

**EMULGEL: TOPICAL DRUG DELIVERY****Ankita Srivastava*, Hitesh Jain and D. B. Meshram**

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Article Received on
15 Feb. 2019,Revised on 08 March 2019,
Accepted on 29 March 2019

DOI: 10.20959/wjpps20194-13539

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ABSTRACT

Emulgels is one of the recent technology in novel drug delivery system used topically containing dual release system i.e. gel and emulsion. Main disadvantages of gel is the delivery of hydrophobic drugs and these hydrophobic drugs are not soluble in gel bases and it causes problem during the release of drug. Emulgels helps the hydrophobic drug to incorporate in the oil phase and then oily globules are disperse in the aqueous phase and this results in O/W emulsion which can mix in the gel base. Emulgels found in analgesic, anti-inflammatory, antifungal, anti-acne and various cosmetics formulation. Emulgels provide local concentration of drug in the affected area. It is more

effective than the regular gels. Emulgels have properties like thixotropic, greaseless, easily spreadable, easily removable, emollient, non-staining, long shelf life and pleasing appearance. The patient adhere to topical formulation is significant in relation to several chronic skin disorders. Thus gel provides faster drug release as compared with other topical drug delivery.

KEYWORDS: Emulgels, Gelling agents, Topical drug.**INTRODUCTION**

Topical drug delivery can be define as the application of drug containing formulation to the skin to treat cutaneous disorder directly.^[1] Both oil in water and water in oil are use as vehicles to deliver the various drugs to the skin. They have high ability to penetrate to the skin. The presence of gelling agents in water phase converts a classical emulsion to the emulgels. Oil in water system is use for lipophilic drugs whereas water in oil system is use for hydrophilic drug. It can be easily wash away whenever need and also shows elegant properties.^[2] Gels are a relatively newer class of dosage form create by entrapment of large amounts of aqueous or hydro alcoholic liquid in a network of colloidal solid particles, which

may consist of inorganic substances, such as aluminum salts or organic polymers of natural or synthetic origin. It also shows good penetration through the skin. Emulgels with properties such as being thixotropic, greaseless, easily spreadable, easily removable, emollient, non-staining, water soluble, longer shelf life, transparent and pleasing appearance are used for dermatological purposes.^[3]

Advantages^[4-5]

- ❖ Avoidance of first pass metabolism.
- ❖ Avoidance of gastrointestinal incompatibility.
- ❖ Improve patient compliance.
- ❖ Suitability for self-medication.
- ❖ Ability to stop medication when need.
- ❖ Convenient and easy to apply.
- ❖ Better loading capacity.
- ❖ Production feasibility and low preparation cost.
- ❖ Controlled release

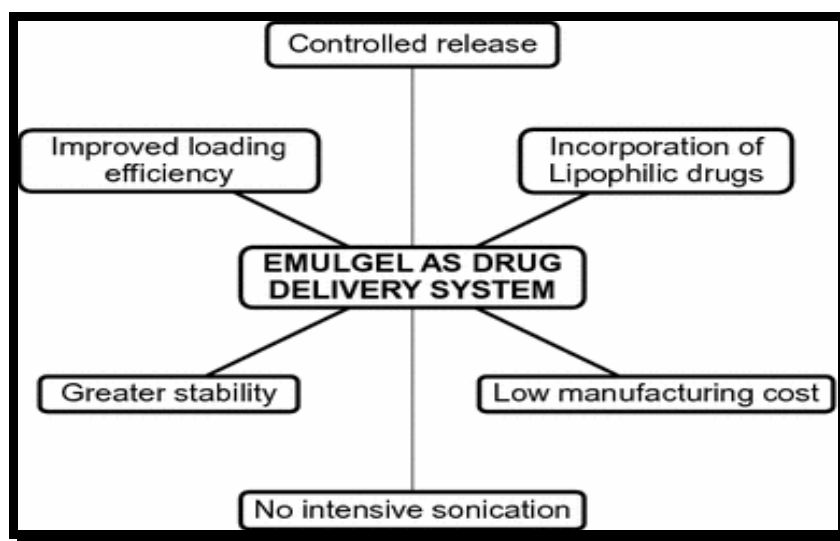


Fig 1: Advantages of Emulgels.

Disadvantages^[6]

- ❖ Possibility of allergenic reactions.
- ❖ Poor permeability of some drug through skin.
- ❖ Larger particle size drugs are not easy to absorb through the skin.
- ❖ Skin irritation.

Factor Affecting Topical Absorption of Drug**Physiological Factors^[7-8]**

1. Skin thickness.
2. Lipid content.
3. Density of hair follicles.
4. Density of sweat glands.
5. Skin pH.
6. Blood flow.
7. Hydration of skin.
8. Inflammation of skin

Physiochemical Factors^[9-10]

1. Partition coefficient.
2. Molecular weight (<400 Dalton).
3. Degree of ionization (only unionized drugs gets absorbed well).
4. Effect of vehicles

Additives of Emulgels**1) Vehicle**

Drug potency and therapeutic effectiveness of dosage form depends on vehicles and its composition that influence the rate and extent of absorption. This release the drug so it can migrate freely to the site of action.^[11]

2) Aqueous material

Aqueous materials are required to prepare the aqueous phase of emulgel such as distilled water and alcohol.^[12]

3) Oils

For the preparation of oily phase of emulgel oily materials are required. Most widely used oil for externally applied emulsion are mineral oils. It works both as vehicles for the drug and for sensory characteristics. The oil phase may include a wide variety of lipid of natural and synthetic origin.^[13]

