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An Overview: Novel Herbal Drug Delivery System

Kimaya Santosh Birare*, Prof Anagha Amit Sarvadnya
Mahavir institute of pharmacy Nashik

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ABSTRACT: There are several types of novel herbal drug delivery system for example phytosome,liposome,niosomes,proniosome,transfer osomes,ethosomes,nanoparticles microspheres etc. novel approach to drug delivery that drug delivery system is a addresses the limitations of the conventional drug delivery systems if the novel drug delivery system is applied to the herbal medicines ,it could enhance the bioavailabilty, solubility,efficacy, it enhances the stability of drugs, avoids the toxicity , gives protection to the chemical and physical degradation of drug. This is the basic concept behind incorporating novel drug delivery methods into herbal medicines. For example, liposomes act as a potential carrier for anticancer agents by increasing the amount of drug in tumor area and decreasing the accumulation of drugs in normal cells or tissues by preventing the tissue toxicity effects

KEYWORDS: Herbal, phytosome, liposome, niosomes, drugs

I. INTRODUCTION:

Preparations of plants or plant parts are generally utilized in medication since old times. In today's world phytomedicines is widespread in most of the world's population. Herbal drugs are becoming more popular in this present era of world as it is applied to cure diseases enhance the therapeutic effect of drug and reduce the toxicity and side effects of drugs. Novel drug delivery system the name "novel" it indicates the novelty, new form, in this type of system it delivers the drug at predetermined rate and at the appropriate site of action, sustained release, controlled release is achieved [1].The nano carriers should fulfill the two important requirements

First is, delivering the drug at predetermined rate over the period of treatment. And second is it should open the active entity of herbal drugs to the desired site of action[2]. The nano carriers for herbal drugs have a possible future for enhancement and dealing with the problems related with herbal medicines. For the enhancement of bioavailability of drug, the herbal product must achieve a specific balance between hydrophilicity and lipophilicity. Hydrophilic for dissolving drug into the GIT, and lipophilic for crossing the lipid membrane. As herbal novel drug delivery systems have lot of potential, several researchers are working towards developing novel drug delivery systems like mouth dissolving tablets, sustained and extended-release formulations, mucoadhesive systems, transdermal dosage forms, microparticles, microcapsules, nanoparticles, implants etc.[3]

From this, novel thoughts on controlling the pharmacodynamics,pharmacokinetics, immunogenicity, bio-acknowledgment and adequacy of medications were created. These new techniques, frequently called drug conveyance frameworks (DDS), depend on interdisciplinary methodologies that join polymer science, pharmaceutics, and sub-atomic science [13].

Quality consistency is one of the fundamental credits of meds, yet it is likewise a troublesome issue that normal drugs and their arrangements should confront. The complex chemical substance organization and far-reaching pharmacological activity of normal prescriptions make it challenging to apply the ordinarily involved assessment strategies in synthetic medications basically. It is subsequently earnest to investigate the original assessment strategies for the characteristics of natural medicines.[14]

TYPES OF NOVEL DRUG DELIVERY SYSTEM

- **Phytosome**
- Patented technology (1989)
- Introduced by Indena company (Milan, Italy)
- **Liposome**

Discovered in 1960
Introduced by Alec D Bangham.

- **Niosomes**

Developed in mid-1980
Introduced by L'Oréal (US)

