Available online on 15.04.2019 at http://jddtonline.info

Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

Open Access Review Article

Pre-Liposomes: A novel drug delivery system

Maitry Sheth*, Divya Jadhav, Hitesh Jain, D. B. Meshram

Pioneer Pharmacy Degree College, Vadodara, Gujarat, 390019, India

ABSTRACT

Preliposomes are a novel drug delivery system (NDDS). Preliposomes, due to their various forms, require further exploration. These structures can deliver both hydrophilic and hydrophobic drugs for cancer, bacterial infections, fungal infections, immunomodulation, diagnostics, ophthalmic, vaccines, enzymes and genetic elements. Prevesicular drug delivery system like preliposomes having distinct advantages over conventional drug delivery system. These systems overcome the problems associated with instability of liposomes. preliposomes composed of water-soluble porous powder as carrier which having ability to rapid hydration of preliposomes and formed vesicles. New concept of demonstrating preliposomes as novel carrier to enhance the oral bioavailability and permeation across the membrane. On the basis of investigation. it is clear that pre-liposomes are the alternate drug carrier for the various route of administration. These reviews give the brief knowledge about the preparation, evaluation and application of prevesicular drug delivery system in pharmaceutical field. The current deepening and widening of liposome interest in many scientific disciplines and their application in pharmaceutics, cosmetics and food industries as promising novel breakthroughs and products are also handle. The obtained information allows establishing criteria for selecting pre-liposomes as a drug carrier according to its advantages and limitations.

Keywords: Novel drug delivery, Liposomes, Lamellar, Carrier

Article Info: Received 20 Feb 2019; Review Completed 23 March 2019; Accepted 26 March 2019; Available online 15 April 2019

Cite this article as:

Sheth M, Jadhav D, Jain H, Meshram DB, Pre-Liposomes: A novel drug delivery system, Journal of Drug Delivery and Therapeutics. 2019; 9(2-s):525-528 http://dx.doi.org/10.22270/jddt.v9i2-s.2613

***Address for Correspondence:**

Maitry Sheth, Pioneer Pharmacy Degree College, Vadodara, Gujarat, 390019, India

INTRODUCTION

Preliposomes are defined as an artificial microscopic vesicle consisting of a central aqueous compartment surrounded by one or more concentric phospholipid. Structurally liposomes contain phospholipids which are biocompatible, biodegradable, nontoxic and not having any allergic or pyrogenic reactions.[1] Preliposomes have been extensively use for the site-specific drug delivery, increased solubility, controlled release, sustained release, prevent the drug degradation for the drug. which are affected by the gastric pH. Preliposomes are dry, phospholipids which, upon addition of water, disperse to form a multi-lamellar liposomal suspension. Preliposomes having the intrinsic property of hydration in which lipids membrane formed the vesicles when contact with aqueous media.[2] Preliposomes available in the dry powder form, easy to distribute, transfer, measure and store making it a versatile system. Preliposomes are given in the form of dry powder for pulmonary drug delivery, tablet, and capsule for oral, buccal, and rectal route. Preliposomes enhanced the oral bioavailability of drug which are poorly water soluble and having the extensive first pass metabolism.[3]

ADVANTAGES OF PRELIPOSOMES

- Preliposomes are more stable then liposomes.
- High entrapment of hydrophilic material.
- Therapeutic benefits of preliposomes include enhanced bioavailability.
- Protection of drugs from degradation in the GIT.
- Reduced toxicity and taste masking.[4]
- Preliposomes relatively cheap as compare to liposomes. [4]
- Convenient to prepare.
- The preliposomes used for targeted drug delivery and controlled drug release.
- Targeting of anti-cancer drugs to tumour sites.
- Targeting of drugs to non-Reticular endothelial tissues, which has not been possible with conventional liposomes.
- Preliposomes can use for controlling release within the vasculature by manipulating the phospholipid composition of bi-layers.[5]

