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Pharmacosomes: A new class of drug carrier delivery: A review

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Abstract
Pharmacosomes are ampipathic lipid vesicular systems that are of very great importance because they are known to improve the bio-availability of lipid insoluble drugs. They are the colloidal dispersions of drugs which are covalently bounded to lipids, and exist as ultrafine vesicular, micellar, or hexagonal aggregates, depending on the chemical structure of drug-lipid complex. Because the system is formed by linking a drug (pharmakon) and carrier (soma) hence they are called pharmacosomes. The pharmacosomes show greater stability, facilitated transport across the biological membrane and a controlled release. Pharmacosomes have been prepared containing various non-steroidal anti-inflammatory drugs, proteins, cardiovascular and antineoplastic drugs. Development of pharmacosomes containing different drugs has been found to improve the absorption and minimize the gastrointestinal toxicity. Pharmacosomes are like the solution for all most all the problems which are related with liposomes, niosomes, transferosomes and so forth. They may serve as efficient tool to achieve desired therapeutic action by drug targeting and controlled release.

Keywords: pharmacosomes, vesicular, phospholipid complexes, bioavailability, targeted drug delivery system

Introduction
The most acceptable system is the Novel drug delivery system and approachable in developing the drug delivery system which improves the therapeutic efficacy of drugs thus provides controlled and sustained drug delivery to the specific site with minimum side effects. Many systems including liposome, noisome, virosomes, and transferosomes have demonstrated their potential for application in effective drug delivery. The limitations of transfersomes can be overcome by the "Pharmacosome" approach. The prodrug unites the hydrophilic and lipophilic properties, and for this reason it acquires amphiphipathic characters. Likewise to other components which are helpful in different vesicle systems, it was found to greatly reduce interfacial tension in fact at higher concentrations it exhibits very powerful mesomorphic behavior. Pharmacosomes are amphiphathic complexes of drugs (containing an active H atom) with lipids. The drugs may be bound 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, micelle, or hexagonal aggregates. Controlled drug-delivery system is genrally made to achieve two main targets they should be possessing: the ability to reach its target and the ability to release the active pharmaceutical ingredient in a very controlled manner. Any drug containing an active hydrogen atom like (COOH, -OH, -NH2, etc.) can be esterifies to the lipid, with or without spacer group that strongly result in an amphipathic compound, which will facilitate membrane, cell wall or tissue transfer, in the organism. The system yet requires greater efforts towards investigating the non-bilayer phases, and exploring the mechanism of action [1, 2].

Merits
- It is suitable for both water soluble and lipid soluble drugs.
- The aqueous ampiphllic solutions exhibit a concentration dependent accrument.
- High and predetermined entrapment efficiency as drug and carrier form a stoichiometrically defined unit covalently linked together.
- Entrapment efficiency is not going to be influenced by its inclusion volume.
- Like in the the case of liposomes, here there will be no need to remove free and unentrapped drug.
- As drug is covalently bound, membrane fluidity has no effect on release rate, but in turn depends upon the phase-transition temperature of the drug-lipid complex.
- As here the drug is covalently binded to carrier therefore no leakage of drug will take place and drug can also be deliverd directly to its site of action
- Drug present in pharmacosomes is genrally released from pharmacosomes by hydrolysis (including enzymatic). Their velocity of degradation into the metabolite and its active drug molecule, after absorption depends on the size, functional groups present in drug molecule, the chain length of the lipids, and the spacer group.
- Helpful in improving bioavailability in the case of poorly soluble drugs.
- Adverse effects and toxicity can be minimized.

Demerits of Pharmacosomes
- Amphiphilic nature will depend upon the compound synthesis

- It requires bulk interaction and surface interaction of lipids with drugs.
- Required covalent bonding to protect the leakage of drugs.
- On storage, undergo fusion and aggregation, as well as chemical hydrolysis.

Applications of Pharmacosomes

- Pharmacosomes exhibit a greater shelf life with minimum toxicity
- Pharmacosomes have the capacity to augment drug absorption and its transport
- Pharmacosomes improves the membrane fluidity which in turn improves the rate of permeation. The transition temperature of vesicles and micelles might pose an evident effect on vesicular interaction with biomembrane, hence may improve the permeation of drug across membrane.
- Pharmacosomes, theamphiphiliclipidvesicularsystem, can be used for the development of novel ophthalmic dosage forms. Amphiphilic prodrug forms pharmacosomes, when diluted with tear, and modify corneal drug transport and release profile
- Pharmacosomes have great rdegree of selectivity for action on specific target cells [3].

