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ADVANCES IN NOVEL DRUG DELIVERY SYSTEM: INNOVATIONS AND FUTURE DIRECTIONS

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ABSTRACT

Plants are the medicines of nature and are used by people Earth has been for food and medicine since ancient times. Today's worldwide Movements to locate herbal medicines in laboratory plants Scale and subsequent pre-clinical and clinical trials Business with an effective human drug supply system. The term "Novel drug delivery system"(NDDS) describes methods, compositions, apparatus and system for a delivering a medical substance. NDDS are considerably superior new dosage form. Novel medication delivery methods are derived based on Biological and physical principles. The development of an existing therapeutic molecule from a traditional form to a unique delivery method can greatly increase its performance in terms ofpatient conformity, safety, and effectiveness. Different strategies, such as medical equipment or drug equipment combination products, are used in novel drug delivery systems. Developing such delivery methods is primarily done toreduce medication loss and degradation, avoid negative side effects, and boost bioavailability. Many new carriers for the last ten years Implants have been documented including liposomes, Nanoparticles, hytosomes and ethosome Successful modificated distribution of different herbal medicines. The controlled drug delivery system or physicalmechanism encompasses the processes of erosion, diffusion, osmosis, and dissolution.

KEYWORDS: NDDS, Liposomes, Nanoparticles, Enhanced drug delivery.

INTRODUCTION

There are several different carriers with benefits over made on the basis types in the novel

drug delivery systems (NDDS). The traditional dosage forms display high dose and low availability, in-stability, first pass effect, fluctuation of plasma drug levels, and fast release of medicinal products. By performance, protection, compliance with patients, and product shelf life.3 NDDS will mitigate the problems. Becoming aware of the potential effects on human health and environmental sustainability and due to the growed environmental performance of human-made nanoparticles, nanoparticles are of current interest.[1] The procedure of giving a Medication or pharamaceutical product to provide the intended therapeutic effect is known as drug delivery. The way a medicine is administered matters since it greatly influences how effective it is various stratiges, such as Medical derives or Medication_device combo products are used in NDDS.

Monoclonal antibodies, gene therapy, vector systems polymer drug addicts, and liposomes are example of Biochemical methods among the drug carriers are soluble polymers, cells, cell ghosts, lipoproteins, liposome, microcapsules, and microcaparticles composed of insoluble or Biodegradablenatural and synthetic polymers.[2]

This led to the development of novel concepts for managing the pharmacokinetics, pharmacodynamics, non-specific toxicity, immunogenicity, biorecognition, and effectiveness of pharmaceuticals. These innovative techniques, which go by the name "drug delivery systems" (DDS), are founded on multidisciplinary methods that bring together molecular biology,pharmaceutics, polymer science, and bioconjugate chemistry. Different drug delivery and drug targeting systems are now being developed in order to reduce drug degradation and loss, avoid negative side effects, boost medication bioavailability, and raise the proportion. Certain novel drug delivery methods provide therapeutic advantages such as extending the medication's duration of action, lowering dosing frequency, regulating the location of release, and preserving steady drug levels.[6-10]

Novel medication delivery methods provide the following benefits over traditional drug administrations.[11-14]

- The Blood System’s or a tissue’s optimal theropetic medication.
- The drug’s short half_life might be extended.
- By focusing on the place of action, adverse effectsmight be reduced.
- Less medication waste and frequent dosage may bepossible.
- Increased adherence from patients.

A. Phytosome

Phytosome are a vesicular delivery system for phytosome substance found in herbal extracts and lipid-binding phytosome prevent irtal components of herbal extracts fromdegrading.[15]

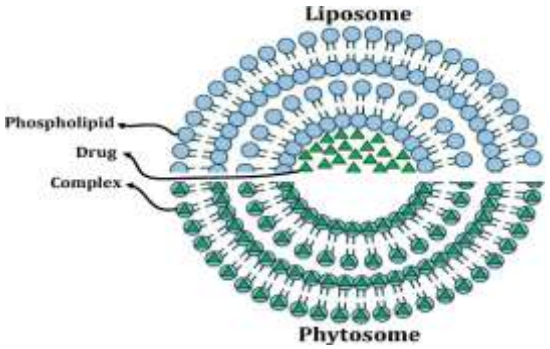

Fig. no. 1: Phytosomes.

