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Review Article

NOVEL DRUG DELIVERY SYSTEM FOR AYURVEDIC FORMULATIONS

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Abstract

Aim of the study: Novel drug delivery systems offer a variety of formulations suitable for different routes of administration, which are useful to deliver herbal drugs with improved palatability, bioavailability and target specificity, hence could serve a custom made dosage form which suits better for today's life style.

Keywords: NDDS, Ayurveda, Liposomes, Phytosomes, Bioavailability

Introduction

The methods by which a drug is delivered i.e. delivery system, can have a significant effect on drug's efficacy and therapeutic action. Drugs have an optimum concentration range within which maximum benefit is derived and concentrations above or below this range can be toxic or produce no therapeutic benefit respectively. This gave the new ideas on controlling the pharmacokinetics, pharmaco- dynamics, nonspecific toxicity, immunogenicity, bio-recognition, and efficacy of drugs as Novel Drug Delivery Systems.

Advantages:

- Increased bioavailability and efficacy
- Tailored dosing and dose frequency
- Fewer raw materials required to compound desired formulation.
- Ready to use devices are more acceptable and suits considered fast life.
- Targeted delivery of maximum drug irrespective of barriers like, pH and first pass effect
- Sustained and controlled drug delivery

Disadvantages:

- Low bioavailability
- Low palatability
- Frequent, bulk and complicated dosing
- No target specificity
- Variety of raw materials required in bulk for processing

Recent Developments:[1,2,3]

Drugs can be prepared as sub-lingual, self adhesive patch on skin, sumps e. g. Insulin pump or as special pervious plastic injects below skin, e.g. Norplant using following carriers:

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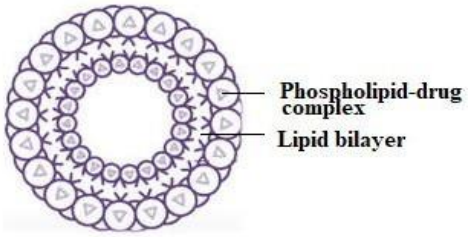
Phytosomes

Phospholipids-based drug delivery system has been found promising for valuable and efficient herbal drug delivery. Complexing the polyphenolic phytoconstituents in the molar ratio with phosphatidyl choline results in a new herbal drug delivery system, known as "Phytosomes". Like phytosomes of flavoioids from fruit of the milk thistle plant (S. marianum, family: Asteraceae) known for its hepatoprotective effect. Following are some advantages

- ✓ Absorption Increased
- ✓ absorptionReduced dose
- ✓ size
- ✓ Improved solubility and targeting
- ✓ Good stability due to chemical bonding between phosphatidylcholine molecules
- ✓ Improved percutaneous absorption

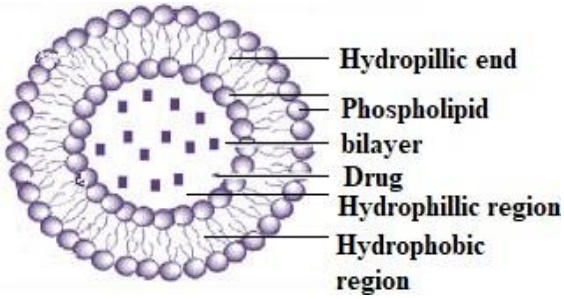


Liposomes[4]

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. These are spherical particles that encapsulate the solvents which are freely floating in the interior. Liposome is 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 liposome is spherical particles that encapsulate the solvents which are freely floating in the interior. The liposomes are spherical particles that encapsulate a fraction of the solvent, in which they freely diffuse (float) into their interior. Following are some advantages:

- High biocompatibility
- Easy preparation

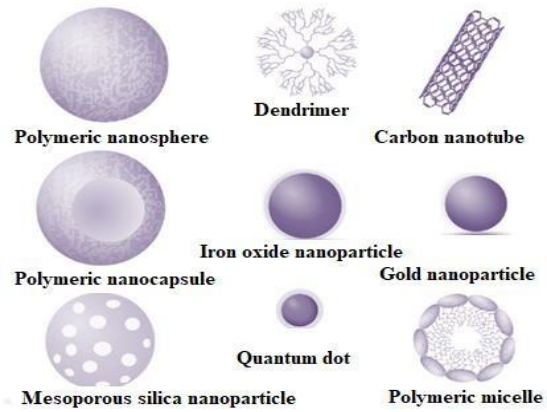
 Chemically versatile to loading of hydro / lipo / amphiphilic compounds
 Simple modulation in pharmacokinetic properties by changing chemical composition of bilayer components



