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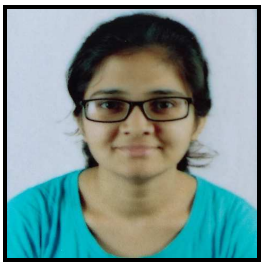

PHARMACOSOMES: A NOVEL APPROACH FOR DRUG DELIVERY

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ABSTRACT

With discovery of new disease and disorder it is necessary to invent new and novel drug delivery system. So that the drug reaches its target site and maximum absorption of drug occurs. With newer drug delivery system many advantages like decrease in drug dose, drug loss, toxicity, side effects and time require for onset on action have been observed. The vesicular delivery system consist of liposomes, pharmacosomes, ethosomes, transferosomes, niosomes and many more. Pharmacosomes are colloidal dispersions of drug covalently bounded to lipid. They may be present as ultrafine vesicular, micellar or hexagonal aggregates, depending on the chemical structure of drug-lipid complex. Pharmacosomes are ampiphillic in nature and hence can encorporate both hydrophilic and lipophillic drugs. They are generally used for NSAID, cardiovascular, protein, neoplastic drug encorporation. Encapsulation of drug in vesicular system increases time span of drug in systemic circulation and hence its bioavailability.

KEYWORDS

Pharmacosomes, Phospholipids, Drug targeting, Bioavailability and Novel drug delivery.

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INTRODUCTION[1-4]

From the very beginning of the human race; the hunt is going on for newer and better alternatives, and in case of drugs it will continue; continue till we find a drug with high efficacy and nil side effects. Many drugs, mainly chemotherapeutic agents, have narrow therapeutic window and their clinical use is partial and compromised by dose limiting toxic effect. Hence, the therapeutic effectiveness of the existing drugs is improved by formulating them in an advantageous way.

In the past few decades, considerable awareness has been focused on the development of Novel Drug Delivery System (NDDS).

At present, no accessible drug delivery system behaves ideally, but honest attempts have been made to accomplish them through various novel approaches in drug delivery. Approaches are being made to achieve this goal, by paying significant attention either to control the distribution of drug by incorporating it in a carrier system, or by varying the structure of the drug at the molecular level, or to have power over the input of the drug into the bio-environment to ensure a suitable profile of distribution. Novel drug delivery system focuses at providing some control, either this is of temporal or spatial nature, or both, of drug release in the body.

Vesicular system

Vesicular structures are the one, which can be expected to prolong the duration of the drug in systemic circulation, and reduces the toxicity by selective up-take. Biologic origin of these vesicles was first reported in 1965 by Bingham, and termed as Bingham bodies, which played a major role in modeling biological membranes, and helps in the transport and targeting of active agents. Therefore, a number of vesicular delivery systems such as liposomes, ethosomes, niosomes, pharmacosomes etc, were developed. Nowadays vesicles are gaining importance as a potential carrier system in fields of immunology, membrane biology, diagnostics and recently ingenetic engineering. They can recommend wide range of incorporation of both hydrophilic and lipophilic drugs as a vehicle of preference in drug delivery. Lipid vesicles were found to be of value in vesicular drug delivery that reduces the cost of therapy by improved bioavailability of medication, especially in case of poorly soluble drugs. Delay drug elimination time of quickly metabolized drugs, and function as sustained release systems. This system solves the troubles of drug insolubility, instability and rapid degradation. Encapsulation of the drug in the delivery system has specific advantages while avoiding demerits associated with conventional dosage forms. These carriers play an increasingly important role in drug delivery because by slowing drug release rate, it may possible to reduce the toxicity of drug. In general, vesicles made of natural or synthetic phospholipids are called liposomes. They possess an infrastructure consisting of hydrophilic, amphiphilic and lipophilic moieties together and as a result can accommodate drug molecules with a wide range of solubility. The characteristics of the vesicle formulation are variable and controllable. Changing the vesicle composition, size, lamellarity, tapped volume, surface charge and concentration can control the vesicular properties significantly. It might act as a depot, releasing the drug in a controlled manner. Lipid vesicles are one type of many experimental models of biomembranes which evolved successfully, as vehicles for controlled delivery for the treatment of intracellular infections, usual chemotherapy is not effective, due to inadequate permeation of drugs into cells.

Advantages of Vesicular System

It is an efficient method for reducing the drug toxicity and targeting it to the site of action.

It is capable of consolidating hydrophilic and hydrophobic drugs.

It helps to reduce the expenditure of treatment.