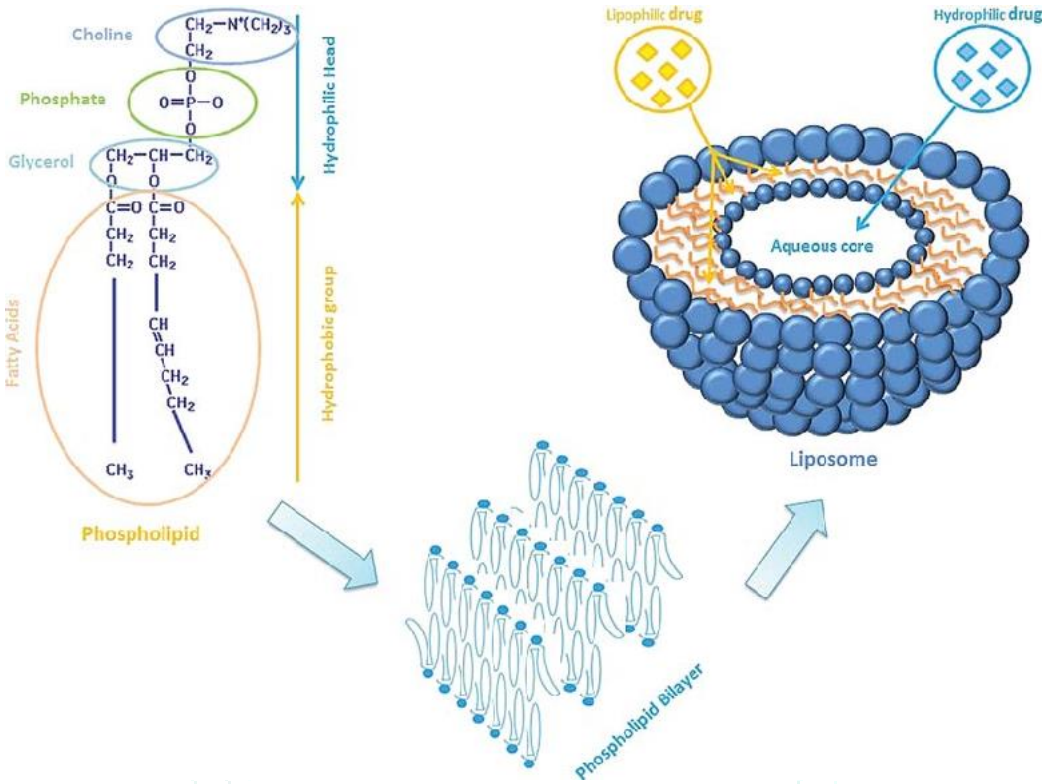

Figure 1: Liposomes classification based on size and lamellarity

METHODS

Film-deposition on carrier method.

It involves deposition of film of drugs and phospholipids onto a porous, water soluble carrier material. Solution of drug and phospholipids in a volatile organic solvent is introduced drop wise via feed tube onto a bed of carrier material held in a flask of a rotary flash evaporator under vacuum. At any given time, over-wetting of the matrix is avoided and subsequent aliquot of organic solution is introduced only when a free-flowing powder matrix is obtained. It also enables high surfactant to carrier mass ratio in the preparation of preliposomes. Further, being water soluble they allow rapid formation of liposomal dispersion on hydration and by controlling the size of porous powder, relatively narrow range of reconstituted liposomes can be obtained. E.g., maltodextrin, sorbitol, microcrystalline cellulose, magnesium aluminium silicates, Mannitol, etc.[6]