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- **Proniosome**

Developed in 1980

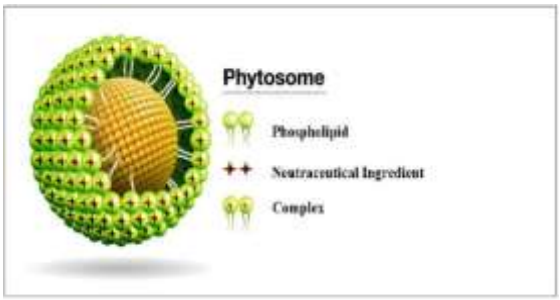
- **Ethosomes**

Developed in 1986
Introduced by Touitou et al.,

- **Microsphere**

Patented in 1972
Introduced by Sidney W. Fox

PHYTOSOME: It is the novel drug system in which, phyto means plant and some means cell. Phytosome it is the patented technology of indena in which herbal extract is embedded in the phospholipid complex which enhances the bioavailability of drug the size range of phytosomal particle is <100nm.It is phospolipid type of drug delivery system. Phytosomes are generally acceptable for poor aqueous solubility of drug and tendency to self-aggregate phytochemicals are prepared by reaction between phosphatidylcholine which contain hydrophilic polar head group and plant extract in solvent. Phyto-particles are used as medicament and it is widespread in the field of cosmetology water soluble phyto-particles can be transformed into the lipid compatible molecular complex. Numerous authors have claimed that the hydrogen interactions are the main interaction in phytosome vesicles[1]



NOVEL HERBAL PHYTOSOMAL FORMULATION

Herbal extract	Category	Applications	references
Curcuma longa	Anti-oxidant	Enhances antioxidant property	[3]
uercetin **Antioxidant activity** **Enhanced therapeutic efficacy** **uercetin** **Antioxidant activity** **Enhanced therapeutic efficacy** Quercetin	Anti-oxidant	enhances the therapeutic effect	[3]

ADVANTAGES

- It assure the predetermined rate of drug delivery to the individual tissue
- It enhances the bioavailability of the drug and stability of the drug
- It shows best stability as there is a chemical bond between thephytoconstituent and phosphatidylcholine.[3]
- The phytosomes-herbal complex has a higher proclivity to the skin phospholipid moiety, which can further develop the lipid dissolvability of the topical formulation[15]

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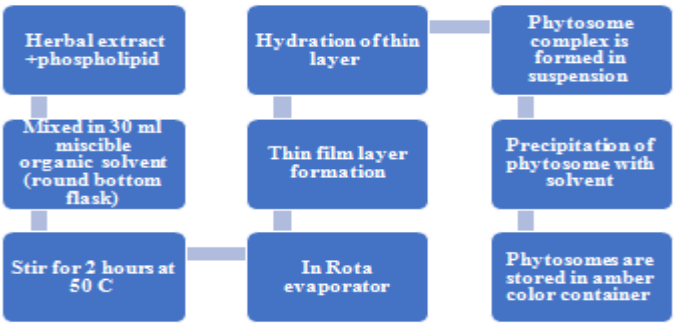
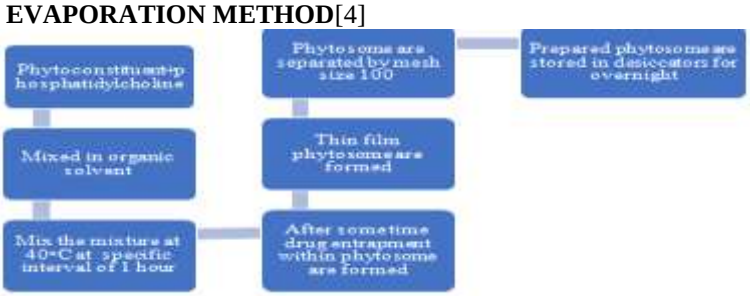
METHOD OF PREPARATION OF PHYTOSOME

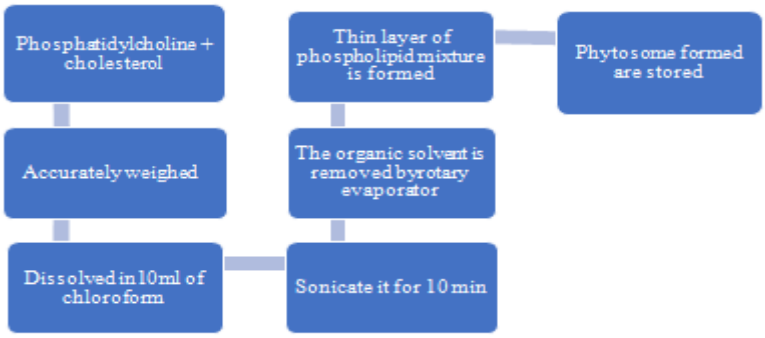
1. ROTARY EVAPORATION METHOD[4]



2. SOLVENT EVAPORATION METHOD[4]



3. SONICATION METHOD[4]



LIPOSOMES

Liposome are lipid base drug delivery system in vesicular structure which consist of bilayers of concentric phospholipid of size 0.05 - 5.0 micron in diameter. Liposome are lipid-base drug delivery system. The main structural components of liposome consist of phospholipid and cholesterol. Liposome can encapsulate both type of drugs hydrophilic and hydrophobic drugs.