Advantages of phytosome

1. Enhanced Bioavailablity of phospholipid complexes
2. Greater absorption.
3. Longer action time.
4. Low dose is necessary due to high bioavailability.
5. Phosphatidylcholine protects the liver rather thanacting as a carrier.[16]

B. Liposomes

A Liposome is a spherical – shaped vesicle that is composed of one or more phospholipid bilayers due to their size and hydrophobic lipid – filled minuscule sacs consisting of fat molecules around a water center are extensively employed in clinical cancer therapy. Polar medication molecules can be encapsulated thanks to the polar nature of the liposomal core.[17]

Advantages of liposomes

1. Provides selective passive targeting to tumour tissues.
2. Increased efficiency and therapeutic index.
3. Increased stability via encapsulation.
4. Anti-inflammatory and anti-cancer medications thattarget particular sites.

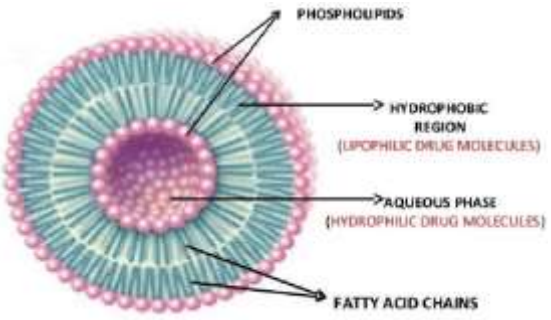

Fig. No. 2: Liposomes.

C. Niosomes

A unique vesicular drug delivery technology called niosomes makes it possible to distribute medications in a focused, regulated, and long-lasting way. Are very small and microscopicin size although structurally similar to liposomes, they offer several advantages over them. The reason niosomes are non toxic is that they are made of non-ionic surfactants, which is how they got their name. The charged molecule in the cholesterol, which gives the structure stiffness, keeps the preparation stable. Niosomes are created when non-ionic surface-active chemicals selfassemble. Because of their structure, they may be utilized to load and distribute both hydrophilic and hydrophobic medicines. Niosomes are a noveldrug delivery system, in which the Medication is encapsulatedin a vesicle.[22]

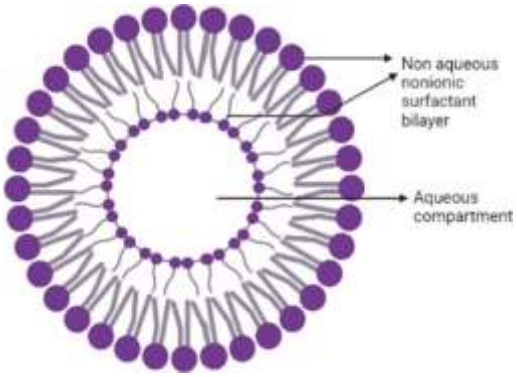

Fig. No. 3: Niosomes.

Advantages of niosomes

1. To control drug delivery rate and provide normal vesicle inexternal non-aqueous medium, niosomal dispersion in an aqueous phase.
2. They boost the stability of the medication that is entrapped and are both osmotically active and stable.
3. They can be used topically, parenterally, or orally to reachthe site of action.
4. They increase the epidermal penetration of medications and increase the oral

bioavailability of poorly absorbed medications.

5. The surfactants may be employed safely in the niosomeproduction process since they are biodegradable, biocompatible, and nonimmunogenic
6. To control drug delivery rate and provide normal vesicle inexternal non-aqueous medium, niosomal dispersion in an aqueous phase.
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D. Nanoparticles

Nanoparticles can be either amorphous or crystalline, and they are in the solid form. This includes nanospheres and nanocapsules with sizes between 10 and 200 nm. They can encapsulate and/or adsorb a medication, shielding it from enzymatic and chemical deterioration.

