

Organogel-A Topical Drug Delivery Approach

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Abstract

An organogel is a topical preparation under gel category are cross linked system It is a viscoelastic system. These are having 3D network structure. They are semisolid type of dosage form. It can prepare by using solid fibre and fluid fibre mechanism. They are thermodynamically stable system. Organogelator is major excipient in this dosage form. Chemical enhancers are not necessary for organogels for the permeation. It enabeles skin penetration and ideal for transdermal route. It's ideal for delivery of bio-active molecule. Other than transdermal delivery it can use for oral and parentral delivery.

Keywords: Gel transition temperature, Organogel, Organogelator, Skin, Topical drug delivery.

I. INTRODUCTION

Due to exposure of various disease the humans bound to discover different treatment medication and dosageform for regaining their health. Based upon necessity and type of disease they selected the rout of administration. Topical drug delivery is one of an approach which is targeted to the skin¹. Topical approaches are for deliver the drug to the site of action which produce a localized effect to the skin or mucous membrane. Different type of topical products are available like sprays,ointment, cream, gel etc. All of these have more safety than oral or intravenous systems. It is not prone to the first pass metabolism.By diffusion it reaches to the site of action and produce effect. Its mainly used for aches, cosmetic purpose, skin disorders etc^{1,2}. Semisolid products are very important during recent times. There are several semisolid systems like gels, ointments, lotions, jellies and creams. Among them gel system are found as more stable³.

Gels are crosslinked structure in which each particles of gelling agents connected strongly. Gels classified into different types based on nature of colloid and solvent into inorganic gel, organic gel, hydrogel and organogel². The organogels otherwise called as oleogel, which have a non polar dispersion medium gelled with organogelator. Under gel category organogel have more stability³.

I. SKIN

Topical preparation is given via the skin. Awareness about skin is necessary part, largest organ which contains glands nail, hair etc.The skin is a multiple layered organ.

- Epidermis
- Dermis
- Hypodermis.

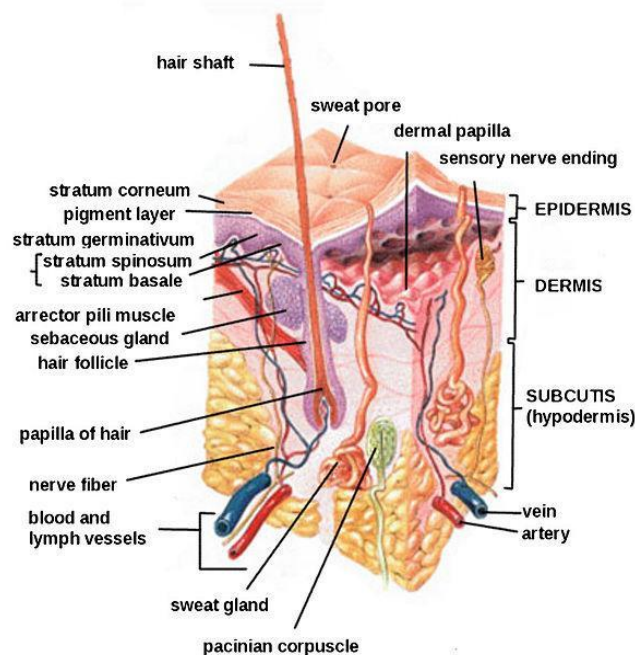


Fig 1: Structure of Skin

Epidermal tissues are the primery layer of skin. And superficial layer composed of stratified squamous epithelium are keratinised. Cells formation happened in the germinative layer by subsequent changes moves to the skin surface. Dermis orinated from connective tissue contain both collagen and elastic fibers. It's contain blood vessels, lymph, sensory nerves, sweat glands and sebaceous glands⁴. Hypodermis is a fat tissues, storing fat and keep safe from wear. Drug penetration is via these hypodermal covering and get into the circulation.



Diffusion enables the drug movement to the destination by various pathways. Appendageal excludes the stratum corneum. Drug travels through the sweat or sebaceous gland. Intracellular is by two subways transcellular (via epithelial cells) and paracellular (between cell junctions)⁵.

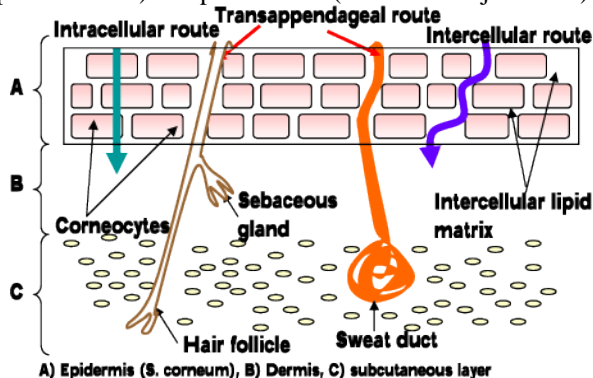


Fig 2: Permeation Pathways

II. ORGANO GEL

It is a semi solid crosslinked substance which used for effective topical drug delivery. Gelator defines the nature of organogel. Low molecular weight (LMV) organic gelator and polymeric gelator defines the type of organo gel.