Cholesterol is important for mainting the stability of liposome. The ratio of 2:1 or 1:1 of cholesterol to phosphatidylcholine is consolidated in the membrane, phosphtidylcholine is obtained from animal egg and vegetable like soyabean. phospholipid is major component of membrane. Liposome delivers and release the drugs to a specific site in the system. Liposome are prevalent formulation policy to enhance the drug delivery and therapeutic effect of drug. Due to increase liposomal technology a liposomal formulation areavailable inclinical use.Liposomes act as the best nano carriers for anticancer agent, for example doxorubicin hydrochloride it is anti-cancer agent it is embedded in liposome. Liposome increases the accumulation of drug in tumor area and decreasing the amount of drug in other cells, this avoids the tissue toxicity. [2]

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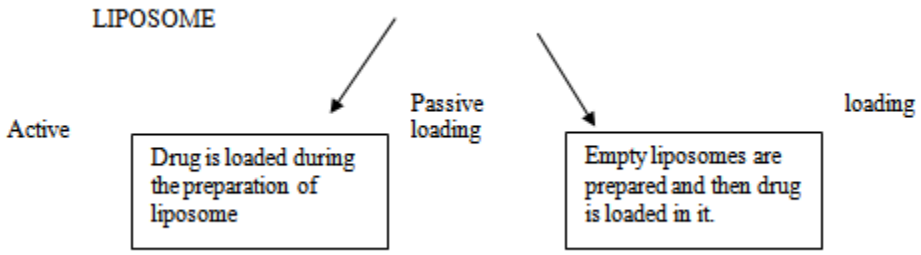
TYPES OF LIPOSOME

1. Multilamellar vesicles(MLVs): It consists of more than one vesicles, varying in size of 100-1000nm.
2. Small unilamellar vesicles(SUV): It consists of single lamella, varying of size between 20-100nm.
3. Large unilamellar vesicles(LUV): It also consist of single lamella, of size >100.[2]

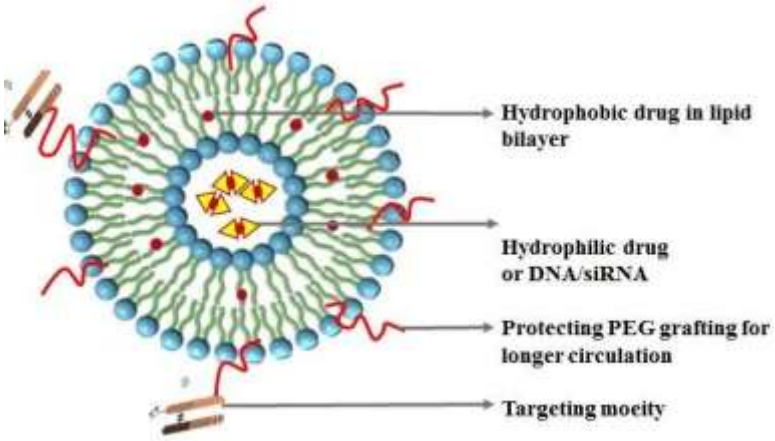
ADVANTAGES

1. They give protection to the embodied medications from external environment
2. Lipososmes are administered by intravenous route(IV), subcutaneous route(SC), oral route, nasal route, topical route, occular route, intramuscular route
3. It enhances the bioavailabilty, reduce the toxicity effects in body.
4. As it has wide range of solubility it can encapsulate smal molecules, macro molecules etc.
5. While liposomes can be figured out to have a longcirculating time in the body, keeping the consistent level of the medication for a longer time.[2]