Nanoparticles

Nanoparticles are nano- or sub-nano-sized structures composed of synthetic or semisynthetic polymers. Nanoparticles are colloidal systems with particles varying in size from 10 nm to 1000 nm. It is an effective system as the formulation is encapsulated in it easily and can easily reach the effective site. Microencapsulation of herbal extract in nanopaticulate is an effective way used to protect drug or food ingredients against deterioration, volatile losses, or premature interaction with other ingredients. Following are some advantages:

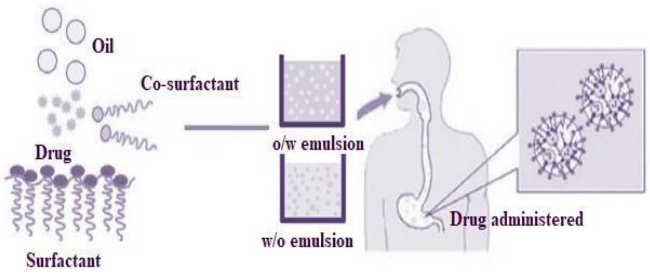
- Direct delivery to at site of action
- Increased efficacy
- Increased stability via encapsulation
- Improved pharmacokinetics
- Formulation options of various size and surface properties



Emulsion

Emulsion is a biphasic system in which one phase is intimately dispersed in the other phase in the form of minute droplets ranging in diameter from 0.1 µm to100 µm. In emulsion, one phase is always water or aqueous phase, and the other phase is oily liquid, i.e., nonaqueous. Among them, the micro-emulsion is also called nano-emulsion and the sub-micro-emulsion is called lipid emulsion. Micro-emulsion (ME) is a clear, thermodynamically stable, isotropic mixture of oil, water and surfactant, frequently in combination with a co-surfactant. Following are some advantages:

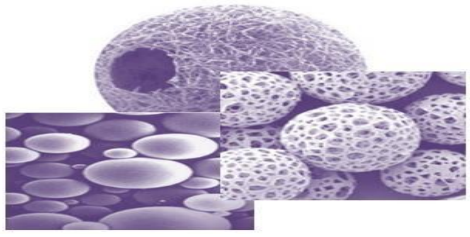
- Sustained drug release
- Enhanced bioavailability



Microsphere

The microsphere comprises of small spherical particles, with diameters in the micrometer range, typically 1 µm to 1000 µm (1 mm). 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, gelatin microspheres, polypropylene dextran microspheres, polylactic acid microspheres, etc. Following are some advantages:

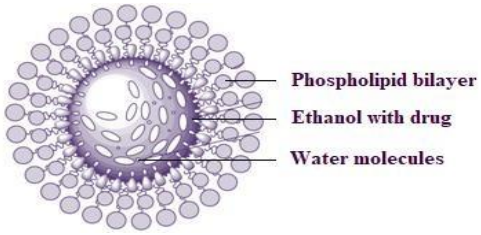
- Can be ingested or injected
- Can be changed for desired release profiles
- Site-specific delivery / organization targeted release
- Easy drug release from formulation



Ethosome

Ethosomes are phospholipids-based elastic nano-vesicles having high content of ethanol (20% -45%). Ethosomes were developed as novel lipid carriers composed of ethanol, phospholipids and water and to improve the delivery of various drugs to the skin. It enables drugs to reach the deep skin layers and / or systemic circulation. Following are some advantages:

- Enhanced transdermal permeation of drug through skinHigh drug loading capacity for variety of drugs



Micropellets

Herbal gastrointestinal controlled drug delivery dosage forms including pellets and process for their preparation described is novel oral dosage form for administration of an herbal extract and process for preparing the same, wherein a herbal extract is coated on pellets and the said pellets are either filled into a capsule or compressed into a tablet.

- Controlled release & less susceptible to dose dumping
- Serves taste-masking
- Free dispersion in GIT & increased drug absorption
- Reduced peak plasma fluctuations and minimized side effect

Conclusion

Ayurvedic Kalapa is accepted in their original form either made in water soluble form like Kalka or Swaras or in oil form like Ghrita or Taila, but when we use active constituent of certain herbal drug in new drug technology we can make sure the presence of all active constituents in drug delivering devices like phytosome, ethosome, tran-dermal drug delivery, micropellet and nanoparticle formulations etc. They have proved high efficacy, bioavailability, low dose, low making cost and eco-friendly nature. So, there is great potential in development of novel drug delivery system for herbals.

Traditional systems of medicines are proven, most of the patients have faith but there is a common perception that formulations are tuff and time consuming to prepare. Ayurvedic medicines are pharmaceutically and therapeutically exclusive, hence well tested and evaluated NDDS may serve more convenient options which suits better in improving life style as well as have controlled release, better bioavailability and fewer side effects as compared to conventional dosage forms. NDDS may be more useful for diseases with long time treatment, so easy to take medicine may lower the chances of treatmentdumping.

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