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CUBOSOMES-ACTIVE CARRIERS IN CHEMOTHERAPY MODERN MEDICIN

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Abstract

Cubosomes are lipid vesicles that are comparable to vesicular systems like liposomes. Cubosomes are created with certain amphiphilic lipids in the presence of a suitable stabilizer. Since its discovery and designation, self-assembled cubosomes as active drug delivery vehicles have drawn much attention and interest. Oral, ocular, transdermal, and chemotherapeutic are just a few of the drugs delivery method in which they are used. Cubosomes show tremendous potential in drug nano formulation for cancer therapeutics because of their prospective advantage, which include high drug dispersal due to the structure of the cubic, large surface area a relatively simple manufacturing process, biodegradability, ability to encapsulate hydrophobic, hydrophilic, and amphiphilic compounds, mostly cubosomes look like a "honey combed" structure and are thermodynamically stable. Application of cubosomes includes treatment of skin, hair, and other body tissue using cubosomes-like vehicle activity of biological substance, regulated release of solubilized chemicals. Melanoma {cancer} therapy based on a size delivery system is the key to effectively targeting melanoma due to increased permeability and retention.

***Keywords*:** Cubosomes, Nanoparicles, Honeycomb, Lipid, Anticancer Therapy.

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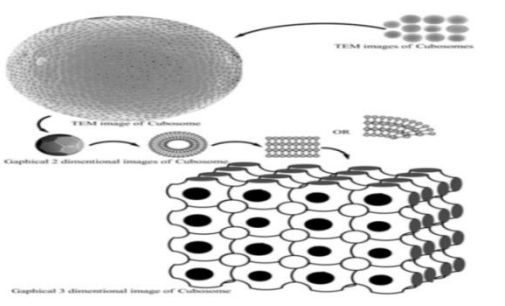
Introduction

Cubosomes are discrete, sub-micron, nanostructured particles of the bicontinuous cubic liquid crystalline phase. Cubosomes are nanoparticles which are self-assembled liquid crystalline particle of certain surfactants with proper ratio of water with microstructure. Drug delivery systems are devices that transport a therapeutic agent to a specific site inside the body.

Controlled drug release is pre- designed to achieve effective concentration at the site of action, thus minimizing toxic side effects while promoting therapeutic benefits. A more evolved system of the same, termed novel drug delivery system [NDDS], is the growing trend in the current drug delivery scenario, mostly as a result of the fact that they address the limitation of traditional drug delivery system. Drug delivery improves a drug's efficacy. However, to curate optimal drug release profile, the rate of active release must be controlled, as well as the ease of preparation and vehicle stability.

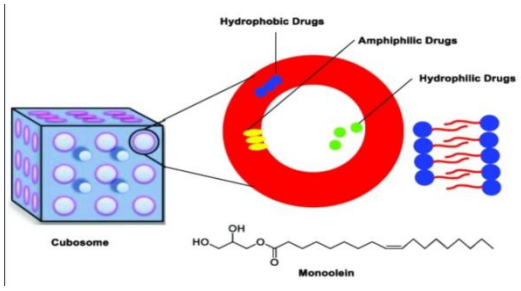
Cross- linked gel networks or liquid-crystalline aggregates are examples of these systems, which load, stabilize,and finally distribute active components. Nanomedicine and nano-devily system are rapidly growing disciplines in which microscopic material are employed as diagnostic tool or to deliver therapeutic drug to specific sites in controlledmanner. Nanotechnology can help treat chronic human diseases by allowing precise medicine to be delivered to specific location , a process known as target-oriented delivery. There has been several noteworthy application of nanomedicine, such as chemotherapeutic agent, immunotherapeutic agent, biological agent, etc



History

Despite the early recognition, large scale manufacture of cubosomes was difficult due to their complex phase behaviour and viscous properties. The cubic phases are unique as they possess very high solid like viscosities because of their intriguing bicontinuous structure. Cubic phase can be fractured and dispersed to form particulate dispersion which are colloidally and /or thermodynamically stable for longer period of time .Certain surfactant spontaneously form cubic phase when mixed with water above a certain concentration .Determination of their honeycomb structure was carried out by LUZZATI and HUSSAN,LUZZATIETAL , LARSSON and HYDE ET AL between 1960 and 1985. The term "CUBOSOME" was coined by Larsson, which reflects the cubic molecular crystallography and similarity to liposomes.