METHOD OF PREPARATION OF LIPOSOMES



STRUCTURE OF LIPOSOSMES



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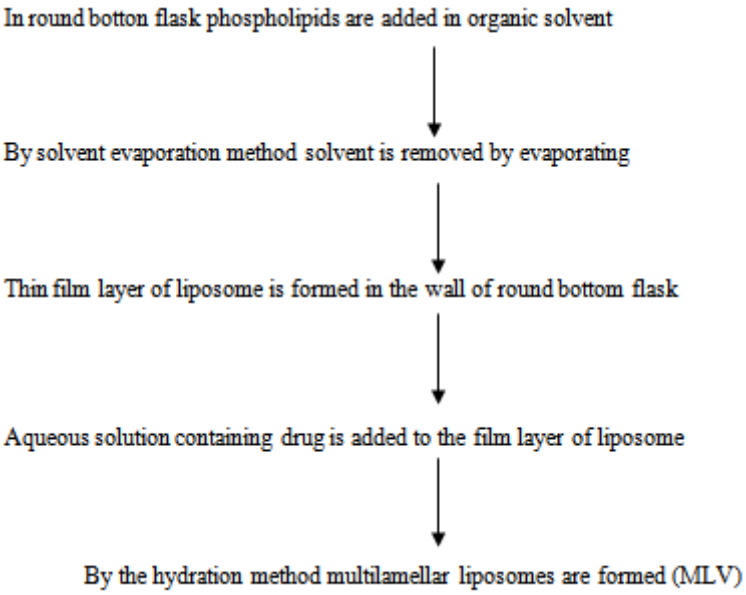
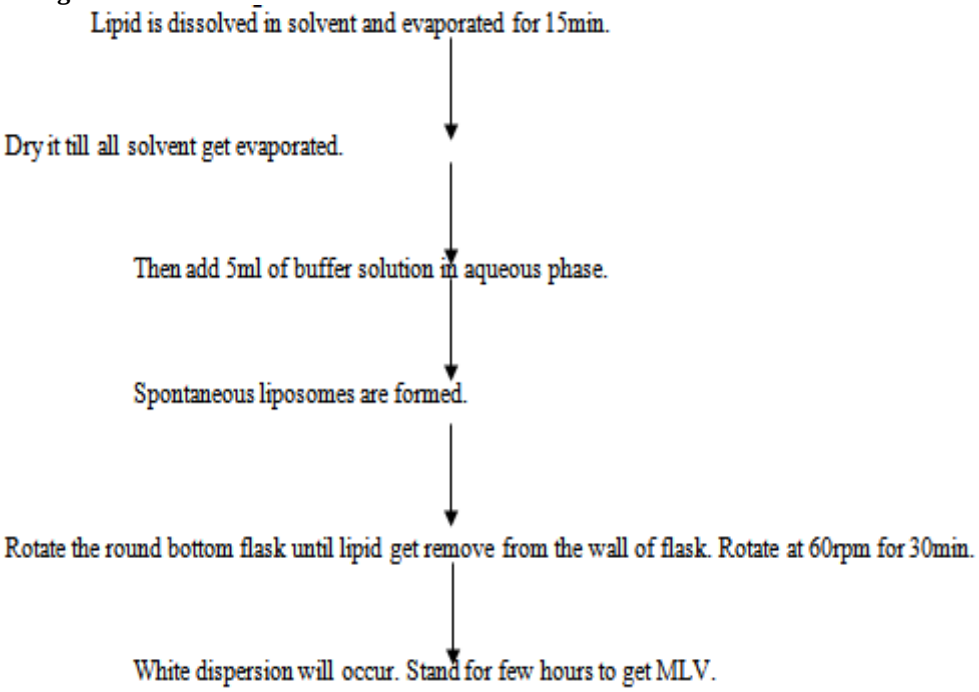
1) **Mechanical dispersion method**[4]

A) Thin film hydration method:



B) Hand shaking method:



