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VESICULAR DRUG DELIVERY SYSTEM: AN INNOVATIVE APPROACH IN FABRICATION AND DRUG TARGETING

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Abstract:

A novel drug delivery is nothing but delivery of a drug at a predetermined state which is designed as per the requirement, physiological aspects, drug profile, physiological conditions of body etc. Now a day's single novel drug delivery systems does not behave ideally as it having fewer side effects. In vesicular drug delivery system, the active moieties all encapsulated in vesicular structures which bridges gap between ideal and availability of novel drug delivery system. Liposomes, transferosomes, ufosomesniosomes, ehosomes, etc. are examples for vdds. In vdds advance have been made. The main aim of these reviews is to bring about a brief of vdds as novel approach in drug delivery system.

Key words: liposomes, niosomes, vesicular drug delivery system , particle size .

Introduction:

Since ancient era, many discussions were done on the drugs delivery system for better efficacy with no side effects. This discussion is continued till now for preparing a suitable drug with no side effects. As many drugs are having narrow therapeutic index their clinical are also limited thus therapeutic effectiveness of drugs is improved by formulatory them in suitable advantageous way. In previous years the efforts had been done, to develop a ndds, which fulfill desired characteristics by delivering a drug at a desired rate as per requirements ofbody, over a period of treatment should show activity at site of action. conventional dosage forms which unable to fulfill the desired characteristics of ndds. At present, no drug delivery system is available which behave ideally but attempts were made to bridge gap between ideal and availability of drug.

Definition:

"Vesicles have become the vehicle of choice in drug delivery system called Vesicular Drug Delivery System"

e.g. liposomes, Niosomes, Pharmacosomes etc.

Advantages:

Vesicular drug delivery systems have several advantages over the conventional dosages forms as well as prolonged released dosage forms as:

- Effective permeation of drugs into cells
- Prolongation of existence of drugs in systemic circulation.
- As selective uptake is taken place so reduces toxicity.
- Reduces the cost of therapy.
- Improves bioavailability.
- Hydrophilic-Lipophilic drugs can be incorporated.
- Sustained-release system function.
- Delayed elimination of rapidly metabolized drugs.
- Overpower the problems of the drug insolubility, instability, and rapid degradations.

Disadvantages:

- Along with numbers of advantages VDDS has some serious disadvantages which restrict their use.
- Drugs passively, which may lead to low drug loading efficiency and drug leakage in preparation, preservation and transport in vivo.
- Need of intensive sonication, lead to leakages of drug during storage. Thus, the major problem of their stability acts as a barrier and thus limiting their use.

Method of preprations of vdds:

Lipid hydration method/hand shaking method:

This is the simplest and most widely used method of physical dispersion. The lipid mixtures of different phospholipid the surfactants, cholesterol and some additives such as changed molecules are dissolved in organic solvent in flask. The flask is then attached to rotatary evaporates and rotated to 60 rpm as shown in figure 2

Solvent evaporates at 30 degress above the transition temperature of the liquid rotation is continued, until the formation of thin film inside the wall of the flask.in aqueous solution of drug is added and thin the dry film is hydrated above transition temperature of surfactant for specific time with constant.

EX: niosomes, Spingosomes

Sonication:

Mlv`s are sonicated at high energy level using either probe or bath ultrasonic disintegrator as shown in fig 3.

Using Probe: It is used for small quantities of suspensions which requires high energy. It may lead to contamination of preparation. when come in contact with metal which lead to degradation of lipid.

Using Bath:

It is used for large quantities of dilute lipids which may not be necessary to reach the limit of vesicle this are finally purified into suv`s by ultrasonification and are collect from supernatant. The vdds type may be affected by temperature, sonication, timeand power composition and concentration volume of product.

Reversed- phase evaporation of vesicles:

In this method phospholipids which are mixed with cholesterol can be used. The lipids are added to organic solvents in RBF latter containing aqueous phase is added to RBF which contain lipid phase. this mixture of two phase is subjected to ultra-bath sonification at 0^0 c. it leads to formation of w/o emulsion. The organic solvent is evaporate by rotary vacuum dryer under pressure. gel is formed which is subjected to agitation. The agitation cause collapse of water droplets due to this lipid monolayer which enclosed collapsed vesicles binds to adjacent vesicles and form largeunilamellar vessels.[fig:04]

EX;-niosomes and sphinosomes

Ether injection method:

In this method surfactant i.e. cholesterol along with additives are dissolved in organic solvents that diethyl ether this are injected slowly into the aqueous drug solution through a needle of gauge and maintained at constant temperature which is above the b.p of organic solvent. The organic solvents is evaporated by using rotary evaporator. During the vaporization single layer vesicles are formed [50-1000 micrometers]

Ex;-niosomes,

Double emulsion method:

In this method the polymer is dissolved in organic solvent and drug dissolved in aqueous phase is added to organic phase and then subjected to ultrasonification for specific time and power which leads to formation of emulsion followed by mechanical dispersion which results in phase inversion and leads to formation of multicompartment vesicles [w\o\w] This vesicle suspended in aqueous medium in which aqueous compartments are separated from which other by means of two phospholipid layer. The hydrophobic surface of monolayer from thin film of organic solvent. The organic solvent is removed by evaporation , thus vesicle are formed.[fig:05]

Characterization methods:

Entrapment efficacy:

The amount of material entrapped in the aqueous or lipid compartment by protamine aggregation or mini column centrifugation technique. Mini column centrifugation technique involves the use of spadixcolumn .