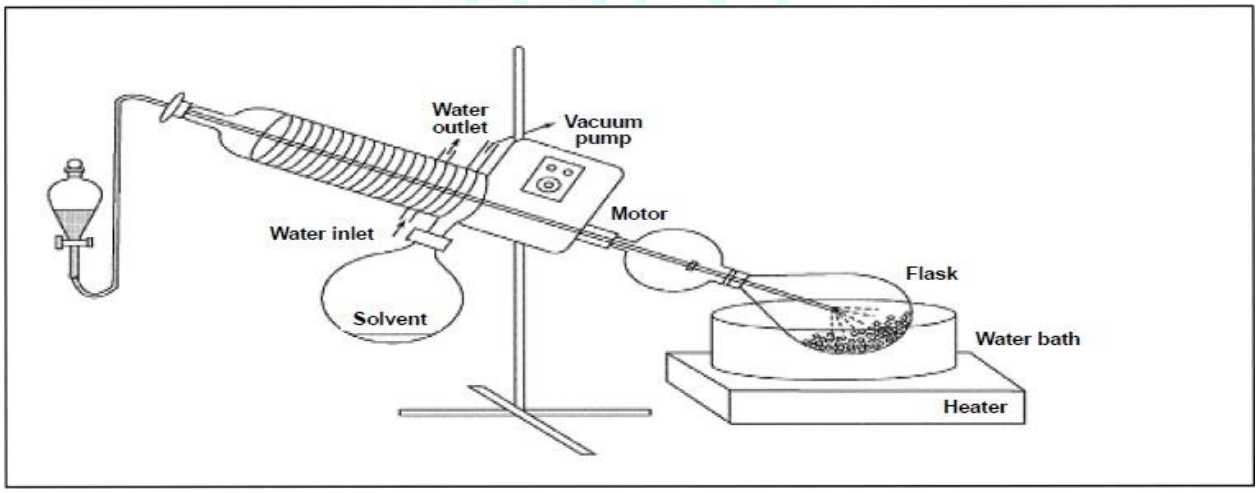

Figure 2: Film Deposition on carrier method

Spray drying method

This method is mainly used when particles of uniform size and shape are required and can be easily scaled up it is cost effective and suitable for large scale production of preliposomes. The unique feature of spray drying process lies in its ability to involve both particle formation and drying in a continuous single step, allowing better control of particle. Spray drying is not only limited to aqueous solutions, but can also be used for non-aqueous systems to prepare particles.

The spray drying process involves four stages.[7]

- Atomization of the product into a spray nozzle.
- Spray-air contact.
- Drying of the spray droplets, and
- Collection of the solid product.

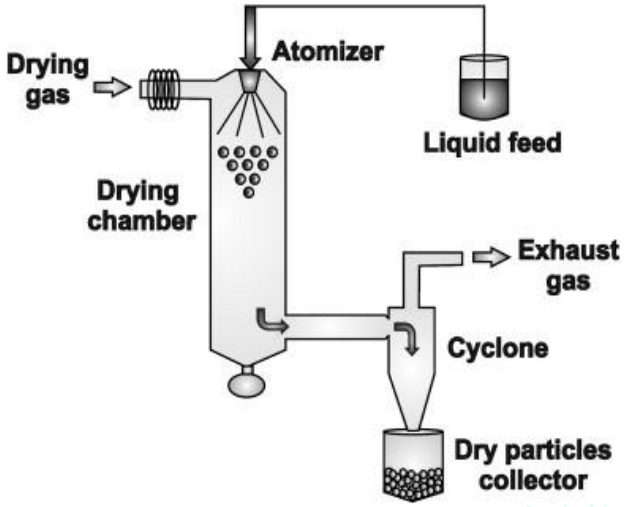

Figure 3: Spray drying method

Fluidized-bed method.

It works on the principle of particle coating technology. The carrier material used here can vary from crystalline powder to non-pareil beads. When using beads as carrier material, initial seal coating is applied to the beads to provide a smooth surface for further coating of phospholipids. This ensures formation of thin uniform coating of phospholipid around the core and formation of smaller sized liposomes upon hydration.[8]

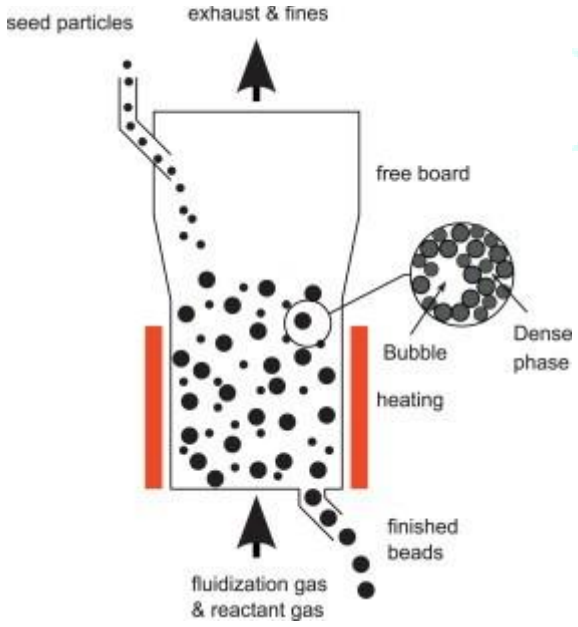

Figure 4: Fluidized-bed method

CHARACTERIZATION OF PRELIPOSOMES

Scanning Electron Microscopy (SEM)

SEM is mainly used to view the surface morphology of the Preliposomes powder. This involves comparing the image of the pure carrier material with that of the Preliposomes. The illegibility of the image of the carrier material in the formulation confirms the deposition of phospholipid on the carrier and thus confirming the formation of preliposomes.[8]

Transmission Electron Microscopy (TEM)

TEM is mainly used to study the morphology of the liposomes from preliposomes upon hydration and observing the shape and lamellarity of the liposome vesicles formed under the microscope.[8]

Hydration study

Hydration study is carried out on the fact that liposomes are formed on contact with aqueous environment. In this method we place small quantity of dry powder of pro-liposomes and place it on a glass slide and then gradual addition of water in it and it can observe by using microscope to view vesicle formation. During hydration dissolution and disintegration occur rapidly as soon as hydration.[9]

Differential Scanning Calorimetry (DSC)

The calorimetric analysis is performed in order to determine the differences in properties of lecithin and cholesterol previously structured in the preliposomes and the effect of the drug on these properties.[9]

Zeta Potential

The zeta Potential is defined as the difference in potential between the surface of the tightly bound layer (shear plane) and the electro-neutral region of the solution. This can be used to study the surface charge of the particles. The zeta potential of samples is measured using Zetasizer 3000 HS.

