Research and Reviews: Drug Delivery

Brief Overview on Liquid Crystalline Drug Delivery Systems and its Appilications

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Editorial

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ABOUT THE STUDY

The use of LCs as drug carriers has been increasing at a rapid rate, with much of the focus on biological applicability *in vitro* and *in vivo*. In a living organism, this type of mechanism facilitates the controlled release of active chemicals, improved potency, and pharmacological efficacy. As a result, several researches have looked into the physicochemical characteristics of pharmaceuticals in order to improve their effectiveness and bioavailability [1-3].

Anticaries drugs must inhibit the adherence and multiplication of Streptococcus mutans in dental biofilms without generating host toxicity or bacterial resistance. Due to their early onset killing and broad-spectrum effectiveness against Gram-positive and Gram-negative bacteria, fungi, and viruses, cationic antimicrobial peptides, such as defensins, have been introduced as prospective antimicrobial agents, with possibly low

levels of induced resistance. Natural substances with antibacterial capabilities have been examined as topical treatments for the oral cavity to reduce infections without causing bacterial resistance [3,4].

Peptides have been used in drug delivery systems to treat cardiovascular illnesses, diabetes, and AIDS, according to several studies [5]. Peptides can be included into LC, which is a medication delivery method. While increasing the efficiency of these peptides, LCs can facilitate regulated medication release and protect active components from thermal and photodegradation. LCs can also help with regulated medication release and preserve active components against heat and photodegradation, all while increasing the effectiveness of these peptides. These systems' bioadhesive properties can keep a high concentration of peptide at the site of action for a long time while also preserving it against degradation [6,7].

Because buccal mucosa is accessible, demonstrates quick repair, has an excellent blood supply, and lacks the first-pass effect, a study designed and assessed a safe buccal medication delivery system for the treatment of many buccal disorders. The findings demonstrated that a precursor of LCs made up of chitosan and polyethyleneimine as the aqueous phase, oleic acid as the oil phase, and ethoxylated and propoxylated cetyl alcohol as the surfactant may be developed for application as a buccal drug delivery system. Medication delivery methods based on nanotechnology, such as LCs, can improve drug delivery by increasing drug absorption through the mucosa [8].

Celecoxib (CXB) is a popular anti-inflammatory medicine that also works as a cancer preventative. In a model of aerosol-induced rat paw edema inflammation, the composition of the systems and the crystalline structure determine the effectiveness of antiinflammatory action. Cubic phase systems with an oleic acid/propylene glycol relationship reduced edema over time, implying that they influence CXB release and penetration. Our findings show that the created liquid crystalline devices could be used to deliver CXB to the skin [9,10].

Topical metronidazole administration *via* nanotechnology-based drug delivery systems, such as LCs, can adjust both drug penetration and activity, reducing side effects while boosting drug potency against Gram-positive bacteria. This study aims to produce a metronidazole-incorporating LC with chitosan and polyethyleneimine dispersion as the aqueous phase, oleic acid as the oily phase, and ethoxylated and propoxylated cetyl alcohol as the surfactant.

Following that, researchers looked at *in vitro* release, skin permeability, and retention properties of metronidazole-loaded liquid crystalline systems, as well as in vitro antibacterial activity against *Staphylococcus aureus*. As a result, the LCs created in this work has the potential to improve metronidazole's clinical efficacy in the treatment of Staphylococcal skin infections.

5-Fluorouracil (5-FU) is one of the most commonly used anticancer medications, either alone or in combination with other chemotherapeutic treatments, to treat gastric, stomach, colorectal, head and neck, and breast cancers. LLC systems have got a lot of interest lately because of their unique microstructural and physicochemical features as drug delivery nanocarriers [8,9].

The synthesis and characterisation of granular phases and dispersions in phytantriol cubosomes loaded with the anticancer medication 5-FU were investigated in this study. Furthermore, the improved, perhaps targeted delivery of 5-FU to cancer cells via designed LLC system vectors could be a significant step toward a more successful and safer breast cancer treatment.

