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Research Article

A Systematic Review On: Novel Herbal Drug Delivery System And It's Type , Application

Sandhya A. Wadkar*[1], Snehal S. Gadade[2], Viraj A. Mahajan[3], Nilesh B. Chougule[4]

[1,2]*Student, Ashokrao Mane Institue of Pharmacy, Ambap 416112*
[3]*Assistant Professor, Ashokrao Mane Institue of Pharmacy, Ambap.*
[4]*Principle, Ashokrao Mane Institute of Pharmacy, Ambap.*

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ABSTRACT

Innovative herbal formulations, including polymeric nanoparticles, nanocapsules, liposomes, phytosomes, animations, microspheres, transfersomes, and ethosomes , have been documented through the use of proactive and plant-based selection techniques. Improvements in solubility, bioavailability, and toxicity protection, as well as improved pharmacological sustained delivery and resistance to physical and chemical deterioration, are just a few of the unusual formulations' impressive advantages over traditional plant actives and extracts. Innovative herbal medicine delivery systems provide fresh opportunities for the proper distribution of herbal medicines at the appropriate time, location, and concentration. They also provide a scientific means of confirming the standardization of herbal medications. Through the application of innovative drug delivery technologies, different herbal components and herbs may have more efficacy and fewer negative effects when used in herbal therapy. Through the application of innovative drug delivery technologies, different herbal components and herbs may have more efficacy and fewer negative effects when used in herbal therapy. "Some" denotes something that resembles a cell, and "phyto" denotes a plant. Small structures resembling cells are called phytosomes. The bioactive phytoconsituents of the herb extract are surrounded and bonded by a lipid in these sophisticated types of herbal formulations. Water-soluble substances like flavonoids and glycosides make up the majority of the bioactive components of phytomedicines.

INTRODUCTION

The development of a novel drug delivery system (NDDS) for herbal medications has received a lot of interest during the last few decades. Throughout the course of treatment, conventional dosage forms—including those with prolonged release—cannot adequately direct phytoconstituents to the desired target site to achieve the maximum

***Corresponding Author:** Sandhya A. Wadkar
Address: *Student, Ashokrao Mane Institue of Pharmacy, Ambap 416112*
Email : sandhyawadkar08@gmail.com
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therapeutic response, nor can they hold the drug component at a specific rate as directed by the body's requirements. The creation of nano-sized dosage forms (polymeric nanoparticles and nanocapsules, liposomes, solid lipid nanoparticles, phytosomes, and nanoemulsion) offers several benefits for the study of phytoformulation in relation to herbal medicines. These benefits include increased solubility and bioavailability, protection against toxicity, increased pharmacological activity, increased stability, improved tissue macrophage distribution, sustained delivery, and defence against chemical and physical degradation As a result, the nano-sized NDDSs of herbal medications may be used in the future to improve the effectiveness of the plant medicines and solve issues related to them. Liposomes are hydrophilic and hydrophobic materials' carriers; they are biodegradable and basically benign.[1] Targeting strategies and enhanced permeability and retention effect phenomena can be used by liposome-based drug delivery systems to decrease drug exposure in normal tissues and/or increase the therapeutic index of anti-cancer agents in tumor cells.[2] A number of dynamic fixes found in plants may be useful in enhancing restorative operators. For calming reveallets, it is crucial to identify evidence of the separation and accumulation of phytochemical clusters and individual components from herbs or plant materials. It has been determined that herbs contain at least fifteen major phytochemical groups, such as flavonoids, alkaloids, glycosides, volatile oils, tars, phytochromes, natural acids, amino acids, tannins, proteins, compounds, and mineral salts. Each group of phytochemicals is made up of numerous distinct chemical entities.

REASONS FOR NOVEL HERBAL DRUG DELIVARY SYSTEM: [3,4]

- To increase patient compliance and avoid repeated administration
- To deliver optimum amount of the drug exactly to “site of action” and starts working then and there
- To increasing the efficacy & reducing the side effect
- For “multi-drugs and multi-targets” mode for combination therapies for complex diseases,such as cardiovascular disease and diabetes

TYPES OF NOVEL HERBAL DRUG DELIVERY SYSTEM:

Different formulations, such as liposomes, phytosomes, pharmacosomes, niosomes, nanoparticles, microspheres, transferosomes, ethosomes, transdermal drug delivery systems, and proniosomes, among others, are included in the list of ways for innovative herbal drug delivery systems. These are spoken about below.