It improved bioavailability of poorly soluble drugs.

It sustained release by receding the time of drug elimination of rapidly metabolizable drugs.

It helps to overcomes the complications regarding stability, solubility and degradation of the drug.

It acts as drug reservoir by encapsulating the drug and overcoming the problems of conventional dosage forms.

These carriers correspond to the structure and function of biomolecules and hence are biocompatible and biodegradable.

Various vesicular carriers used for bioavailability enhancement are classified as:

Lipoidal Biocarriers

Non-lipoidal Biocarriers

Types of vesicles for bioavailability enhancement

Lipoidal biocarriers for bioavailability enhancement

Liposomes

Transferosomes
Pharmacosomes
Emulsomes

Non-lipoidal biocarriers for bioavailability enhancement

Niosomes
Bilosomes

Non-lipoidal biocarries for bioavailability enhancement

Niosomes

These can enhance the bioavailability of encapsulated drug and also provide the drug release in a controlled manner for prolonged period of time 34. Niosomes are novel surfactant vesicles, which are microscopic lamellar structures of size range 10-1000nm formed on admixture of non-ionic surfactant of alkyl or dialkyl polyglycerol ether class and cholesterol with subsequent hydration in aqueous media. The properties of non-ionic surfactant vesicles can be customized by incorporation of various ingredients into the membrane, for e.g., cholesterol imparts rigidity and orientational order to the niosomal bilayer resulting in stable and fewer leaky vesicles. Charge inducing agents like dicetyl phosphate, diacylglycerol and stearylamine offer electrostatic stabilization of vesicles and hence show improved entrapment efficiency of vesicles. Niosomes are also recognized as amphiphilic vesicles allow the encapsulation of hydrophilic drug in the core cavity and hydrophobic drugs in non-polar region inside the bilayer. The vesicles act as a depot and release the drug in forbidden manner. The therapeutic performance of drug molecules can be improved by delayed clearance from transmission, protecting the drug from biological environment thus providing targeted drug delivery. These can be prepared by various methods such as ether injection method, hand shaking method, thin film hydration method, sonication, micro fluidization, multiple membrane extrusion method, reverse phase evaporation and bubble method. They provide enhanced drug concentration at the site of action after oral, parenteral and topical administration, thus minimize the side-effects. They release the drug by diffusion controlled mechanism.

Bilosomes

Bilosomes are the novel innovative drug delivery carriers consist of deoxycholic acid incorporated into the membrane of niosomes. As conventional vesicles (liposomes and niosomes) can cause dissolution and experience enzymatic degradation in gastro intestinal tract but amalgamation of bile salts (commonly used as penetration enhancers) in niosomal formulation might stabilize the membrane against the damaging effects of bile acids in GI tract. These bile salt stabilized vesicles are known as bilosomes. Bilosomes show a variety of advantages together with biocompatibility as they are produced from naturally occurring lipids. Bile salts along with lipid content boost the bioavailability of enclosed bioactive substance and act as penetration enhancers. Bilosomes have been found to increase the bioavailability of drugs as they can voluntarily absorbed through small intestine to the portal circulation (hepatocirculation). Through this circulation they approach to liver and release the drug, so also found to be an effective tool indrug targeting to liver. This delivery system exhibits inherent adjuvant properties when associated with anantigen. These allow only small quantity of an antigen tobe effective and both cellular and humoral immune responses can be induced. Shukla *et al* showed that HBsAg loaded bilosomes formed both systemic as well as mucosal antibody responses upon oral administration. Daisy Arora *et al* developed and characterized mannosylated bilosomes loaded with Hepatitis B surface antigen for dendritic cell targeting to provide improved bioavailability with extended humoral, cell mediated and mucosal immune responses.

Lipoidal Biocarries for Bioavailability enhancement

Liposomes

Liposomes are the microscopic lipid vesicles ranging from 20nm to several micrometers in size. These are composed of one or several lipid membranes surrounding discrete aqueous compartments. These vesicles can encapsulate water

soluble drugs in their aqueous space and lipid soluble drugs within the membrane. Depending upon the gel-liquid crystalline transition temperature of phospholipids (i.e., the temperature at which acyl chainsmelt), liposomal membrane can attain varying degree of fluidity at ambient temperature. Due to their biocompatibility and biodegradability, liposomes and nanoliposomes are being used in applications ranging from drug and gene delivery to diagnostics, cosmetics, long-lasting immunocontraception and food nanotechnology. Liposomes stabilize the encapsulated materials against a range of environmental and chemical changes, including enzymatic and chemical modification, as well as buffering against extreme pH and temperature.