- Solid-matrix organogels.
- Fluid-matrix organogels.
- Cross linked matrix organogels.
- Entangled chain matrix organogels⁶

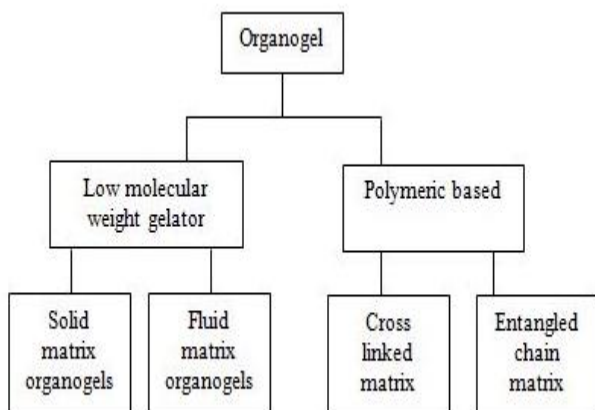


Fig 3: Types of Organogel

LMV organogel is splits two solid or fluid matrix type. In Solid fiber mechanism organogel formulated by heating organogelator polar solvent mixture with continuous stirring till getting a homogenous solution followed by cooling at room temperature. It leads to the gel formation. Later can incorporate other ingredients such as drug, permeation enhancer to the formed organogel⁷. Fluid matrix organogel has subclasses. First one is lecithin organogel formulate by preparing an aqueous or oil phase separately. Add aqueous to oil slowly by stirring at 400 rpm. Drug is dissolved in the oil phase. Here lecithin used for produce oil phase^{8,9}. Fatty acid organo gel is second

type. Fatty acid dissolved in organic solvent such as vegetable oils, isopropyl monostearate etc and heat with stirring till dispersion of mixture. Later cool under room temperature for an overnight gel formation occurs. It can widely used in food industries^{10,11}. Polymeric based organogel either called as poly organogel are poly (ethylene) and P(MAA-co- MMA). They are non-irritant, less sensitive, having good drug release and better bioavailability⁶.

A) Advantages^{7,8}

- It's thermodynamically stable system.
- Safety is high due to the use of biocompatible ingredients.
- Number of ingredients are less there by it is less expensive.
- Incorporation of substances with different physicochemical characters is possible.
- Structural integrity is persist for longer time period.
- Free from first pass metabolism.
- Release drug in a controlled manner.

B) Disadvantage^{7,8}

- Less thermostability.
- The gel formation effected if any impurities present. In such condition gel would not form.
- Lecithin is less available.
- It swells in the presence of liquid.
- Proper storage is necessary.
- Those drug which irritate skin cannot be used.

C) Properties

There are so many properties for organo gel. Primarily it is biocompatible due to the use of biocompatible ingredients. It will be opaque or transparent. organo gelator has chiral molecule. which ensures kinetic stability. It's isotropic and not permit passage polarized light. If shear stress is less it act as solid and while increasing stress it flows⁸.

Method of Preparation^{3,12}

Organogel can be prepared by various mechanisms they are

• Fluid Filled Fiber Mechanism

Non polar solvent mixed with surfactant mixture followed by formation of reverse micelles. By adding water tubular reverse micells formed. Further addition of water 3D network formed.

• Solid Fiber Mechanism

To the organic solvent add solid organogelator. On heating at 60-70° C hot solution of organogelator formed. After aqueous phase addition further heating proceeds which leads to formation of solid fibre entangle together to form 3D network.

D) Evaluations^{9,11,13}

- **Texture test**
Using two finger gel will rub and it can find the stiffness and grittiness.
- **Occlusiveness**
Measured visually by placing the sample in a vial.
- **pH determination**
1g organogel dissolved in 30ml solution and measure pH using pH meter and average must be considered.
- **Viscosity**
Took the sample in a 100 ml beaker and viscosity determine by using Brookfield viscometer. Use no.6 spindle and 2 rpm rotation.
- **Spreadability**
For this create an apparatus described by Muller and Moulter. There is one wooden plate and two slides, one fixed and other can be moved. Sample is placed between later compressed and time for separation was measured. Spreadability found by equation.
- **Gel Transition Temperature**
Vial containing formulations to be heat with stirring by magnetic bar and observe gelation. Temperature note immediately after the movement of magnetic bar stopped.

III. APPLICATIONS¹⁴

A) Oral drug delivery

It is rarely used for oral drug delivery. Some studies are available for organogel oral drug delivery. Example Cyclosporine - given orally as sorbitan monoleate based organogel.

B) Topical delivery

Gels commonly used for topical purpose. Organogels are used for the delivery of agents like anti-fungal, steroid, analgesic drugs.

C) Parenteral delivery

Sorbitan monostearate organogel is an example for parenteral delivery. But in site of injection, which showed small half-life. So they prepare sorbitan monostearate organogels with an antigen and radio-labelled albumin which given to the mice through intramuscular route, results sustained drug release pattern is observed.

D) Ophthalmic delivery

There are so many other ophthalmic preparation such as eye drops, eye ointment, occusert, suspension etc. but have various problems such as easy dilution with tears, leakage problem, less patient compliance etc. But organogel is free from this difficulties due to its highly viscous nature. Due to the transparent nature of the gel vision is not affected by its long term presents in the eye cavity. E) **Rectal delivery**

Drug is incorporated into organogelator (most commonly Eudragit L and S). Drug release depends on quantity of organogelator. Further addition of absorption enhancer improves the bio-availability.

Eudragit L containing linoleic acid or oleic acid as absorption enhancer ensures rectal sustained delivery¹².

IV. CONCLUSIONS

Organogel is a topical drug delivery system. It is a lipid based carrier system, which is easy to prepare and administer. This shows better efficiency and shelf life comparing to other gels. By choosing this system due to reduce the cost. Non toxic solvents should be used according to their compatibility. It also ensures a sustained effect which vary by the different organic phase selecting.

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