Particle size and size distribution:

It can be determined by light microscopy, fluorescence microscopy, electron microscopy, laser light scattering, photon correlation spectroscopy, gel exclusion and zetasizer.

Vesicle shape and lamellarity:

It can be assayed by nuclear magnetic resonance and freeze fracture microscopy.

Surface charge:

It is measured by free flow electrophoresis and zeta potential.

Turbidity measurement:

Turbidity can be measured by neplometric turbidity units. It is used for measures the intensity of light scattered at 90 degrees as a beam of light passes through a water sample.

Stability:

Volume of particular formulation in a specific container or closure system, to remain within its physical, chemical, microbiological, therapeutic and toxicological specifications.

Pyrogenesity:

Pyrogenesity testing using rabbit fever response or limulus amebocyte lysate [LAL] test and animal toxicity.

Phospholipid peroxidation:

It is quantitatively determined by using UV absorbance, iodometry and GLC techniques.

Zeta potential:

It is the potential difference across phase boundaries between solids and lipids. It is measures of the electrical charge of particles are that are suspended in liquid.It is low negative than -15mv typically shows the beginnings of agglomeration of particles

Osmolarity:

It refers to the number of solute particles per 1L of solvent, whereas osmolality is the number of solute particles in 1KG of solvent. For dilute solutions the difference between osmolarity and osmolality is significant.

Applications:

- It is used in gene delivery : gene and antisense therapy, genetic vaccination
- It is used as artificial blood surrogates.
- It is used in cosmetics and dermatology.
- It is used in targeting of bioactive agents.
- It is used to reticular endothelial system.
- It is used for many purposes in drug delivery.
- It is used for transdermal delivery of hydrophilic and impermeable drugs through the skin.
- It is used in the treatment malnutrition.
- It is used in the regulation of immune response.
- It is used in enzyme mobilization and bioreactor technology.
- It is used to treat acute and chronic liver disease of toxic metabolic or infective orgin or of degenerative nature.

Conclusion: Vesicular drug delivery system is considered as useful carrier system, as it is having site specific targeting action of drugs. Along with this activity, it is having several advantages, which makes this vesicular

system to gain popularity in present scenario. Drugs are targeted directly to their site specific action to prevent toxicity and undesirable effects at the other sites, which is used for enhancing bioavailability. The dose of the drug administered can be reduced and to increase the pharmacological action of drug. Utilization and solving problems of pharmaceutical field by outstanding example of VDDS such as liposomes, niosomes, proteasomes etc.have been useful drug delivery system in current scenario and have gained advantage over conventional drug delivery system.

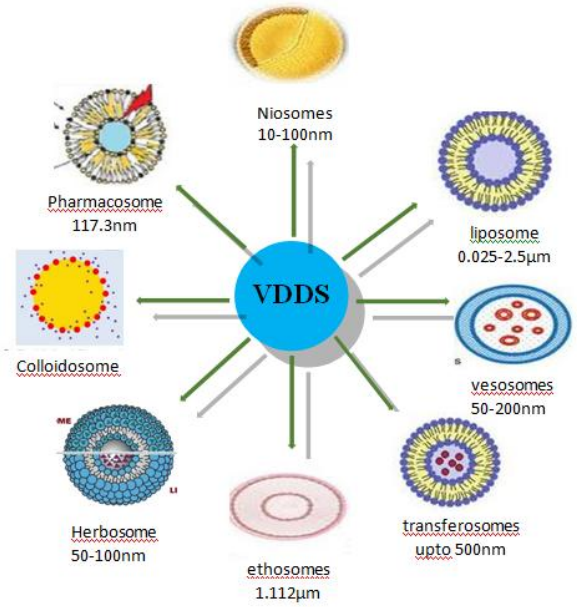

Figure-1: Types of vesicular drug delivery system.

