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Cubosomes in cancer therapy

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ABSTRACT

Cubosomes are bicontinuous cubic phase liquid crystals have many properties that make them appealing as a universal vehicle for drug delivery and it was considered as the drug Nano carrier due to their great potential as an alternative drug delivery system relative to liposome. cubosome have great potential in drug Nano formulations for melanoma therapy owing to their potential advantages, including high drug payloads due to high internal surface area and cubic crystalline structures, relatively simple preparation method, biodegradability of lipids, the ability of encapsulating hydrophobic, hydrophilic and amphiphilic substances, targeting and controlled release of bioactive agents. Cubosome dispersions are bio adhesive and biocompatible. The application of cubosomes for intravenous drug delivery is an ambitious one; however, these Nano carriers may find accelerated applications for oral, ocular and topical delivery of poorly water soluble drugs, there by offering an alternative, yet, a cost effective opportunity in formulation science. Cubosomes are attractive nano vehicles for loading and delivery of proteins and peptides but the reported studies are still on a fundamental level and different aspects in terms of structural and morphological characteristics of these soft Nano carriers, loading capacity of bio macromolecules and their release should be addressed. Future development of cubosome based intravenous Nano medicines should address blood compatibility at early stages of formulation development.

Keywords: Cubosomes, Vesicles, Nano particles, Co polymers, Novel drug delivery

INTRODUCTION

The most significant contributors to cancer-related death are late diagnosis and interventions. Cubosomes are liquid-crystalline nanostructured particles with specialized amphiphilic lipid compositions. They are biocompatible, adaptive drug carriers that can deliver drugs through a variety of routes of administration because of their capacity to encapsulate lipophilic, hydrophilic, and amphiphilic molecules inside their structure. Several research studies have been carried out to evaluate the potential use of cubosomes in a range of disease models, including hepatoprotection, skin infections, ocular applications, Alzheimer's disease, and ENT infections[1]

METHODS OF CUBOSOMES

Cubosomes have been tested in numerous preclinical trials to treat cancer and for theranostic purposes. Amphiphilic lipids, stabilisers, and therapeutic molecules make up cubosomes, which self-assemble to form the lipid bicontinuous cubic phase. Amphiphilic lipids like monoolein and phytantriol (PHYT) are used in this process. Stabilizers are an essential ingredient in the production of cubosomes. They function by encasing the cubosome structure in a protective shell, preventing aggregation, and enhancing dispersion stability by avoiding amalgamation with the bulk cubic phase. The most often used stabilisers in the production of cubosomes are block copolymers. Triblock copolymer F127 (Poloxamer 407) has long been regarded as the benchmark for non-lamellar lyotropic liquid crystal (LLC) lipid nanoparticles.
The ability of cubosomes to hold hydrophilic, hydrophobic, and amphiphilic medicinal molecules is one of their main

advantages as nanoparticles. Moreover, cubosomes have demonstrated significant advantages in the administration of drugs via intravenous and intranasal methods. Cubosomes might help move colloidal materials without clogging capillaries. Moreover, they may reduce drug plasma-protein interactions, improving the stability and bioavailability of drug molecules.

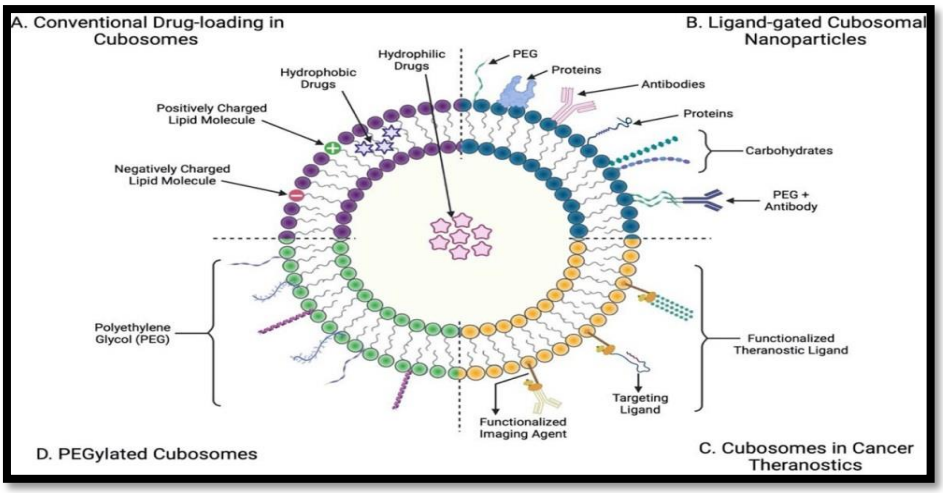

Fig 1: Structure of Cubosomes

APPLICATIONS

The application of cubosomes nanoparticles has experimented with several times in colorectal cancer. Saber and colleagues had explored reducing the toxicity of Cisplatin, a major drug used in colorectal chemotherapy. 5-Fluorouracil (5FU) is a potent anticancer drug that has been used to treat solid tumours, particularly liver cancer [2]

The bio distribution of 5FU in the rat liver was substantially greater in cubosome formulations than in 5FU alone. Saber and colleagues came up with a cubosome formulation to look into the possibility of better bioavailability and the likely mechanism of albendazole's anticancer action. Patil and colleagues created bedaquiline-loaded cubosomes that were specifically designed to target non–small-cell lung cancer (NSCLC). Aleandri and colleagues developed a cubosome formulation of paclitaxel to decrease toxicity and improve the site-of-action specificity. Cubosomes have been used to circumvent the difficulties associated with chemotherapy in skin cancer. Thus, Zhai and colleagues chose paclitaxel as the active ingredient in cubosome formulations, to evaluate human epidermal carcinoma A431 and an animal skin cancer xenograft model [3].

CONCLUSION

As a drug delivery system, cubosomes have been demonstrated to be effective in a variety of dosage forms, including oral, topical, ocular, and parenteral administration. In the future, cubosome-mediated targeted nanoparticle cancer-drug carriers have the potential to revolutionize cancer therapy by improving the quality of life of cancer patients.

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