1. Liposomes

These are micro-particulate or colloidal carriers, which spontaneously develop when specific lipids are hydrated in aqueous conditions. They are typically 0.05-5.0µm in diameter. [5] A portion of the solvent is encapsulated by the spherical liposomes, which allow the solvent to freely diffuse or float into their core. Their concentric membrane count might range from one to many. Polar lipids, the building blocks of liposomes, are distinguished by the presence of both hydrophilic and lipophilic groups on the same molecule. Polar lipids self-assemble to generate colloidal particles that are self-organized when they come into contact with water. [6]

2. Phytosomes :

Although phytosomal complexes were initially studied for cosmetic purposes, during the past few years, growing evidence of their potential for drug delivery has been accumulated, with positive effects in the fields of cardiovascular, anti-inflammatory, 172 hepatoprotective, and

anticancer applications. [7] Compared to their non-complexed herbal extract counterpart, phytosome complexes exhibit superior pharmacokinetic and therapeutic profiles. Some phytochemicals' bioavailability has been significantly increased via the Phytosome technique.[8]

3. Niosomes :

These microscopic structures are called lamellar ones, and they are created by adding cholesterol, a nonionic surfactant, and a charges-inducer to watery media, followed by hydration. Drug compounds with a wide range of solubilities can be accommodated by niosomes due to their hydrophobic and hydrophilic moiety architecture. Niosomes have been evaluated in a number of therapeutic applications. Encapsulating therapeutic compounds can lower systemic toxicity and decrease medication clearance from the body by slowing the release of the agent. These are just a few of the significant benefits of this approach in clinical settings. [9] Previous research conducted in collaboration with L'Oreal has demonstrated that niosomes generally have characteristics with liposomes that make them suitable medication carriers. [10] Niosomes are not affected by any of these issues. [11]

4. Nanopartical :

Potential medication delivery devices that are biodegradable have garnered significant interest in recent times [12]. Both hydrophilic and hydrophobic medications can be efficiently delivered using nanoparticles. Within the size range of 10 to 1000 nm, nanoparticles are submicron particles. [13] Managing the release of pharmacologically active substances, surface characteristics, and particle size is a primary objective when designing nanoparticles as a delivery system. This allows the medicine to act on a specific spot at the best dose and rate for therapy. [14]

5. Transfereosomes:

Transferosomes and Ethosomes are phospholipid vesicles intended to administer the drug via transdermal route. Both have a common rationale of enhancing the penetration through stratum corneum barrier but the mode of action is different [15] Colchicine delivery through transferosomes provides sustained, local and site-specific delivery and preventing it from the gastrointestinal side effects due to oral administration [16] Transfersomes are highly engineered particles, or vesicles, with the ability to quickly and cheaply change their shape in response to external stimuli. [17]

6. Transdermal Drug Delivery System:

Curcumin and boswellic acid have been created as transdermal formulations for continuous medication delivery. [18] In addition to various herbal transdermal formulations, there are currently antismoking patches available on the market for quitting smoking and scopolamine patches for motion sickness. [19] There has been a rise in interest in transdermal drug delivery systems for both topical delivery of medications to treat sick skin locally and systemic delivery of drugs via the skin. [20]

7. Microspheres:

The average particle size of microspheres is between 1 and 50 microns. They are distinct, spherical particles. [21] When diffusion and dissolution are the release rate-limiting stages in such systems, first ordered release kinetics is typically applied [22]. The synthesis of microspheres can be accomplished using a variety of methods, including phase separation coacervation, solvent extraction, spray drying and congealing, polymerization (normal and interfacial), double and single emulsion, and spray drying.[23][24]

8. Proniosomes:

plasmiosomes A development over niosome, the prometheosome gel system is useful for

delivering actives to specific locations in a variety of ways. [25] Proniosomal gels are formulations that become niosomes when hydrated in situ using skin-derived water. [26] Before being used on brief agitation in hot aqueous media, prosniosomes—water-soluble carrier particles coated with surfactant—can be hydrated to produce a niosomal dispersion. [27]

9. Ethosomes

The invention of the ethosomal patch, which comprises of medication in ethosomes, is the result of more recent advances in patch technology. Soy phosphatidylcholine, ethanol, and water comprise ethosomal systems. As medication carriers for a variety of small compounds, peptides, proteins, and vaccines, elastic vesicles and transferosomes have also been employed. [28]

Table 1. Herbal Ddrugs with NDDS

Drugs or Compounds (Class)	Plant Origin (Part)	Activity	Drug Delivery System	Refs.
Ampelopsin (Flavanonol)	Ampelopsis grossedentata Family: Vitaceae (Leaves)	Anticancer	Liposome	[29,30]
Andrographolides (Labdane diterpene)	Andrographis paniculata Family: Acantharean (Leaves)	Rheumatoid arthritis	Micropellatization	[31,32]
Artemisinin (sesquiterpene lactone)	Artemisia annua Family: Asteraceae (Leaves)	Anticancer	Nanoparticle	[33,34]
Berberine (Benzyliso -quinoline alkaloids	Berberis vulgaris Family: Berberidaceae (Root)	Anticancer	Emulsion, Nanoparticle	[35,36]
Curcumin (Phenolic compound)	Curcuma long a Family: Zingiberaceae (Rhizomes)	Anticancer, Anti-inflammatory, Antioxidant	Liposome, Phytosome, Emulsion, Micropellatization, Transferosomes	[37,38]
Colchicine (Alkaloid)	Colchicum autumnale Family:Colchicaceae (Seeds)	Antigout	Transferosomes	[39,40]
Capsaicin (Homovanillic acid alkaloid)	Capsicum annuum Family: Solanaceae (Fruit)	Analgesic	Liposome	[41,42]
Camptothecin (Alkaloid)	Camptotheca acuminata Family:Nyssaceae (Leaves)	Anticancer	Microsphere, Nanoparticle	[43,44]
Docetaxel (Taxotere) (Alkaloid)	Taxus baccata Family: Taxaceae (Needles)	Anticancer	Emulsion	[45]
Epigallo -catechins (Catechin)	Camellia sinensis Family:Theaceae (Leaves)	Anticancer, Antioxidant	Phytosome	[46,47]