Liposomes easily improve the bioavailability of drug molecules having poor solubility and permeability.

Transferosomes

Transfersomes are specifically optimized, ultra deformable (ultra flexible) lipid supramolecular aggregates, which are able to penetrate the mammalian skin intact. Liposomal as well as niosomal systems, are not suitable for transdermal delivery, since their poor skin permeability, breaking of vesicles, leakage of drug, aggregation and fusion of vesicles. To conquer these problems, a new type of carrier system called "transfersome" has recently been introduced, which is capable of transdermal delivery of low as well as high molecular weight drugs. Each transfersome consists of at least one inner aqueous compartment, which is bounded by a lipid bilayer with particularly tailored properties, due to the incorporation of "edge activators" into the vesicular membrane. Surfactants such as sodiumcholate, sodium deoxycholate, span 80 and Tween 80, have been used as edge activators.

Emulsomes

The emulsome nanocarrier technology is a lipid-based drug delivery system designed to act as a carrier for drugs with poor water solubility. In emulsomes, the internal core is prepared up of fats and triglycerides, which are stabilized in form of o/w emulsion by adding up of high concentration of lecithin. Emulsomes have the characteristics of both liposomes and emulsions. By virtue of solidified or semisolidified internal oily core, it provides better opportunity to load lipophilic drugs in high concentration, simultaneously a controlled release can also be expected and these also have the ability to encapsulate water soluble medicaments in aqueous compartments of surrounding phospholipid layers.

These systems are often prepared by melt expression or emulsion solvent diffusive extraction methods. Emulsomes guard the drug from harsh gastric environment of stomach before oral administration because the drug is enclosed in the triglyceride lipid core therefore increases the solubility and bioavailability of poorly aqueous soluble drugs. As they are composed of lipid core hence used to develop oral controlled delivery of drug. They are cost-effective alternative to current commercial lipid formulations because they decrease the dosing frequency of drugs. Emulsomes-based system showed excellent potential for targeting also. The formulations could significantly modify providing prolonged action at comparatively low drug doses thereby reduction in the toxicity problem due to complimentary localization of the drug in target cells. Emulsomes may improve bioavailability of drugs by altering the biochemical barrier functions of the GI tract as it is clear that the lipidsand triglycrides, which are included in emulsomal preparation may attenuate the activity of intestinal efflux transporters, as indicated by the p-glycoprotein efflux pump and may also decrease the extent of enterocyte based metabolism. This is a new emerging drug delivery system and therefore could play an essential function in the effective treatment of life-threatening viral infections and fungal infections such as hepatitis, HIV, Epstein-Barrvirus, leishmaniasis, etc. Kaisar Raza *et al* prepared dithranol loaded emulsomes with enhanced biocompatibility, efficacy and stability in treatment of psoriasis. Paliwal R *et al* developed and evaluated methotrexate (MTX), an anticancer drug

loaded emulsomes for oral lymphatic delivery. The relative bioavailability of MTX was improved nearly 5.7 times with optimized emulsomal formulation when compared toplain MTX solution with superior uptake and longer residence time of MTX molecules in lymphatics. Hence, emulsome could be used as lymphotropic carrier for delivery of bioactive(s) and thus for bioavailability enhancement of drugs.

Pharmacosomes

Pharmacosomes are amphiphilic complexes of drugs (containing an active hydrogen atom) and lipids. The drugs bound either covalently, electrostatically or by hydrogen bonds to lipids. Depending on the chemical structure of the drug-lipid complex, they are defined as colloidal dispersions of drug covalently bound to lipids existing as ultrafine vesicular, micellar, or hexagonal aggregates. Similar to other vesicular systems pharmacosomes offer an efficient method for delivery of drug directly to the site of infection, leading to decline of drug toxicity with no adverse effects, also reduce the cost of therapy by improved bioavailability of medication especially in case of poorly soluble drugs.

Pharmacosomes are appropriate for incorporating both hydrophilic and lipophilic drugs to improve their solubility, bioavailability and reduce the gastrointestinal toxicity of various drugs. So, developing the drugs as pharmacosomes may show to be a probable approach to improve the bioavailability of drugs and also to reduce the GI toxicity. The thought for the growth of the vesicular pharmacosome is based upon surface and bulk interactions of lipids with drug. Any drug possessing an active hydrogen atom (-COOH, -OH, -NH2, etc.) can be esterified to the lipid, having spacer chain or not.

