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ORGANOGEL: A NEW APPROACH IN TOPICAL DRUG DELIVERY SYSTEM

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ABSTRACT

The topical routes, like ophthalmic, rectal, vaginal and skin offer certain visible advantages for drug delivery like direct application of drug to the location of action and persistence of action for prolonged periods of your time. Skin is one among the foremost readily accessible and main route for topical drug delivery. Gels represent semisolid dosage forms, intended for skin application or to some mucosal surfaces either for local action or for emollient properties. Gel is preferred for topical application because of more stability and better application property. The main objective of this article is to review all the knowledge associated with gels like structure, properties, characteristics, classification, uses, polymers, formulation, evaluation and future scope of gels. Organogels are semi-solid systems, during which an organic liquid part is immobilized by a three-dimensional network composed of self-assembled, intertwined gelator fibers. Despite their majoritarily liquid composition, these systems demonstrate the looks and rheologic behaviour of solids. Investigatory analysis relating these systems has only picked up speed within the previous few decades. Consequently, several burning queries regarding organogel systems, like the specific molecular needs guaranteeing gelation, still expect definite answers. nonetheless, the application of various organogel systems to varied areas of interest has been fast to follow their discoveries. Unfortunately, their use in drug delivery continues to be quite limited by the scarce toxicology data on the market on organogelators, as well as by the few pharmaceutically-accepted solvents utilized in gel systems. This review aims at providing a worldwide view of organogels, with special emphasis on the interaction between the gelator's structural characteristics and therefore the succeeding intermolecular interactions. A consequent focus is placed on the applying of organogels as drug delivery platforms for active agent administration via various routes like transdermal, oral, and parenteral.

KEYWORD: Gel transition temperature, Organogel, Organogelator, Skin, Topical drug delivery Topical, Gel, Bigel, Hydrogel, Skin, Spreadability, Permeation.

INTRODUCTION

The topical drug delivery denotes the appliance of drug onto the body employing ophthalmic, rectal, vaginal and skin because the route of administration. Skin is one of the foremost readily accessible organs on body for topical drug delivery and constitutes the chief route for topical application. For the local treatment of dermatological diseases also as for cosmetic purposes, variety of preparations, starting from solids to semisolids and liquid formulations are available to healthcare practitioners and patients. Within the category of semisolid preparations, transdermal gels offer great potential to be used in cosmetic and pharmaceutical fields. External application of gel at skin offers certain visible advantages like quick release of drug on to the site of action, independent of water solubility of drug, as compared to creams and ointments. The three-dimensional network structure in two-phase gels and jellies are formed by several inorganic colloidal clays.[1-4]

A gel may be a two-component, cross linked three-dimensional network consisting of structural materials interspersed by an adequate but proportionally large amount of liquid to make an infinite rigid network structure which immobilizes the liquid continuous phase within. Gels contains two phase system during which inorganic particles aren't dissolved but merely dispersed throughout the continuous phase and enormous organic particles are dissolved within the continuous phase, randomly coiled in the flexible chains.[5]

The gel systems is also clear as water or turbid because the ingredients might not be entirely molecularly dispersed (soluble or insoluble) or they'll produce aggregates, which disperse light. The concentration of the gelling agents is generally less than 10%, usually in 0.5% to 2.0% range, with a couple of exceptions. Different types of transdermal preparations like lotions, creams, ointments, patches, gels etc. are available; out of

which gel is preferred because of more stability and better application property. Organogels are thermodynamically stable, visco-elastic biphasic systems comprising of a gelator [any substance capable of forming gel] and a nonpolar phase, with or without the presence of water molecules within the network formed by the gelator system. When compared with hydrogel they have a lower degree of hydration. Because of their non-irritating property and biocompatibility they gained importance in the delivery of drugs over the past few years. Although organogel comprised of large amount of liquid systems but it exhibit morphological and rheological properties similar to solids. The thermodynamic and kinetic stability of these systems can be attributed to the opposing forces which are operating and are associated with the organogelator‘s partial solubility in the continuous phase. The Gelling matrix governs by the resulting interaction and physicochemical properties of gel components. Gels can be classified on the basis of the properties of gelators, solvents and the intermolecular interactions which converted into gels. Organogelators are mostly small molecules, while gelators in a hydrogel are polymeric in nature. Hence, the organogelators are well known by the name Low Molecular Weight [LMW] Organogelators. Depending upon the route of administration, organogel required the change in its formula to administer the drugs. Solvent system in organogels are non-aqueous liquids, which is a useful topical deliveries for lipophilic drug and aqueous liquids, which is useful for hydrophilic drug mentioned in various pharmacopoeias as well as for hydration of skin. Through percutaneous absorption Organogel achieved the local as well as systemic effect by the presence of penetration enhancers: their lipophilic nature and occlusive effect are potentiated. Organogels are thermodynamically stable, visco-elastic biphasic systems comprising of a gelator [any substance capable of forming gel] and a nonpolar phase, with or without the presence of water molecules within the network formed by the gelator system. When compared with hydrogel they have a lower degree of hydration. Because of their non-irritating property and biocompatibility they gained importance in the delivery of drugs over the past few years. Although organogel comprised of large amount of liquid systems but it exhibit morphological and rheological properties similar to solids. The thermodynamic and kinetic stability of these systems can be attributed to the opposing forces which are operating and are associated with the organogelator‘s partial solubility in the continuous phase. The Gelling matrix governs by the resulting interaction and physicochemical properties of gel components. Gels can be classified on the basis of the properties of gelators, solvents and the intermolecular interactions which converted into gels. Organogelators are mostly small molecules, while gelators in a hydrogel are polymeric in nature. Hence, the organogelators are well known by the name Low Molecular Weight [LMW] Organogelators. Depending upon the route of administration, organogel required the change in its formula to Administered the drugs. Solvent system in organogels are non-aqueous liquids, which is a useful topical deliveries for lipophilic drug and aqueous liquids, which is useful for hydrophilic drug mentioned in various pharmacopoeias as well as for hydration of skin. Through percutaneous absorption Organogel achieved the local as well as systemic effect by the presence of penetration enhancers: their lipophilic nature and occlusive effect are potentiated.[1-2]

Structure of Organogels Gels are an intermediate state of the matter, containing both solid and liquid components. The solid component comprises a three dimensional network of interconnected molecules which immobilizes the liquid continuous phase. Hydrogels have an aqueous continuous phase, and organogels have an organic solvent as the liquid continuous medium. Organogels exhibit interesting properties such as the ability to solublize guest molecules, uses for purification and separation purposes and as transdermal delivery vehicles.