Methods of Prepration

The two common procedures for pharmacosomes preparation are:

- **Hand-shaking method**: - It involves the dried film of drug lipid complex deposited in a round bottom flask upon hydration with aqueous medium readily gives vesicular suspension. In the drug lipid complex usually, lecithin is added many times to reduce surface tension of the complex, so when reconstituted in an aqueous medium gives good surface wetting properties. Water is usually used as an aqueous phase.
- **Ether injection method**: - In ether injection method, organic solution of drug lipid complex was injected slowly into the aqueous medium, wherein the vesicles were readily formed. Here the drug lipid complex is mixed with ether which acts as a solvent and then it is slowly injected in the aqueous medium and spontaneous formation of vesicles takes place.[4]

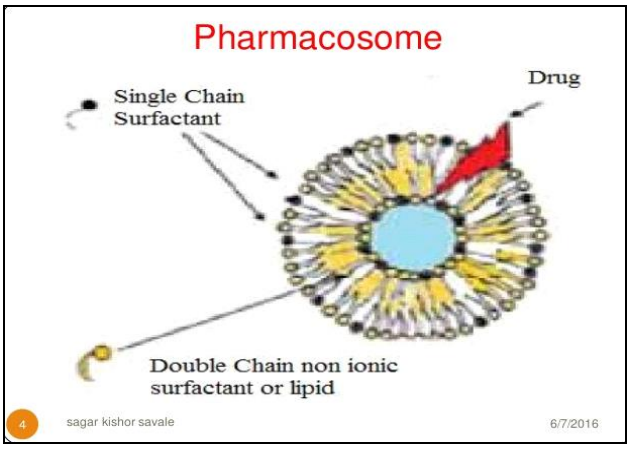

Fig 1

Formulation of Pharmacosomes

Drug salt will converted into acid form to provide an active hydrogen site for complexation. Drug acid will be prepared by acidification of aqueous solution of a drug salt, extraction with the help of chloroform and subsequent recrystallization will be performed. Drug-Phospholipid Cellulose (PC) complex will prepared by associating drug acid with an equimolar concentration of PC. Equimolar concentration of pc and drug acid should be placed in round bottomed flask and dissolved in dichloromethane. The solvent will be evaporated under vacuum at 40°C in a rotary vacuum evaporator.

Componenets of Pharmacososmes

Any conveyance framework comprises of three segments and those are medications, dissolvable and conveys (lipid).

- Drugs
- Processing of any medication containing hydrogen molecule (- COOH, - OH, - NH2 and so forth) can be esterified to the lipid, where spacer gathering might possibly be available coming about into amphiphilic buildings. These amphiphilic edifices (pharmacosomes) encourage layer and cell divider move, in the life form.
- Solvent
- An systematic evaluation natural dissolvable is required for the readiness of pharmacosome. It must be of high immaculateness and unpredictable in nature. The PLs and the medication must be broken down in the chose dissolvable either essentially by its expansion or by refluxing. The determination of dissolvable relies upon extremity of the medication and the lipid. A dissolvable with middle of the road extremity is chosen for pharmacosome readiness.
- Lipids
- Lecithin is the chief structure square of cell films. It is miscible in both that is in water just as in oil and all around assimilated orally. It is a dietary enhancement and it is available in two structures: granular lecithin and a case, containing scattering in oil [7].

Evaluation of Pharmacosomes

These are assessed for the accompanying parameters:

- Solubility
- It is commonly controlled by shake cup technique utilizing phosphate cradle of PH 6.8 and n-octanol in order to decide the adjustment in any dissolvability which may happen because of complexity
- Drug content
- To discover the medication content in pharmacosomes of medication for example (e.g.: diclofenac-PC complex), take a mind boggling equal to 50 mg of diclofenac and afterward it was included into a volumetric cup containing 100 mL of pH 6.8 phosphate cradle. At that point the substance of volumetric flagon was blended constantly for around 24 h on an attractive stirrer. Toward the part of the arrangement weakenings were made and medication substance was estimated at explicit absorbance at 276 nm UV spectrophotometrically.
- Scanning electron microscopy (SEM)

- To decide the surface morphology of these blended ampiphillic framework, SEM of the complex was recorded utilizing examining electron magnifying lens.
- X-beam powder diffraction (XRPD)
- In the various examples the medication present in its crystalline state was assessed utilizing X-beam powder diffraction. Diffraction examples were acquired on a Bruker Axs-D8 Discover Powder X-beam diffractometer, Germany. The X-beam generator must be worked at 40 kV tube voltages and 40 mA tube current, utilizing copper lines as the radiation source. The filtering point went from 1 to 60° of 2q in the progression check mode (step width 0.4°C/min).
- Stability of Pharmacosomes
- Correlation between the ranges of complex acquired at different purposes of time in its strong state with range of its scattering in water comprising of little particles, when the item has been lyophilized, and after that it is utilized to assess the solidness of the framework.
- Drug-Lipid Compatibility.
- Differential filtering calorimetry (DSC) is a thermoanalytical method by and large used to decide similarity between the medication and lipid and communications between the two, assuming any. The warm reaction is considered by warming them in an example container which is shut. The nitrogen gasispurged, and the temperature is kept up in a distinct range with a particular warming rate [6].

Conclusion

Vesicular frameworks are the rising transporter frameworks in the pharmaceutical business. In spite of having weaknesses of getting combined, collected, despite everything they fill in as a crucial apparatus for focusing on and continued medication discharge. With the improvement in spacer gatherings and linkages, further medication destiny and organic movement might be altered. However more noteworthy endeavors are required towards investigating the instrument of activity and researching non-bilayer stages. Subsequently, pharmacosomes have colossal potential in improving the medication conveyance if there should arise an occurrence of both normal and manufactured dynamic constituents. Flow research patterns incorporate cell focusing on utilizing various methodologies like PEGylation, Biotinylation, etc.

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