Components of pharmacosomes[5]

There are three essential components for Pharmacosomes preparation.

Drug

Drugs containing active hydrogen atom (-COOH, OH, NH2) can be esterified to the lipid, with or without spacer chain and they forms amphiphilic complex which in turn make easy membrane, tissue, cell wall transfer in the organisms.

Solvents

For the preparation of Pharmacosomes, the solvents should have high purity and volatile in nature. A solvent with intermediary polarity is selected for pharmacosomes preparations.

Lipid

Phospholipids are the major structure component of biological membranes, where the two types of phospholipids generally used phosphoglycerides and sphingolipids. The most common phospholipid is phosphotidyl choline molecule. Phosphotidylcholine is an amphipathic molecule in which a glycerol bridges links a pair of hydrophobic acyl hydrocarbon chains, with a hydrophilic polar head group, phosphocholine.

Advantages of Pharmacosomes[6]

1. Pharmacosomes offer a capable method for delivery of drug directly to the site of infection, leading to decrease of drug toxicity with no adverse effects and also reduces the cost of therapy by improved bioavailability of medication, specially in case of poorly soluble drugs.
2. Pharmacosomes are suitable for incorporating both hydrophilic and lipophilic drugs. The aqueous solution of these amphiphiles exhibits concentration reliant aggregation.
3. Entrapment efficiency is not only high but also predetermined, because drug itself in conjugation with lipids forms vesicles and covalently linked together.
4. Unlike liposome, there is no need of following the tedious, time-consuming step for removing the free, unentrapped drug from the formulation.
5. While the drug is covalently linked, loss due to leakage of drug, does not take place. Though, loss may occur by hydrolysis.
6. No problem of drug incorporation.
7. Encaptured volume and drug-bilayer interactions do not manipulate entrapment efficiency, in case of pharmacosome. These

factors on the other hand have huge control on entrapment efficiency in case of liposomes.

8. The lipid composition in liposome decides its membrane fluidity, which in turn influences the rate of drug release, and physical stability of the system.

However, in pharmacosomes, membrane fluidity depends upon the phase transition temperature of the drug lipid complex, butit does not influence release rate since the drug is covalently bound. The drug is free from pharmacosome by hydrolysis (including enzymatic).

Limitations of Pharmacosome

1. For the synthesis of compound the amphiphilic nature is required.
2. The fundamental principle for pharmacosomes are surface and bulk interaction of lipid with drug
3. The pharmacosomes undergo fusion, aggregation as well as hydrolysis when they set on storage.
4. Required covalent bonding to protect the leakage of drugs.

Salient features of pharmacosomes

1. Entrapment efficiency is not only high but predetermined, because drug itself in conjugation with lipids forms vesicles.
2. Unlike liposomes, there is no need of following the boring, time-consuming step for taking out the free, unentrapped drug from the formulation.
3. Since drug is covalently linked, loss due to leakage of drug, do not take place. Nevertheless, loss may occur by hydrolysis.
4. No problem of drug incorporation into the lipids.
5. In pharmacosome, the encaptured volume and drug-bilayer interactions do not manipulate on entrapment efficiency. However, these factors have huge influence on entrapment efficiency in case of liposomes.
6. The lipid composition in liposomes decides its membrane fluidity, which in turn influences the rate of drug release, and physical stability of the system. But, in pharmacosomes, membrane fluidity depends on the phase transition temperature of the drug lipid complex, but it does not affect discharge rate since the drug is covalently bound to lipids.
7. Phospholipid transfer/exchange is reduced, and solubilization by HDL is low.

Methods of Preparation[7]

Pharmacosomes can be prepared by various methods. Fundamentally, a drug (bearing an active hydrogen group) when reacted with PL in the presence of a suitable organic solvent yields pharmacosomes. The drug and the PtdCho are reacted in a 1:1 or 1:2 molar ratio. Some methods 0described in various studies are discussed below.

Conventional solvent evaporation technique

To make pharmacosomes of diclofenac sodium, it was acidified initially so that active hydrogen might be existing for complexation. Diclofenac acid was prepared by acidification of an aqueous solution of diclofenac sodium, extraction into chloroform, and following recrystallization. Diclofenac–DPPtdCho (dipalmitoylphosphatidylcholine) complex was prepared by associating diclofenac acid with an equimolar concentration of DPPtdCho. A suspension of the complex in water was used as the diclofenac–DPPtdCho complex.