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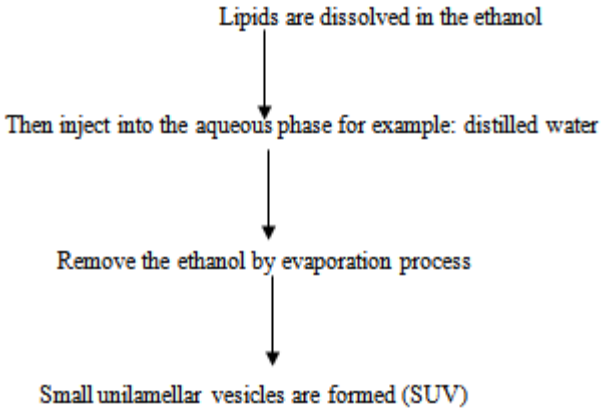
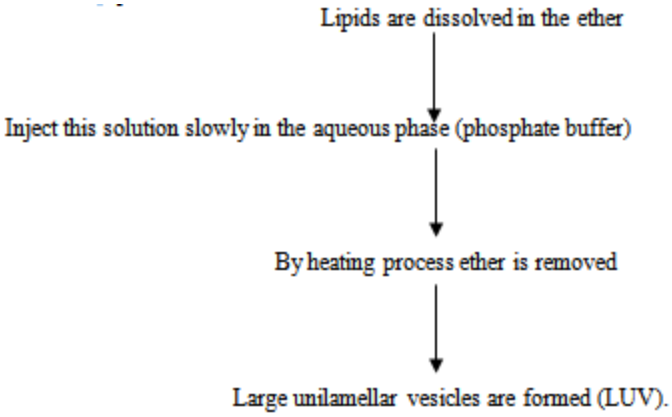
2) Solvent dispersion method [4]

A) Ethanol injection method:



B) Ether injection method:



NOVEL HERBAL FORMULATION IN LIPOSOMES

Herbal extract	Category	Application	References
Garlicin	Lungs	Increase efficiency	[1]
Quercetin	Antioxidant	Enhance bioavailability	[5]
Nux vomica	Anti-tumor	Stability enhancer	[6]
Wogonin	Anti-cancer	Prolong duration	[1]

NIOSOMES:

Niosomes are multi-lamellar vesicles formed from nonionic Surfactants cholesterol They are made up of both hydrophobic and hydrophilic moieties, and thus can accommodate drug molecules with a wide range of solubility.

Niosome have ability to reduce systemic toxicity by encapsulation of treatment agents and of such agents from the body by slow drug release.

Niosomes are similar to liposomes in structure which is having a bilayer

It entraps both hydrophobic and lipophilic drugs in aqueous or organic layer.

The main difference between the liposome and niosome is about the structure

In niosome structure the layer is made up of the non-ionic surfactant and liposome layer is made up of phospholipids.[7]

NIOSOME CLASSIFICATION BASED ON THEIRE STRUCTURE:

1) Small unilamellar vesicles (SUV): The size of these vesicles is in range of 0.025-0.05µm.

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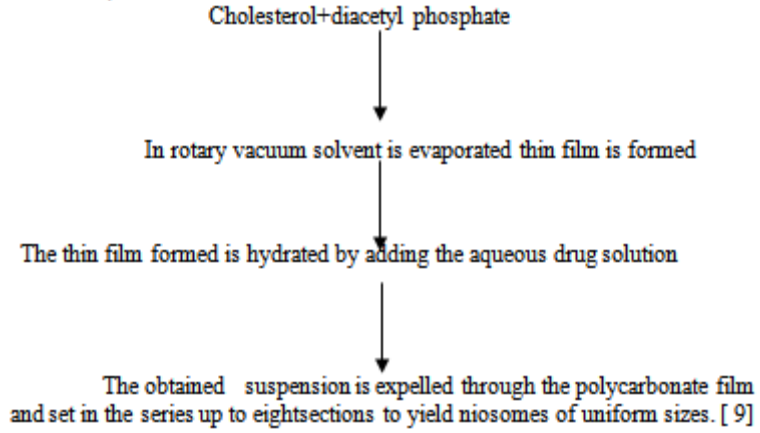
2) Multilamellar vesicles (MLV): The size of these vesicles is in range of the 0.5-10µm.
3) Large unilamellar vesicles (LUV): The size of these vesicles is >0.10µm. [2]

