

A Review on Novel Drug Delivery System

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Abstract- Drug delivered can have significant effect on its efficacy. Some drugs have an optimum concentration range with in which maximum benefit is derived and concentrations above (or) below the range can be toxic or produce no therapeutic effect. Various drug delivery and drug targeting systems are currently under development. The main goal for developing such delivery systems is to minimize drug degradation and loss, to prevent harmful side effects and to increase bioavailability. Novel drug delivery technologies have gained the importance to achieve modified delivery of herbal drugs their by increasing the therapeutic value as well as reducing toxicity. The present reviews gives information regarding various novel techniques used for improving safety and efficacy of phytomedicines and application of novel formulation. The main goal for developing such delivery systems is to minimize drug degradation and loss, to prevent harmful side effects and to increase bioavailability. Targeting is the ability to direct the drug loaded system to the site of interest. Among drug carrier one can name soluble polymers, microparticles made of insoluble (or) biodegradable natural and synthetic polymers, microcapsules, cells, cell ghosts, lipoproteins, liposomes and micelles. Two major mechanisms can be distinguished for addressing the desired sites for drug release, (a) Passive and (b) Active targeting. Controlled drug carrier systems such as micellar solutions, vesicles and liquid crystal dispersions, as well as nanoparticle dispersions consisting of small particles of 10 –400 nm show great promise as drug delivery systems. Hydrogels are three dimensional, hydrophilic, polymer networks capable of imbibing large amounts of water or biological fluids.

Keywords- Novel drug delivery system, Pytosomes, Nanoparticles, Microsphere, Transdermal drug delivery system.

I. INTRODUCTION

Novel drug delivery systems is the new system Recent advances in the understanding of pharmacokinetic & pharmacodynamics behaviour of drug have offer a more rational approach to the development of optimal drug delivery system. The novel drug delivery systems (NDDS) are carriers which maintain the drug concentration in therapeutic range for

longer period of time. Novel drug delivery systems can include those based on physical mechanisms and those based on biochemical mechanisms. Physical mechanisms also referred as controlled drug delivery systems include osmosis, diffusion, erosion, dissolution and electro transport. Biochemical mechanisms include monoclonal antibodies, gene therapy, and vector systems, polymer drug addicts and liposomes. Targeting is the ability to direct the drug-loaded system to the site of interest. Two major mechanisms can be distinguished for addressing the desired sites for drug release: (I) Passive and (ii) Active targeting. Therapeutic benefits of some new drug delivery systems include optimization of duration of action of drug, decreasing dosage frequency, controlling the site of release and maintaining constant drug Levels.

ADVANTAGES OF NOVEL DRUG DELIVERY SYSTEM.

1. Optimum therapeutic- drug concentration in the blood or in tissue may be maintained over a prolonged period of time.
2. Pre- determined release rates of extended period of time may be achieved.
3. Duration for short half- life drug may be increased
4. By targeting the site of action, side effects may be eliminated.
5. Frequent dosing and wastage of the drug may be reduced or excluded
6. Better patient compliance may be ensured.

RECENT DEVELOPMENT IN NOVEL DRUG DELIVERY SYSTEM

1. Phytosome
2. Liposome
3. Nanoparticles
4. Emulsions
5. Microsphere
6. Ethosome
7. Solid lipid nanopartical
8. Niosomes
9. Proniosomes
10. Transdermal Drug Delivery System
11. Dendrimers

12. Liquid Crystals
13. Hydrogels

Phytosome

Phytosomes are lipid compatible molecular complex which are composed of “phyto” which means plant and “some” meaning cell-like. Complexing the polyphenolic phytoconstituents in the molar ratio with phosphatidyl choline results in a new herbal drug delivery system, known as “Phytosome”. Phytosomes are advanced forms of herbal products that are better absorbed, utilized to produce better results than those produced by conventional herbal extracts. Phytosomes show better pharmacokinetic and therapeutic profiles than conventional herbal extracts.