Semalty *et al*[7]. Prepared Diclofenac–PtdCho complex by reacting diclofenac acid with an equimolar concentration of PtdCho by a conventional solvent evaporation technique. The equimolar concentration of PtdCho (LIPOID S80) and diclofenac acid were placed in a 100ml round bottom flask and dissolved in dichloromethane and refluxed. The solvent was evaporated off under vacuum at 40°C in a rotary vacuum evaporator (Perfit Model No. 5600 Buchi type). The dried residues were collected and placed in vacuum desiccators.

Supercritical fluid process

The conventional formulation methods used for the preparation of drug PL complex, most frequently solvent evaporation, are always time-consuming

and involve multistage processing. In addition, the dissolution of pharmacosomes does not improve ideally. Parameters related to solid morphology, including the particle size, the crystal habit and crystal pattern, influence the dissolution rate of a compound and thus can affect their bioavailability significantly. So the supercritical fluid (SCF) process may be used to get better dissolution of pharmacosomes and to simplify the experimental procedures for preparing complexes. In recent years supercritical antisolvent precipitation (SAS), which is one of the SCF technologies, has become a promising technique that can be used to produce micrometer and submicrometer particles with controlled size and size distribution. The process is characterized by very mild conditions of temperature, and smaller particles can be obtained depending on the drug and process conditions when compared with the common industrial comminution techniques such as jet milling, liquid antisolvent precipitation and crystallization. Particle size is mainly related to the dissolution of drugs and hence can significantly affect their bioavailability; so the SAS process may boost the dissolution of pharmacosomes.

Two different SCF technologies, gas antisolvent (GAS) and solution-enhanced dispersion by supercritical fluid (SEDS), belonging to the SAS process, were used by Li *et al.* for preparation of PL complexes of puerarin. In the GAS process, mass transfer typically occurs by the mechanism of convection and molecular diffusion, leading to relatively small supersaturation for many solutes. Although, theoretically, very slow expansion in the GAS process should produce a homogeneous supersaturated solution, such expansion is very difficult to control. In addition, it is impossible to achieve high supersaturation levels in the GAS because of the faster process of nucleation. In the SEDS process, premixing is created between a fresh liquid solution and supercritical CO2 (SC-CO2), which produces high supersaturation and occurs predominantly within the nozzle mixing chamber. This process features a highly turbulent flow of solvent and CO2, leading to a very fast mixing or dispersion. Thus, mass transfer is not limited by molecular diffusion or convective phenomena. By using this technique, it is possible to control the size, shape and morphology of the material of interest.

In the SEDS method, the CO2 was passed through a heat exchanger to ensure that it was supercritical before entering the nozzle with a diameter of 0.1 mm, which consisted of two concentric tubes and a small premixing chamber. The mixing solution of puerarin and PLs or the single component solution and the supercritical antisolvent were continuously added by two pumps, one for delivering liquid CO2 and the other for drug solution. Both of them were controlled by an Isco Series D pump power controller to the precipitation vessel in co-current mode through the nozzle. The temperature of the vessel was maintained in an Athena heater. The high velocity of the SC-CO2 stream thoroughly mixed and dispersed the solvent stream and extracted solvent, leaving dry powder in the vessel. The particles formed were collected at the end of the experimental runs. The SC-CO2 left the high-pressure vessel and flowed to the backpressure regulator, which controlled the pressure discharge in the system. The contents of the residual organic solvents within the microparticles were reduced by a washing step for 90 min or more to remove any residual solvent to avoid the recondensation of the liquid inside the chamber. The vessel was then slowly depressurized for 60 min and the powder removed. The conditions optimized for preparing puerarin or its complex were as follows: temperature 35°C, pressure 10 mPa, flow rate of CO2 45 ml/min, flow rate ratio of drug-to-CO2 solution 1%, the mass ratio of drug-to-PLs used for preparing puerarin PL complexes (PPC) in all methods retaining 1:1.2, and concentration of puerarin 100 mg/ml. Handling and storage conditions for SCF products were identical to the conventional processed PPC.