Cubosome Structure



Advantages

1. Cubosomes are biocompatible, biodegradable, and non-irritating
2. It has a simple preparation process.
3. Because of their large interior surface area, they have a high drug-loading capacity. For a longer period of time, they are thermodynamically stable.
4. They can encapsulate hydrophobic/ lipophilic [cinnarize] and hydrophilic molecules.
5. They lessen the negative effects of injection that are caused by the burst release
6. Polymer present in cubosomes is stabilizers as well as it has controlled and targeted released behaviour.
7. They are non-irritant,non-allergic, non-toxic
8. They are less cost due to less repeated administration

Disadvantages

1. Cubosome has large amounts of water, which affect the entrapment of hydrophilic drugs.
2. Due to increased viscosity, it affects the formation of cubosomes.
3. Due to the external environment, it may be possible to change the phase.
4. Due to increased drug loading it may change the growth of particles.
5. Because cubosomes contain a large amount of water, water-soluble drugs are less likely to be trapped.
6. Due to its high viscosity,large-scale cubosome manufacture is challenging
7. Without the use of a specific polymer, regulated drug delivery is not possible.
8. They have the nanomedicines to tumours, with passive and active targeting of cancer calls having been shown to be valid approaches in preclinical and clinical studies.

Cubosomes and Their Uses

A Universal application is drug delivery vehicles and although bulk cubic phases achieve controlled release frequently, the first patent on cubosomes was to specify its medical and controlled release applications. As a result , self-assembled surfactant phases are extensively examined for compatibility through various medical dynamic ingredients and their application .An area under modern development by L 'Oreal is the use of Cubosomal particles as oil-in water emulsion stabilizers and pollutant absorbent in cosmetics. They revealed that a second amphiphile, glycerol monoleate and phytantriol have aqueous phase behaviour sufficiently close to that monoolein to form cubosomes.

Characteristics of Cubosomes

1. Nanosized [usually 100-300nm]
2. Large surface area and bioadhesive nature
3. Biocompatible and biodegradable
4. High drug -loading capacity
5. Controlled and sustained release properties.

Current Status of Knowledge

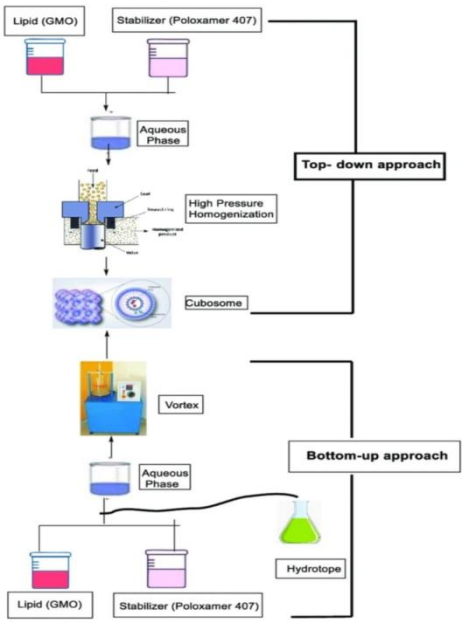
The medication delivery method known as cubosome is innovative and biocompatible. These Nano particles used in controlled release have significant implications for pharmacy and cosmetics industries .In the first example, leal et al, demonstrated that the Gyroid cubic phase grew to Lattice parameter above 20nm when 15 mol% of the positively charged lipid DOTAP was added to a cubosome made of monoolein in OptiMEM media. Spicer et al.., first described the dilution method. They created a nano-plinal, created a piperin-loaded cubosome with integrated monoolein to combat Alzheimer's illness.

Method of Preparation

Cubosome can be prepared by high pressure homogenizer, emulsifiers, spray drying etc.

Prepared By Two Techniques

- Top down technique
- Bottom up technique



Application in Cancer Therapy

Recently some anticancer drugs have been successfully encapsulated in cubosome and characterized physicochemical properties. The unique structure of this promising nano carrier suggests its application in melanoma therapy. In specific target nano medicinesto tumor, different approaches have been envisaged, with passive and active targeting of cancer cells having been shown to be valid approaches in preclinical and clinical studies.

Oral Drug Delivery

Cubosomes direct the varied challenges in oral delivery of numerous compounds including poor aqueous solubility, poor aqueous solubility, poor absorption, and large molecular size. In an application large proteins have encapsulated for local activity in the gastrointestinal tract.

Topical Drug Delivery System

Cubosome are more bio- adhesive in nature, so that they can be conveniently used in topical and mucosal delivery of different drugs. Topical delivery systems are based on the exploitation of unique properties of liquid crystal and liquid crystal nanoparticles technologies, Topical drug delivery system are unique in-situ forming bio-adhesive liquid crystal system facilitate controlled and effective drug delivery to mucosal surface likebuccal, ophthalmic and vagina.

Treatment of Viral Diseases

Because of the microbicidal properties of monoglyceride, it could be used for HIV; HSV] or by bacteria like chlamydiatrachomatis and Neisseria gonorrhoeae.

Conclusion

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