Quest Journals
Journal of Research in Pharmaceutical Science
Volume 8 ~ Issue 6 (2022) pp: 01-05
ISSN(Online) : 2347-2995
www.questjournals.org

Research Paper

Liquid Crystal A Novel Drug Delivery System for the Treatment of Skin Infection and Promote Bioavailability of Drugs: A Review

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Abstract
In a present day, skin infection is become a more problems to everyone. Harmful chemicals which are used by humans may affect the skin. Some drugs or different types of substances are used in this treatment. Liquid crystal (LC) is one of them. These are the substance which are use for the maintaining the characterization of solid crystalline. Monoolein is formed In between the liquid crystal phase. This can be classified into two thermotropic and lyotropic liquid crystal. One is used for the temperature variation and another one is used for the dissolving the compounds. It has some unique microstructures and physiochemical property. These properties may increase the bioavailability of drugs, penetrability due to different phases. Liquid crystal may help to develop the transdermal drug delivery system. Liquid crystal system may show effectiveness towards biological target. It has three route phases.

KEYWORDS: *liquid crystals, monoolein, skin penetration, Enhancement of bioavailability*

***R**eceived 22 May, 2022; **R**evised 02 June, 2022; **A**ccepted 04 June, 2022 © The author(s) 2022.*
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I. INTRODUCTION

In present day to day life diseases may occurs with more effectiveness. For this a novel drug delivery system is formed which may overcome this type of diseases and produces relax to the effective aera.[1,2,3] This process is only used to enhance the therapeutic efficacy and bioavailability of drugs. These are also used for the transdermal or topical drug delivery system. There are some different approaches and process like nano-emulsion, transdermal gels, sonophoresis etc. are used to promote bioavailability and skin permeation of drugs.[4,5,6,7] This system is biocompatible due to the presence of lipid in formulation. It can enhance the bio-adhesion an it can tunned the drug delivery system.[8,9,10] These performances can be achieved by nanostructured biomaterials of different kinds of lipid polar, monoglycerides and phospholipid. In pharmaceutical companies, monoolein is used as an emulsifier.[11,12,13] Nanostructure is been formed when monoolein (MO) is used in water. Lipid bilayers are used to form several mimic membranes. 10 to 15 weights by percentage of water are used in the LC phases. Minimal amount of water is used for the formation of water-in-oil micellar.[14,15,16] A reverse hexagonal phase of LC is formed due to the high temperature. Some natural additives are used in the formation of LC. Protein and peptides are used for this. These preparations are not used in a large extent due to the several limitation and very high stiffness.[17,18,19] Due to the introduction of H2 and LC phases are used for the prolonged kinetic stability. In drugs and cosmetic LC phase stabilized the emulsion. this may show many advantages on creams and ointments for those who required high storage, stability etc.[20,21,22] On skin and mucosa drug delivery system monoolein LC phase gives most interesting properties. These may enhance the bio adhesive and biocompatibility which may incorporated with their solubility.[23,24] These may help to maintained the degradation of enzymatic actions and sustained delivery. It should be non-irritant, safe to skin while apply and it should be in safe category.[25,26,27] It should promote the ceramide extraction and lipid fluidity should be enhanced when apply to skin. In physical and chemical property lamellar and bicontinuous cubic phase are shown.[28,29] These are used for the cosmetic and therapeutic application. These are also used for the treatment of neurodegenerative disorders. By fat metabolism these may stimulated the anti-cellulite.[30,31]

TECHNIQUE USED FOR CHARACTERIZATION OF LIQUID CRYSTAL

1. X-Ray Diffraction:

This process is used for liquid crystalline phases investigation. In this process surfactant and copolymer are used. In this process, interfaces characteristic is been generated from microstructure.[32,33] Two method are used to detect these interferences which have positive sensitive detectors. Electromagnetic radiations are used to detect the wavelength. It may form by long-range structure in liquid crystal. Long and short range of X-ray may be detected by small angle and long angle diffractions.[34,35,36]

2. Nuclear Magnetic Resonance (NMR) Spectroscopy:

Liquid crystal may be investigated by the NMR technique. For phase equilibrium detection, deuterium NMR spectroscopy is used. By this technique, the straight different phase is been calculated.[37,38] A narrow singlet is been yield from isotropic phase which may quadrupolar the nuclei. The splitting quadrupolar is done by anisotropic phases. It should doublet the resonance signals. Magnitude splitting is done by anisotropic phases. These techniques not only show the single-phase system but it also shows the multiphase system.[39,40,41]

