal Drug Delivery: From Simple Potions to Smart Technologies. Curr Drug Deliv. 2019; 16(5): 444–60.

[3] Cevc G, Mazgareanu S, Rother M. Preclinical characterisation of NSAIDs in ultradeformable carriers or conventional topical gels. Int J Pharm. 2008; 360(1–2): 29–39.

[4] Herbert A, Liberman, Martin M, Reiger and Gilbert BS. Pharmaceutical Dosage Form – Disperse System. In: Pharmaceutical Dosage Form – Disperse System. 2005; 399–418.

[5] Panwar AS, Upadhyay N, Bairagi M, Gujar S, Darwhekar GN, Jain DK. EMULGEL: A REVIEW. Asian J Pharm Life Sci. 2011; 1(3): 333–43.

[6] Wang ML, Fang L. Percutaneous absorption of diclofenac acid and its salts from emulgel. J Pharm Pharmacol. 2008; 60(4): 429–35.

[7] Djordjevic J, Michniak B, Uhrich KE. Amphiphilic star-like macromolecules as novel carriers for topical delivery of nonsteroidal anti-inflammatory drugs. AAPS PharmSci. 2003; 5(4): 1–12.

[8] Snehal Patel, Chintan Aundhia, Avinash Seth, Nirmal Shah K Emulgel: a Novel Approach for Topical Drug Delivery System Shailendra. Eur J Biomed Pharm Sci. 2016; 3(9): 501–6.

[9]. Nayank SH, Nkhat PD, Yeole PG (2004), “The Indian Pharmacist”, Volume 3, Issue 27, pp. 7−14.

[10]. Devada P, Jain A, Vyas N, Jain S (2011), “Development of antifungal emulsion based gel for topical fungal infection”, Int J Pharm Res Dev. Volume 3, Issue 2, pp. 18−25.

[11]. Rashmi, MS (2008), “Topical Gel: A Review”, Available from: http://www.pharmainfo.net/reviews/to pic al-gel-review

[12]. Mishra AN (1997), “Controlled and Novel Drug Delivery”, 4thed., CBS Publisher and Distributers,, pp. 107−109.

[13]. Swarbrick J (2007), “Encyclopedia of Pharmaceutical Technology”, Informa Healthcare, 3rd ed., Volume 1, pp. 1311−1323

[14]. Tortora, G. J, Derrickson (2007), “Principles of Anatomy and Physiology”, 11th ed., John Wiley and Sons, Hoboken (NJ), 140−154

[15]. Kanikkannan N, Kandimalla K, Lamba SS, Singh M (1999), “Structure activity relationship of chemical penetration enhancers in transdermal drug delivery”, Current med chem, Volume 6, pp. 593−608.

[16]. Singh PB, Choudhary PK (2007), “Penetration enhancers for transfer drug delivery of systemic agents”, J Pharm Res, Volume 6, pp. 44−50

[17] Gaur PK, Mishra S, Purohit S, Dave K (2009), “Transdermal Drug Delivery System: A Review. AJPCR”, Volume 2, pp. 14−20.

[18]. Subranayam N, Ghosal SK, Moulik SP (2005), "Enhanced In Vitro Percutaneous Absorption and In Vivo Anti-Inflammatory Effect of a Selective Cyclooxygenase Inhibitor Using Microemulsion", Drug Dev. and Industrial Pharm.,

[19] . Rutrer N (1987), "Drug absorption through the skin: a mixed blessing", Arch Dis Child Volume 62, pp. 220−221.

[20]. .Zhang XL, Zhao R, Qian W (1995), "Preparation of an emulgel for treatment of aphthous ulcer on the basis of carbomers", Chin. Pharm. J., Volume 30, pp. 417−418.

[21]. Swarbrick, J, "Encyclopedia of pharmaceutical technology", 3rd ed., 1551.

[22]. Gibson, M (2004), "Pharmaceutical formulation and preformulation", Interpharm

[23]. Jacob SW, Francone CA. "Structure and Function of Man", Volume 2.

[24]. Jain A, Gautam SP, Gupta Y, Jain S (2010), "Development and characterization of Ketoconazole emulgel for topical drug delivery", Der Pharmacia Sinica, Volume 1, Issue 3, pp. 221−231

[25]. Djordjevic, J., Michniak, B. and Uhrich, Kathryn E. (2003), "Amphiphilic star like macromolecules as novel carriers for topical delivery of non steroidal anti-inflammatory drugs", AAPS PharmSciTech, Volume 5, Issue 4, pp. 1−12. 40.

[26]. WB Saunders Co. Philadelphia, 1970, pp. 55−60

[27]. Mutimer, M. N., Riffskin, C., Hill, J. A., Marry, E., Cyr, N.G., Glickman G. (1956), J. Amer. Pharm. Asso. Sci., Volume 45, pp. 212

[28]. Shawn, D. M. (1949), J. Am. Pharm. Ass., Volume 38, pp. 618 [Pubemd].

[29]. Singh S, Gajra B, Rawat M, Muthu MS, "Enhanced Transdermal Delivery of Ketoprofen From Bioadhesive Gels", Available at http://www.google.com.

[30]. Rathore RPS, Nema RK (2008), "Formulation and evaluation of topical gels of Ketoprofen", Asian J Pharm Clinical,; Res 1, pp. 12–16.

[31]. Gupta GD, Gound RS (1999), "Release rate of nimesulide from different gellants", Indian J Pharm Sci, Volume 61, Issue 1, pp. 229−323