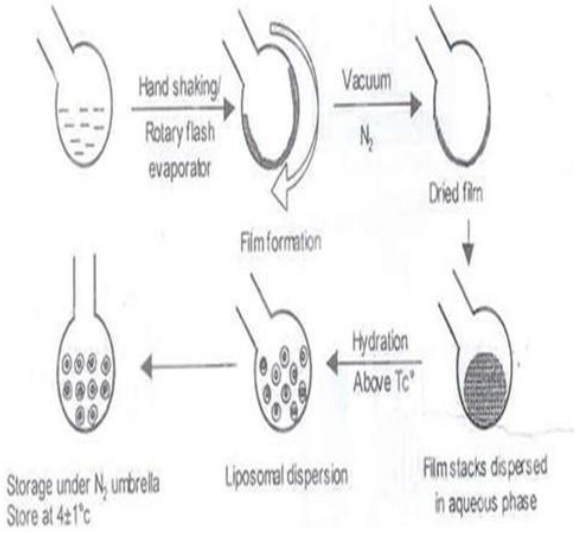

Figure-2: Hand shaking method.

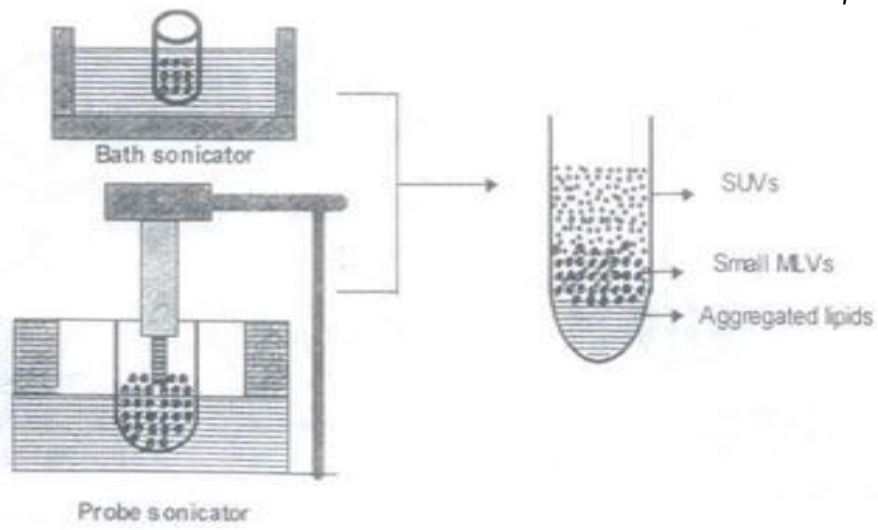

Figure-3: Sonication method.

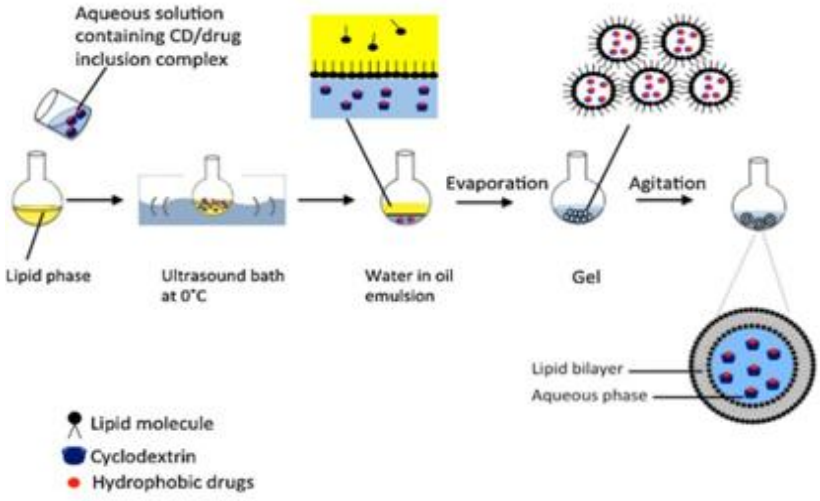

Figure-4: Reverse phase evaporation method.

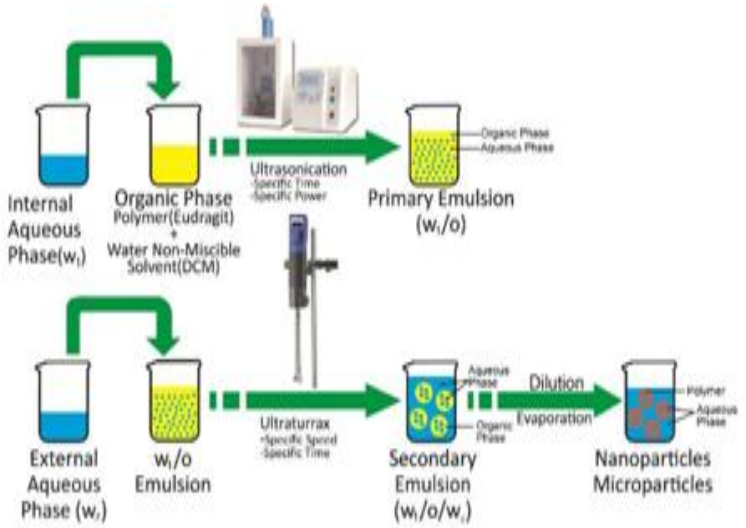

Figure-5: Double Emulsion Method.

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