3. Electron Microscopy:

Electron microscope is used for the detection of liquid crystal microstructure.in this technique, succumbs of high vacuum is used for the preparation of samples. It can change the microstructure responsibility.[42,43,44] By the use of this techniques freeze-fracture is prove successfully. The first step in this technique is shock freeze the sample which may help to keep the sample in the preserve. Two gold plate thin layer is used for the high frizzing the samples. After that it been preserve by nitrogen-cooled liquid propane. Crystallization of water within the sample ensure the pressure application. [45,46,47]

4. Differential Scanning Calorimetry:

In this technique, changes in energy are been occurs due to phase transition system. It should be done by consumption of energy which will occurs by recrystallization, endothermic and exothermic signals.[48,49] This energy may be decreases by crystalline when goes to amorous. These energies may be consumed from liquid crystal phase. Sensitivity and detection limit is been taken very carefully for any measuring the devices.[50,51] During the phase transfer baseline slope shows the heat capacity specific. The second order is been shown by liquid crystal polymers. These are known as glass transition. These have some detection complication which may overlaid the enthalpic effect.[52,53,54]

LIQUID CRYSTAL(LC) APPLICATION IN DRUG DELIVERY SYSTEM

1) In LC, the molecule array may convert the lipophilic to hydrophilic. it is one of the most significant parameters of LC.
2) It shows the stability and resemblance in lamellar phases which is help to develop the sustained release tablets.
3) In this lamellar phases, water soluble, oil soluble and amphiphilic drugs are peculin the lipid bilayer.
4) The lipid bilayer and lamellae can move the drug through hydrophilic regions and between the crosses. This process may be depending on the solubility and affinity of the drug.
5) As the distance is been increases in interlamellar inferring the lamellar spacing is also been increased.
6) It has three-dimension cubic phases bilayer lipid. It was separated by two congruent networks in water channel. This cubic phase has been transparent and gel-like structure.
7) Biodegradability is also important for drug delivery.
8) Cubic structure show bio membrane. It helps to deliver the protein molecules
9) These shows protecting behaviour for external factors which helps to inactivation of protein molecules. [55,56,57,58]

LIQUID CRYSTAL PREPARATION FOR DRUG DELIVERY SYSTEM

The preparation of liquid crystal gel is done by blending the aqueous phase with lipid phase by the use of ultrasonication. These may save the energy.[59,60] It should be thermodynamically stable and it is stored for long time periods. As compared with the dispersion phases the LC is quite simple to manufactured. In which aqueous phase is been mixed with lipid by vertexing at high speed. It should achieve the homogenous state.[61,62,63] For obtaining the liquid crystals these mixtures should equilibrate at 35^{o}C for 45 to 48h. Additives may be added to these mixture and modification of method is done. Top-down and bottom-up methods are used for the preparation of this liquid crystal.[64,65] In top-down process, the viscous bulk is been hydrated and will be dispersed into aqueous solution with high pressure homogenization. In bottom-up, for creating the liquid precursor the hydrotrope is been used.[66,67] It may prevent the formation of liquid crystal at high temperature. These are not required any fragmentation procedure.[68,69]

PROPERTIES OF LIQUID CRYSTAL

In between oil/water interface LC is present. It gives the rigidity to the system and fluctuation of components by limiting at interface.[70,71] It should give the stability to the emulsion. It may enhance the liquid

crystal system by moisturising the emulsion. when the cream is applied on skin the inter-lamellar is were immediately available.[72,73] This emulsion has a shiny surface and may leave a pleasant sensation. In recent era, cosmetic has become more importance.[74,75] These may contain the anisotropic lamellar phases which help to evaporate the water bonding in emulsion. It may prolong the moisturising effects. It contains the access water. These may directly link to stability.[76,77]

ADVANTAGES OF LIQUID CRYSTALS

1. These may provide stability to the emulsion. multilayer is been formed around the oil droplets which form the strong barrier.
2. Lamellar liquid crystalline is been present in oil in water emulsion which has les evaporation prone. It forms the lasting miniaturisation and hydrating effect for drug entry.
3. The dissolution of drug in oil phase is been prevented by liquid crystal. These may reduce the interfacial tension of drug within the oil droplets. [78,79,80]

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