ADVANTAGES OF NIOSOMES:

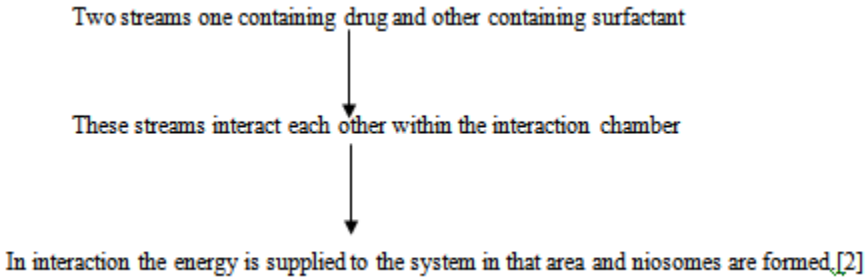
- Niosomes provide targeted drug delivery system.
- Enhances the bioavailability and skin penetration.
- Improves the therapeutic effect of drugs.
- No special storage and handling of surfactants used in niosomal formulations are required.
- It can be formulated as parenteral, oral, topical routes.
- In niosome water-based suspension is used which offers the huge patient compliance than the oily dosage forms.[8]

METHOD OF PREPARATION OF NIOSOMES

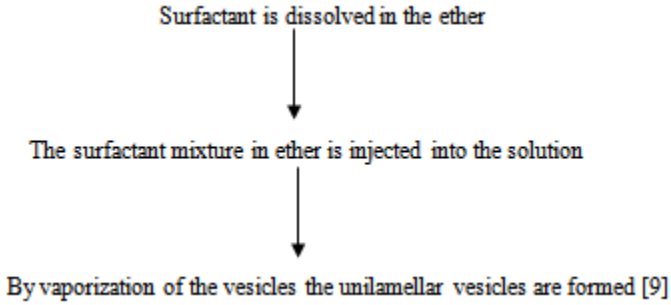
1) EXTRUSION METHOD:



2) MICROFLUIDISATION METHOD:



3)ETHER INJECTION METHOD:



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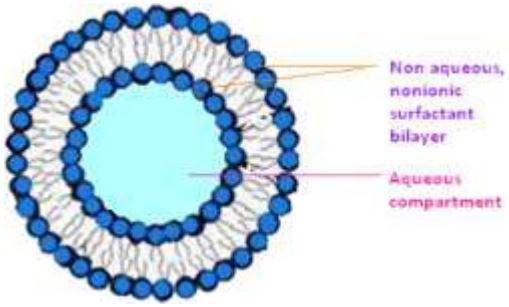
4)**SONICATION METHOD:**

In the glass vial the mixture of surfactant and cholesterol is added

↓

Mixture is sonicated for a time and small unilamellar vesicles are formed [2]

STRUCTURE OF NIOSOME:



NOVEL HERBAL FORMULATIONS IN NIOSOMES

Herbal extract	Category	Application	References
Colchicine	Anti-rheumatic	Prolong release	[11]
Silymarin	Gall bladder and liver treatment	Enhance bioavailability	[11]

II. CONCLUSION:

As herbal medicine have been generally utilized in all over globe since ancient time. It has been recognized by specialist doctors, patient for these therapeutic effect and reduces toxicity and have less adverse effect than conventional doses form.

Novel drug delivery system overcome the patient non compliance and avoid the repeatedadministration and increases the bioavailability and efficacy.

Drug researchers have moved their concentration to planning a drug delivery system for herbal medicines using a scientific approach.By formulating herbal drug in nanocarriers would be a promising aide for advancement of the progress of core remedy and will act as a promising proposal for many pathological conditions.

The herbal drug has a symmetrical way of interest to fabricate nanoparticles compared to synthetic drugs

Thus it is important to in-corporate the novel method of drug delivery in herbal medicines[1].

The main conclusion is that in untargeted drug delivery system the drug enters in cell and release into the healthy cells and infected cells so due this toxcity occurs.

But by incorporating the drug in novel carrier system the drug enters in cell and release in the healthy cells which avoids the toxicity.

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