The antiinflammatory activity of Resveratrol (RE) has positive effects on human health. RE's aqueous solubility, on the other hand, inhibits its therapeutic efficacy. As a result, nanostructured RE delivery methods, such as LCs, may be a viable option. The *in vivo* effectiveness of RE-loaded LCs was investigated in this work. In a

carrageenan-induced paw-inflammation animal model, topical administration of RE-loaded lamellar mesophase LCs resulted in edoema inhibition. Furthermore, all LCs were as bioadhesive as anticipated bioadhesive formulations, and these LCs in particular were able to keep RE's antiinflammatory efficacy.

To increase oral bioavailability and safety of present chemotherapy treatment, the pharmacological activity of tamoxifen-loaded liquid nanoparticles (TMX-LCNPs) was explored. When compared to free TMX, TMX-LCNPs were found to be much more cytotoxic to MCF-7 cells. Following comprehensive *in vitro* and *in vivo* testing, it was determined that the TMX-LCNP formulations employed in this study had a much higher relative bioavailability, resulting in better tumour regression with less hepatotoxicity.

The effect of exemestane, an antiestrogen and aromatase inhibitor, on estrogen's anticancer properties. It is used to treat high-risk postmenopausal women with breast cancer. In this respect, the goal of this study was to produce and test LC gel formulations for transdermal delivery of the anticancer medication exemestane. The formulations generated in this study were also able to produce a sustained release and permeate a full-thickness skin without causing any noticeable side effects, according to the findings. Furthermore, the *in vitro* efficacy investigation revealed that the formulations may trigger cancer cell death even at low exemestane doses (12.5 and 25 g/mL). The formulations enter the intercellular regions of squamous cells, according to histopathological study of the epidermis [10].

Diabetes mellitus, a metabolic condition defined by a high level of glucose in the blood, is another well-known disease. It is caused by an insufficient quantity of insulin produced in the body or a lack of cell response to insulin. The purpose of this study was to see if Liquid Crystalline Nanoparticles (LCNPs) could improve the stability and therapeutic efficacy of insulin when it was given orally. Based on the findings, it was determined that the created LCNPs had an excellent stability, absorption, and glucose lowering profile. There was also a facility in the production technique and low cost of formulation components, making this approach simple and scalable.

REFERENCES

1. Park K. Controlled drug delivery systems: past forward and future back. J Control Release. 2014;190:3-8.
2. Barenholz Y. The first FDA-approved nano-drug: Lessons learned. J Control Release. 2012;160:117-134.
3. Dibner C, et al. The mammalian circadian timing system: Organization and coordination of central and peripheral clocks. Ann Rev Physiol. 2010;72:517-549.
4. Patel VM, et al. Design and characterization of chitosan-containing mucoadhesive buccal patches of propranolol hydrochloride. Acta Pharm. 2007;57:61-72.
5. Vashmi Y, et al. Development of mucoadhesive patches for buccal administration of carvedilol. Curr Drug Deliv. 2007;4:27-39.
6. Chien-Chun C, et al. Three-dimensional imaging of dislocations in a nanoparticle at atomic resolution. Nature. 2013;496:74-77.
7. Laokri S, et al. Removal of user fees no guarantee of universal health coverage: observations from Burkina Faso. Bull World Health Organ. 2013;91:277-282.
8. Raikhinstein M, et al. cDNA cloning and sequence analysis of the bovine adrenocorticotropic hormone (ACTH) receptor. Biochim Biophys Acta. 1994;1220:329-332.
9. Hanukoglu I, et al. Mechanism of corticotropin and cAMP induction of mitochondrial cytochrome P450 system enzymes in adrenal cortex cells. J Biol Chem. 1990;265:20602-20608.
10. Isales CM, et al. ACTH is a novel regulator of bone mass. Ann N Y Acad Sci. 2010;1192:110-116.