4) Emulsifiers

They are used to maintain stability of a preparation during its shelf life and to cause emulsification during the manufacturing. e.g. Polyethylene glycol 40 stearate, Sorbitan monooleate (Span 80), Polyoxyethylene sorbitan monooleate (Tween 80), Stearic acid, Sodium stearate.^[14]

5) Gelling agents

These are the agents used to increase the consistency of any dosage form can also be used as thickening agent.^[15]

6) Penetration enhancers

The agents which increase the penetration power of drug through skin are called penetration enhancers. To promote the absorption of drug through skin barrier vehicles often include penetration enhancer's agents which disrupt the structure of stratum corneum skin barrier, fluidize the lipid channel between corneocytes, alter the partitioning of the drug into skin structure or otherwise enhance the delivery of drug.^[16]

Method of Preparation^[17-18]

STEP 1: Formulation of Emulsion either o/w or w/o.

STEP 2: Formulation of gel base.

STEP 3: Incorporation of emulsion into gel base with continuous stirring.

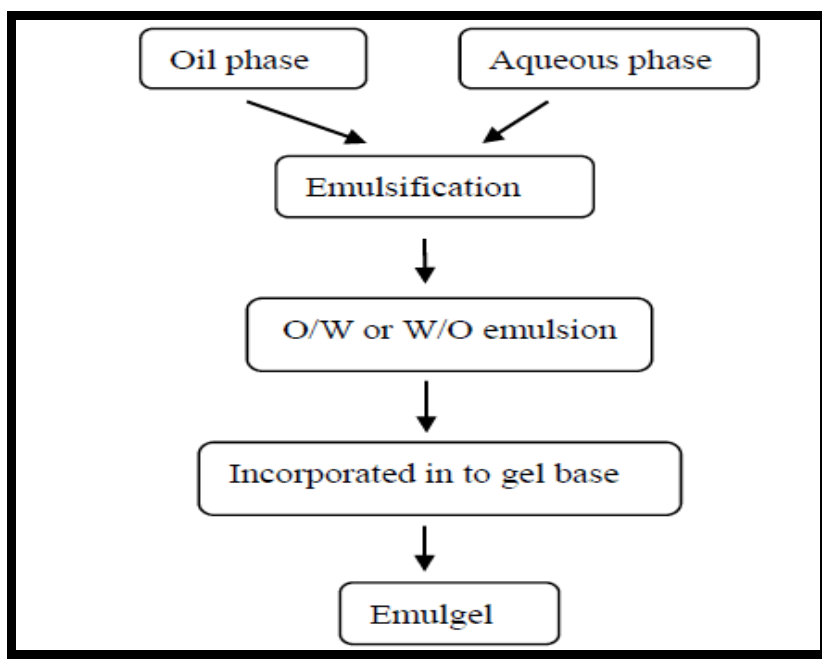


Fig 2: Flow chart of method of preparation of Emulgels.

EVALUATION

1) Physical examination

The prepared emulgel formulations are inspected visually for their color, homogeneity, consistency, and phase separation.^[19]

2) Determination of pH

pH of the formulation can be determined by using a digital pH meter.^[20]

3) Spread ability

The spread ability test can be determined by slip and drag characteristics. A ground slide is fixed on the wooden block. The emulgel is sandwiched between two slides. A weight is put on the top of the slide for a few minutes to expel the excess of air and to provide a uniform film of emulgel between the slides. The top plate is then subjected to pull by the weight with the help of a hook. The distance covered by the top slide is measured in time (seconds). A shorter interval indicates better spread ability.

$$S = \frac{M \cdot L}{T}$$

Where,

S = Spread ability

M = Weight bounded to upper slide

L = Length of glass slide

T = Time taken to detach the slide

4) Extrudability study

It is a usual empirical test to measure the force required to extrude the material from the tube. The method applied for the determination of applied shear in the region of the rheogram corresponding to a shear rate exceeding the yield value and exhibiting consequent plug flow. More quantity extruded is better extrudability.^[23]

5) In-vitro release study

In vitro release studies can be performed by using a Franz diffusion cell. Emulgel is applied on the surface of the membrane which is clamped between the donor and the receptor chamber of the diffusion cell. The receptor chamber contains freshly prepared media to solubilize the drug and is stirred by using a magnetic stirrer. The samples are withdrawn at specific intervals of time and analyzed by a spectrophotometer.^[24]

MARKETED FORMULATION**Table 1: List of marketed formulations.**

DRUG	BRAND NAME	MANUFACTURER
Azithromycin	Avindo Gel	Cosme Pharmaceuticals
Nadifloxacin	Nadixin Cream	Psychoremedies
Tezartotene	Zorotene Gel	Elder Pharmaceutical
Metronidazole	Lupigyl Gel	Lupin Pharma
Clindamycin	Exceex Gel	Zee Laboratories
Clotrimazole	Cloben Gel	Indoco Remedies
Clobetasol propionate	Topinate Gel	Systopic Pharma

CONCLUSION

Emulgel is used as the recent technique among the topical drug delivery systems. It is mainly used for the delivery of both hydrophobic and hydrophilic drugs. Emulgel technique contains both oil and aqueous (i.e. gel base) base so it can be used for hydrophobic drugs. Since emulgel shows enhanced spread ability, adhesion, viscosity and extrusion. This novel drug delivery becomes a popular formulation.

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