Advantages of phytosome

1. Phytosome increases the absorption of active constituents, so its dose size required is small.
2. There is appreciable drug entrapment and improvement in the solubility of bile to herbal constituents, and it can target the liver.
3. In Phytosome, chemical bonds are formed between phosphatidylcholine molecules, so it shows good stability.
4. Phytosome improves the percutaneous absorption of herbal phytoconstituents.

Liposome

Liposomes are concentric bi-layered vesicles in which aqueous volume is entirely enclosed by a membranous lipid bi-layer mainly composed of natural or synthetic phospholipids. The liposomes are spherical particles that encapsulate the solvents which are freely floating in the interior.

Advantages of liposomes

1. The high biocompatibility.
2. The easiness of preparation.
3. The chemical versatility that allows the loading of hydrophilic, amphiphilic, and lipophilic compounds. The simple modulation of their pharmacokinetic properties by changing the chemical composition of the bilayer components.

Nanoparticles

Nanotechnology is science of matter and material that deal with the particle size in nanometres. The word “Nano” is derived from Latin word, which means dwarf (1nm=10⁻⁹m). Nanoparticles are defined as particulate dispersions or solid particles with a size in the range of 10-1000nm. The drug is dissolved, entrapped, encapsulated or attached to a nanoparticle matrix.

Advantages of nanoparticle delivery system

1. Nano particulate system delivers the herbal formulation directly to the site of action.
2. Increased efficacy and therapeutic index.
3. Increased stability via encapsulation.
4. Improved pharmacokinetic effect.
5. Producing with various sizes, compound surface properties.

Emulsions

Emulsion is a biphasic system in which one phase is intimately dispersed in the other phase in the form of minute droplets in ranging in diameter from 0.1µm to 100 µm. In emulsion, one phase is always water or aqueous phase, and the other phase is oily liquid, i.e. non aqueous. Among them, the micro emulsion is also called Nano emulsion, and the sub-micro-emulsion is called liquid emulsion. Micro emulsion is a clear, thermodynamically stable, frequently in combination with a co-surfactant.

Advantages of emulsion-based formulations

1. It can release the drug for a long time because it is packed in the inner phase and makes direct.
2. Contact with the body and other tissues.
3. As a result of the lipophilic drugs being made into o/w/o emulsion, the droplets of oil are phagocytosis by macrophages and increase its concentration in liver, spleen and kidney.
4. As the emulsion contains herbal formulation, it will increase the stability of hydrolysed formulated material and improve the penetrability of drug into skin and mucous.
5. The new type, viz., Emlenium emulsion, is used as an anti-cancer drug and causes no harm to the heart and liver.

Microsphere

Microsphere comprises of small spherical particles, with diameters in the micrometer range, typically 1µm to 1000 µm (1 mm). Microspheres are sometimes

referred to as micro-particles. Microspheres can be manufactured from various natural and synthetic materials. Glass microspheres, polymer microspheres and ceramic microspheres are commercially available. Microspheres are classified as biodegradable or non-biodegradable. Biodegradable microspheres include albumin microspheres, modified starch microspheres, gelatine microspheres, polypropylene dextran microspheres, polylactic acid microspheres, etc. According to the current literature reports on non-biodegradable microspheres, polylactic acid is the only polymer approved to be used by people, and it is used as a controlled-release agent. Solid and hollow microspheres vary widely in density and therefore are used for different applications .

Twosomes

Ethosomes are developed by mixture of phospholipids and high concentration of ethanol. This carrier can penetrate through the skin deeply lead to improve drug delivery into deeper layer of skin and in blood circulation. These formulations are useful for topical delivery of alkaloids in form of gel and cream for patients comfort. They show increase in their permeability through the skin by fluidizing the lipid domain of the skin. Unstable nature and poor skin penetration are limits for Ethosomes topical delivery. The Ethosomes was developed and examined for their ability the topical absorption of Tetrandine through dermal delivery, and the relation of formulations to the pharmacological activity of Tetrandine loaded in the formulation was also accessed. Result of the drug levels in rat plasma showed that when Tetrandine loded Ethosomes were topically administered in rats the drug level was low to be detected in rat plasma. By providing fewer delivery of Tetrandine into bloodstream, topical administration might offer favorable efficacy with reduced side effects, thus leading to improve patient's compliances. In conclusion, Ethosomes were demonstrated to be promising carrier for improving topical delivery of Tetrandine via skin .