There are many properties of organo gel. Primarily it is biocompatibile 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 property is less it act as solid and while increasing stress it flows.[3]

Organogel prepared by various mechanisms and methods.

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 togather to form 3D network

Advantages of organogel Template vehicle:

The wide range of substances can be incorporated in organogel with diverse physicochemical characters viz: chemical nature, solubility, molecular weight, and size etc.[38,46] Process benefits: The process is very simple and easy to handle because of organogels formulation by virtue of selfassembled super molecular arrangement of surfactant molecules makes the process very simple and easy to handle.[4]

Structural/ physical stability

The organogel do not form semisolids on standing as an organogel consists of macromolecules existing as twisted matted strands. The units having the strong Vanderwaal forces so as to form crystalline amorphous regions throughout the entire system and it maintained for longer

periods of time as it is thermodynamically stable, the structural integrity of organogel.[4-5]

Chemical stability
Organogel is organic in character also resist microbial contamination and are moisture insensitive.[6]

Topical delivery potential
Since having both hydrophilic and lipophilic character, they can efficiently partition with the skin and therefore enhance the skin penetration and transport of the molecules.

Evaluation Parameters Of The Formulated Gels
Measurement of pH
The pH of various gel formulations determined by using digital pH meter. One gram of gel was dissolved in 100 ml water and stored for 2 hours. The measurement of pH of every formulation was done in triplicate and average values are calculated.[5-6]

Drug content
1 g of the prepared gel was mixed with 100ml of suitable solvent. Aliquots of various concentrations were prepared by suitable dilutions after filtering the stock solution and absorbance was measured. Drug content was calculated using the equation, which was obtained by statistical regression analysis of calibration curve.

Viscosity study
The measurement of viscosity of the prepared gel was done with a Brookfield Viscometer. The gels were rotated at 0.3, 0.6 and 1.5 rotations per minute. At each speed, the corresponding readings was noted. The viscosity of the gel was obtained by multiplication of the dial reading with factor given within the Brookefield Viscometer catalogues.[7-9]

Spreadability
It show the extent of area to which gel readily spreads on application to skin or affected area. The therapeutic value of a gel formulation also depends upon its spreading value. Spreadability is expressed in terms of your time in seconds taken by two slides to slip movement from gel which is placed in between the slides under the direction of certain load. Lesser the time taken for the separation of two slides, shows better the Spreadability. it's calculated by using the formula: S = M. L / T where, M = wt. tied to upper slide L = length of glass slides
T = time taken to separate the slides.[10]

Extrudability study
After the gels were set within the container, the formulations were filled within the collapsible tubes. The extrudability of the formulation determined in terms of weight in grams required to extrude a 0.5 cm. ribbon of gel in 10 second.

Skin irritation study
Guinea pigs were used for the testing of skin irritation. The animals were observed on standard animal feed and had free access to water. The animals were kept under standard and atmospheric conditions. Hair was shaved from back of guinea pigs and area of 4 cm2 was mark done both the edges, one side served as control while the other side was test. Gel was applied (500 mg / guinea pig) twice every day for 7 days and also the site was observed for any sensitivity and the reaction if any, was graded as 0, 1, 2, 3 for no reaction, slight patchy erythema, slight but confluent or moderate but patchy erythema and severe erythema with or without edema, respectively.[8-9]

In vitro Diffusion studies
The diffusion studies of the prepared gels may be concluding in Franz diffusion cell for studying the dissolution release of gels through a cellophane membrane. Gel sample (0.5g) was taken in cellophane membrane and also the diffusion studies were carried out at 37 ± 1° using 250 ml of phosphate buffer (pH 7.4) because the dissolution medium. Five milliliters of every sample was withdrawn periodically at 1, 2, 3, 4, 5, 6, 7 and 8 h and each sample was replaced with equal volume of fresh dissolution medium.[4-8]

Stability
Stability studies were carried out for all the gel formulation by freeze - thaw cycling. Here, by subjecting the product to a temperature of 4° C for 1 month, then at 25°C for 1 month then at 40°C for 1 month, syneresis was observed. After this, the gel is exposed to ambient temperature and liquid exudate separating is noted.

Homogeneity After the gels are set within the container, all developed gels were tested for homogeneity by visual inspection. They were tested for their physical appearance and presence of any aggregates. Grittiness All the formulations were evaluated microscopically for the presence of any appreciable particulate which was seen under microscope. Hence obviously the gel preparation fulfills the need of freedom from particular matter and from grittiness as desired for any topical preparation.[6-8]

DISCUSSION
Topical formulations include creams, ointments, pastes, gels etc. Out of which gels are getting more popular now a days because they're more stable and can also provide controlled release than other semisolid preparations. The gel formulation can provide better the absorption characteristics and hence the effective bioavailability of drug. It also provides the information regarding to the formulation and evaluation parameters of the novel herbal gel for anti-inflammatory activity and show the better therapeutic effects to patient compliance.

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