Classification of nanomaterials

A. Nanotubes -They comprise carbon atom-based hollow cylinders. Additionally, they can be formed into test tubes or possible medication delivery devices by filling and sealing them.
B. Nano wires- A single human hair strand is encircled by glowing silica microwire. It appears fragile.
C. Nanoshells- Gold coated hollow silica spheres are known as nanoshells. The ability to affix antibodies to the surfaces of these shells allows scientists to target certain shells, like cancer cells. One day, drug- containing polymers will likewise be contained in nanoshells.
D. Nano pore- Applications for cancer research and therapy include nanopores. These pores, which are engineered into particles, are so small that individual strands of DNA may flow through them, enabling incredibly accurate and effective DNA sequencing. medication producers may also utilize nanopores to regulate the pace of medication diffusion in the bodyby designing them onto the surface of drug capsules at a size that is only slightly bigger than the molecules in the medicine.

E. Gold nanoparticles- These nanoparticles contain a solid core, as shown in thetransmission electron microscopy image. North Western University researchers are developing very sensitive detection techniques for DNA and protein markers linked to a variety of cancer types, including breast and prostate cancer, by using gold particles. [31-36]

Advantages of nanoparticles[39]

1. After parenteral injection, it is simple to modify the size and surface properties of nanoparticles to accomplish bothpassive and active medication targeting.
2. They manage and maintain the drug's release throughout transportation and at the location of localization, modifying the drug's distribution throughout the body and its eventual elimination to enhance therapeutic efficacy and minimize negative effects.
3. Targeting particular sites can be accomplished by the use of magnetic guiding or by affixing targeting ligands to particlesurfaces.
4. The system may be administered through a variety of methods, including as intraocular, parenteral, nasal, and oral.

F. Transfersome

Transfersome is a highly adaptive and stress-responsive dynamic aggregate. It is a pliable vesicle encircled by the intricate Fat bilayer and featuring an aqueous core. The bilayer's shape and local composition determine the vesicle.both self control and self-improvement. This enables the client to function as a non-intrusive target drug transport agent after successfully navigating several convey hurdles. supplying medicinal substances and ensuring their ongoing release These transfers are particularly suited for skin penetration since they are many orders of magnitude more elastic than standard liposomes.Squeezing them through the stratum corneum's internal lipid causes the transfers, which hinder skin penetration. The adaptability of the transfersoma membrane is attained with the proper combination of surfactive components.[24-30]

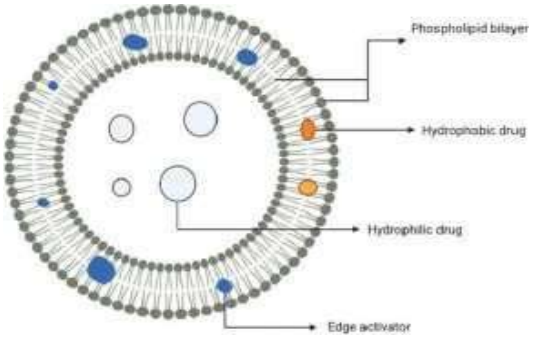

Fig. No. 4: Transfersome.

Advantages of transefersome

- They have a high capture efficiency of around 90% in thecase of lipophilic medication
- This high deformity increases the penetration of the intactvesicles.
- Because transfers have a combined hydrophobic and hydrophilic infrastructure, a broad range of soluble drugmolecules.
- They release its contents gradually and steadily, much likea storehouse.[25]

CONCLUSION

The innovative dosage forms in NDDS combine modern technology with superiority over conventional dosage forms. The innovative drug delivery system offers advantages to patients, better therapy, reduced manufacturing costs, efficient use of expensive pharmaceuticals and excipients, ideal dose at the right time and location, improved comfort and quality of life, and benefits to patients. Pharmaceutical science focuses on the administration of medications, vaccinations, gene therapy, and the commercial development of new carriers, among other innovative methods for drug transport and targeting.

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