Advantages of ethosomal drug delivery

1. Ethosomes enhance transdermal permeation of drug through skin.
2. Ethosomes are a platform for the delivery of large amounts of diverse groups of drugs.
3. Ethosomal drug is administered in semisolid form resulting in improvement in patient's compliance..

Solid Lipid Nanoparticles (SLN)

It is a technique developed in the 1990s. It is a colloidal carrier used especially for the delivery of lipophilic compounds. The average mean size of solid lipid nanoparticles ranges from 50 nm to 1000 nm. Solid lipid nanoparticles are composed of lipid matrix, which becomes solid at room temperature and also at the body temperature .

Niosome

Niosomes are multilamellar vesicles formed from non-ionic surfactants of the alkyl or dialkyl polyglycerol ether class and cholesterol. Earlier studies, in association with L'Oreal have shown that, in general, niosomes have properties as potential drug carriers similar to liposomes. Niosomes are different from liposomes in that they offer certain advantages over liposomes .

Proniosomes

Proniosomes gel system is step forward to niosome, which can be utilized for various applications in delivery of actives at desire site. Proniosomal gels are the formulations, which on in situ hydration with water from the skin are converted into niosomes .

Transdermal Drug Delivery System

Transdermal drug delivery system has been an increased interest in the drug administration via the skin for both local therapeutic effects on diseased skin (topical delivery) as well as for systemic delivery of drugs. But immense potential lies in transdermal drug as future smart drug delivery devices . These are the devices in which drug present in the formulation permeates into the systemic circulation by diffusion to stratumcorneum and further to the effected organ. These devices use polymer matrix, adhesive bandage and permeation enhancers.

Dendrimers

Dendrimers are nanometer-sized, highly branched and monodisperse macromolecules with symmetrical architecture while their stability and protection from the Mononuclear Phagocyte System (MPS) is being achieved by functionalization of the dendrimers with polyethylene glycol chains (PEG) .

Liquid Crystals

Liquid Crystals combine the properties of both liquid and solid states. They can be made to from different geometries, with alternative polar and non-polar layers (i.e., a

lamellar phase) where aqueous drug solutions can be included

Hydrogels

Hydrogels are three-dimensional, hydrophilic, polymeric networks capable of imbibing large amounts of water or biological fluids. They are used to regulate drug release in reservoir-based, controlled release systems or as carriers in swellable and swelling-controlled release devices.

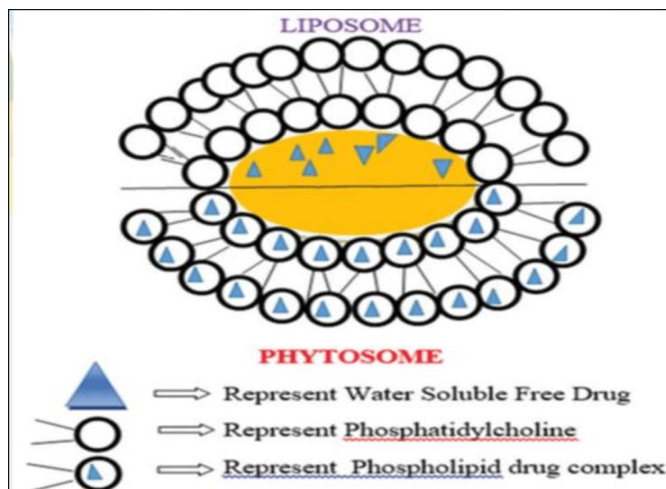


Fig no 1 : LIPOSOME AND PHYTOSOME

II. CONCLUSION

Novel Drug delivery System (NDDS) NDDS is a combination of advance technique and new dosage forms which are far better than conventional dosage forms. Advantages of Novel Drug Delivery System are: Optimum dose at the right time and right location, Efficient use of expensive drugs, excipients and reduction in production cost, Beneficial to patients, better therapy, improved comfort and standard of living. Basic modes of novel drug delivery systems are: Targeted Drug Delivery System, Controlled Drug Delivery System etc.

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