Embelin (Benzoquinone)	Embelia ribes Burm. F. Family: Myrsinaceae (Fruit)	Antifertility, Antibacterial	Phytosome	[48,49]
Glycyrrhizic acid (Saponin)	Glycyrrhiza glabra Family:Fabaceae (Root)	Antihypertensive, Anti-inflammatory	Nanoparticle	[50,51]
Ginsenosides (glycosylated triterpenes)	Panax ginseng Family:Araliaceae (Flower bud)	Anticancer, Immuno - modulator	Microsphere, Phytosome	[52,53]
Hypocrellins (Pigments)	Shiraia bambusicola Family: Hypocreaceae (Fruit)	Antiviral	Nanoparticle	[54,55]
Matrine (Alkaloid)	Sophora flavescens Family: Fabaceae (Root)	Antiinflammatory, Anticancer, Antirheumatism,	Ethosomes, Nanoemulsion	[56,57]
Magnolol (Lignan)	Magnolia officinalis Family: Magnoliaceae (Bark)	Vascular smooth muscle proliferation inhibition	Liposome	[58,59]
Naringenin (Trihydroxy flavanone)	Lycopersicum esculentum Family: Solanaceae (Fruit)	Anticancer, Antiinflammatory, Hepato -protactive	Phytosome, Nanoparticle	[60]
Oxymatrine (Quinolizidinalkaloid)	Sophora flavescens Family: Fabaceae (Root	Antiviral	Phytosome	[61,62]
Paclitaxel (Taxol)	Taxus brevifolia Family: Taxaceae (Leaves)	Anticancer	Liposome, Nanoparticle	[63,64]
Puerarin (Isoflavones)	Radix puerariae Family: Fabaceae (Root)	Antioxidant, Antihypercholesterolemic	Liposome, Microemulsion	[65,66]
Procyanidin (Flavonoid)	Rhaphiolepis umbellate Family: Rosaceae (Bark)	Cardio -protective, Antioxidant	Phytosome	[67]
Quercetin (Flavonoid)	Allium cepa Family: Amaryllidaceae (Outer Scales)	Anti oxidant Anti – inflammatory Anti congestion Anti anxiety	Emulsion Microsphere Liposome	[68,69]
Rutin (Flavonoid)	Carpobrotus edulis Family:Aizoaceae (Leaves)	Antioxidant	Microsphere	[70,71]
Sinigrin (Aliphatic glucosinolate)	Brassica nigra Family: Brassicaceae (Seeds)	Anticancer, Wound healing	Phytosome	[72,73]
Silymarin (Flavonolignans)	Silybum marianum Family: Asteraceae (Fruit)	Antihypertension, Antiinflammatory, Hepatoprotective	Microsphere Nanoparticle	[74,75]
Sinigrin (Aliphatic glucosinolate)	Brassica nigra Family: Brassicaceae (Seeds)	Anticancer, Wound healing	Phytosome	[76,77]
Triptolide (diterpenoid epoxide)	Tripterygium wilfordii Family:	Antiinflammatory	Ethosomes	[78,79]

	Celastraceae (Leaves)			
Tetrandrine (Bisbenzyliso - quinoline alkaloid)	Stephania tetrandra Family: Menispermaceae (Root)	Antihypertension, Antiinflammatory	Nanoparticle	[80,81]
Usnic acid (Dibenzofuran)	Ramalina reticulate Family: Ramalinaceae (Lichen)	Anti- mycobacterial	Liposome	[82,83]
Vincristine (Vinca alkaloid)	Catharanthus roseus Family: Apocynaceae (Leaves)	Anticancer	Transferosome	[84,85]
Wogonin (O-Methylated flavone)	Scutellaria havanensis Jacq. Family: Lamiaceae (Leaves & Stem)	Anticancer	Liposome	[86,87]

CONCLUSION:

Since they have fewer side effects than contemporary medications, herbal medicines have been utilized extensively throughout history and are acknowledged by medical professionals and patients as having superior therapeutic value. By combining them into contemporary dose forms, medications with ayurvedic origins can be used more effectively and more optimally. To boost patient compliance and prevent recurrent administration, phytotherapeutics must be delivered using a scientific method that combines the constituent parts in a novel way. This might be accomplished by creating innovative drug delivery methods for the components of herbs. By lowering toxicity, raising bioavailability, and other factors, novel drug delivery systems not only minimize the need for repeated administration to overcome non-compliance but also contribute to an increase in therapeutic value. The creation of innovative drug delivery systems holds significant promise for valued herbal medications, as they offer cost-effective and efficient drug delivery. Additionally, the tendency of adding NDDS to natural medications has been widely embraced.

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