Flow Property

It ensures the despite the deposition of phospholipids on carriers, the flow ability of particles is not affected. This can be done by measuring the parameters such as Angle of Repose, Carr's Index or Compressibility Index and Hauser's Ratio.

Drug Entrapment Studies

Separation of unentrapped drug can be done by mini column centrifugation method. Liposomal suspension can be centrifuged at 2000 rpm for 3 min. Elutes containing drug loaded liposomes can collected and can be observed under optical microscope to ensure the absence of unentrapped drug particles. Appropriate amount of elute can be digested with chloroform methanol and the clear solution be obtained and analysed by spectrophotometrically.[10]

In Vitro Dissolution Study

In vitro dissolution study of preliposome powder can be performed by USP Dissolution apparatus Type II and Franz diffusion cell using any suitable membrane such as rat skin, cellophane dialysis membrane.[10]

APPLICATION [11-12]

1) As a parenteral delivery
2) As a oral delivery
3) For the treatment of Arthritis
4) As a dry powder inhalers (DPIs)
5) As a nebulizer
6) As a transdermal delivery
7) As a mucosal deliver

CONCLUSION

Preliposomes are novel vesicular carrier having ability to overcome the instability issue associated with the vesicular drug delivery system. To develop a prevesicular drug delivery system for the challenging drug for large scale-up and controlled release of the encapsulated drug. Utilising methods such as spray drying and fluidised bed drying preliposomes can be produced on a large scale. They also have the ability to be delivered as conventional formulations the preliposomes are administrated orally, parenterally and topically as well as used in cosmetic and hair technologies, sustained release formulations, diagnostic purpose and as good carriers in gene delivery.

REFERENCES

1. Shaji J, Bhatia V, Preliposomes a brief overview of novel delivery System: International Journal of Pharma and Bio Sciences, 2013; 4(1):150-160.
2. Jain SK, Jain NK, Liposomes as Drug Carriers. In: Jain NK Controlled and Novel Drug Delivery. 6th ed. New Delhi: CBS Publication; 2008. P. 304-345.
3. Chen Y. et. al., Enhanced bioavailability of the poorly water-soluble drug fenofibrate by using liposomes containing bile salt: International journal of pharmaceutics, 2009; 367:153-160.
4. Xu H. et al., Optimized preparation of vinpocetine preliposomes by a novel method and in vivo evaluation of its pharmacokinetics in New Zealand rabbits: Journal of Control Release, 2009; 16:61-68.
5. Deshmukh DD, Ravis WR, Betageri GV, Improved delivery of cromolyn from oral preliposomes beads: International Journal of Pharmacy, 2008; 358:128-136.
6. Gupta V, Barupal AK, Ramteke Formulation development and in vitro characterization of preliposomes for topical aelivery of aceclofenac: Indian Journal of Pharmaceutics and science, 2008; 70(6):768-775.
7. Hiremath PS, Soppimath KS, Betageri GV, Preliposomes of exemestane for improved oral delivery, Formulation and in vitro evaluation using pampa Caco-2 and rat intestine: International Journal of Pharmaceutics, 2009; 96:104-380.
8. Vyas S P, Khar R K, Targeted and controlled drug delivery (Novel carrisers systems). 7th ed Delhi: CBS publishers and distributors; 2006. P. 173-181.
9. Gupta V Barupal, A K Ramteke S, Formulation development and in vitro characterization of preliposomes for topical delivery of Aceclofenac: Indian Journal of Pharma Science, 2008; 70(6):6875.
10. Nalla P, Bagam S, Eedara BB, Dhurke R, Formulation and Evaluation of Domperidone Oral Preliposomes Powders: International Journal of Pharmatech Research, 2015; 7:108-118.
11. Yadav AV, Murthy MS, Shete AS, Sakhare S, Stability Aspects of Liposomes: Indian Journal of Pharma Education and Research, 2011; 45(4):402-413.
12. Dua J S, Rana A C, Bhandari A K, Liposome: methods of preparation and applications: International Journal of Pharmaceutical Study Research, 2012; 3:14-20.