Current Approaches and Pharmaceutical Applications of Colloidosome Drug Delivery Systems

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ABSTRACT

Recently a number of lipid based systems like lipospheres, liposomes, niosomes, ethosomes, and transferosomes have been developed. The purpose of this review article on colloidosome drug delivery was to compile the focus on the types, properties, fabrication techniques, characterization and stability of colloidosomes. This system also solves the problem of insolubility, instability, rapid degradation and is widely used in specialized areas like protein delivery, gene delivery, targeting to the brain and tumor targeting. In a series of vascular systems, colloidosome represents an advanced tool in drug delivery. Colloidosomes are an emerging vesicular system in drug delivery. Vesicular drug delivery reduces the cost of therapy by improved bioavailability of medication, especially in the case of poorly soluble drugs. Colloidosomes have a great encapsulation efficacy with a wide control over size, permeability, mechanical strength and compatibility.

KEYWORDS: Colloidosomes; emulsion droplets; fused colloidal particles; microcapsules

Introduction

Colloidosomes are microcapsules characterized by a coating, or shell composed of self-assembled colloidal particles) that can range in size from nanometers to microns (Dinsmore et al. in 2002). As a result, the surface porosity, namely, the size of the ‘voids’ or surface pores, can range over similar orders of magnitude (see Figure 1). In the past three decades, a lot of advancement in drug delivery system has been made. As a result, new techniques have developed in drug delivery systems (Chein et al., 1982). These techniques are capable of controlling the rate of drug delivery, sustaining the duration of therapeutic activity and targeting the delivery of a drug to a cell/tissue (Chein et al., 1989). This advancement led to the development of several novel drug delivery systems of medication and provides a number of therapeutic benefits. The capsules are fabricated by the self-assembly of colloidal particles onto the interface of emulsion droplet. These assemble particles are locked together to form hollow, elastic shells the resultant structure is known as colloidosomes.

A capsule surface is composed of one packed layer of colloidal particles, linked together to form a solid shell. The interstices between the particles form an array of uniform porous whose size is easily adjusted over the parameter to micro meter scale to control permeability. The colloidosomes are produced by assembly of polymer latex colloidal particles into shells around water-in-oil emulsion drops followed by partial fusion of the shell and centrifugal transfer into water to yield stable capsules in which the shell permeability can be controlled by adjustment of partial fusion conditions. Further advantages could be obtained from colloidosomes and capsules with a non-spherical geometry, or with multiple compartments (Daeyeon Lee et al., 2009). Size ranges of colloidosomes from 5nm to several microns in diameter.

Colloidosomes have several advantages over their liposome and polymersome delivery agent counterparts. These include:

1. Mechanical stability of the colloidal shell (Dinsmore et al., 2002).
2. Control of shell pore size (Kim et al., 2007).
3. The ability to trigger release in response to external fields or changes in environmental conditions.
4. 100% encapsulation efficiency, eliminating the need for complex recovery steps of expensive encapsulants.
5. Production capability of highly monodisperse colloidosomes, in large numbers by using microfluidic devices (Kim et al., 2007).
6. Possible tracking in vivo by doping the shell with metallic particles observable in such methods as X-Ray or MRI.

Fig. 1 Colloidosome structure.