In the GAS precipitation for preparing PPC, Li *et al.* used approximately the same equipment as used with SEDS, apart from that the pump controller in charge of delivering drug solution was not turned

on. The drug solution was not imported into the precipitation vessel by this pump, but was poured into the vessel before the experiment started. In the batch GAS step configuration, the precipitation unit attached to the Isco syringe pump was initially loaded with 100 ml of purring or 10 ml of PL solution. Then CO2 was added until the final pressure was reached. The rate of CO2 addition was 107 ml/min. The volume of the precipitation vessel was 250 ml. The vessel was filled with SC-CO2 at the desired pressure (10 mPa) and temperature (38°C) and left for 3 h without any agitation. A pure constant carbon dioxide flow rate of 25 ml/min was then maintained in order to remove completely the residual solvent. After this washing step, which lasted for ~ 90 min, the autoclave was depressurized for 30 min at the experimental temperature. At the end of experiment, solid product was scraped out with a spatula from the filter located at the bottom of the vessel and subjected to handling and storage conditions identical to the unprocessed materials.

Anhydrous co-solvent lyophilization method

Shi *et al*. prepared a new insulin–PL complex by an anhydrous co-solvent lyophilization method. In this method insulin powder and PLs were co-dissolved in 1 ml dimethyl sulfoxide (DMSO) containing 5% glacial acetic acid accompanied by gentle agitation until formation of a clear mixture. The ensuing homogeneous solution was then freeze-dried overnight at a condenser temperature of -40°C and under a vacuum of 10 Pa. The ensuing complex was flushed with nitrogen and stored at 4°C.

Characterization of pharmacosomes[8]

Complex Determination

The formation of complex and conjugate can be determined by the correlation spectrum observed in complex sample with that of discrete constituents and also with their mixture will be determined in the help of FTIR spectrum.

Solubility with the help of shake – flask Techniques; the purpose of change in solubility due to complexation can be evaluated. In this method solubility of drug acid and drug PC- complex was resolute in phosphate buffer 6.8 and n-octanol was also determined. In this method, the drug acid and n-octanol i.e phosphate buffer at Ph of drug-phospholipid conjugated are mixed after continuous shaking, equilibrium is maintained with the temperature of 37°C for 24 hrs. The partition of aqueous phase is occurring and concentration is resolute using UV or HPLC techniques.

Scanning electron microscopy

Scanning electron microscopy detect the surface morphology of pharmacosome.

Drug content

To determine the drug content in drug – pc complex, complex is equivalent to drug was weighed and added into volumetric flask with Ph 6.8 Phosphate buffer. Then volumetric flask was stirred for 24 hrs on magnetic stirrer. After 24 hrs suitable dilution were made and measured for the drug content at 276nm UV spectrophotometrically.

Differential scanning calorimetry

This thermanaltyical techniques is used to determine the drug - excipient compatibility interactions were recorded using a 2910 Modulated Differential Scanning Calorimeter V4.4E. The thermal behaviour was studied by heating 2.0+ 0.2 mg of each individual sample in a enclosed sample pan under nitrogen gas flow. The investigatin were carried out over the temperature range 25-250 °C at a heating rate of 10°C min– 1. The interaction can be concludes by the elimination endothermic peaks, appearance of peaks and change in peak shape and its onset, peak temperature /melting point and relative peaks area or enthalpy.

X-ray power diffraction (XRPD)

It is performed to determine the degree of crystallinity by using the relative integrated intensity of reflection peaks. The integrated intensity is given by the area under curves of the XRPD patterns and it represents the specimen characteristics.

Fourier transform infrared spectroscopy (FTIR)

With the help of IR spectroscopy the formation of complex can be confirned by comparing the spectrum of complex with the spectrum of individual components and their mechanical mixture. In different time interval the stability can

be determined by comparing the spectrum of complex in solid form with the spectrum of micro dispersion in water after lyophilization techniques.

***In – Vitro* Study**

Depending upon the expected therapeutic activity of biologically active constituents, model of *in –vivo* and *in- vitro* evaluation have been carried out.

Surface Morphology

With the help of scanning electron microscopy (SEM) or transmission electron microscopy (TEM), the surface morphology can be observed. Purity grades of Phospholipid exaggerated to shape and size of pharmacosome and the method variables such as speed of rotation, vacuum applied or the method used.

CONCLUSION

Due to our busy day to day lifestyle, there is an increase in number of diseases and disorder. It is important to cure them at right time with proper medication. But due various physiological parameter it is not possible to place right amount of drug at target site. Hence, it is necessary to formulate formulations that protect the drug and help it to reach target site at right time and right amount. Novel vesicular drug delivery is currently a boon to such problems. Parmacosomes are type of vesicular system which protect drug from outer and inner environment. And help in target drug delivery with optimum drug absorption at target site.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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