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Review on Herbal Novel Drug Formulation

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M. SAKTHIVEL*, K. REETA VIJAYA RANI, R. SENTHAMARAI, N.RIFAYA SULTANA, R. SANGEETHA, SU. SANGEETHA, K. SATHIYA, V. SELVAKUMARI.

Department of Pharmaceutics,
Periyar College of Pharmaceutical Sciences,
Thiruchirapalli-620 021. Tamilnadu, India.

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ABSTRACT

Herbal medicines have been widely used all over the world since ancient times and have been recognized by physicians and patients for their therapeutic uses. However, phytotherapeutics needs a scientific approach to deliver the components in a novel manner to increase patient compliance and avoid repeated administration. Novel drug delivery system such as Anti rheumatic activity of Boswellic acid and Curcumin in the form of transdermal patches, a liposomal formulation of neem gel has enhanced antimicrobial activity. The novel drug delivery system have greater potentials being able to convert poorly soluble poorly absorbed and liable herbal drugs into favorably bioavailable forms. The novel herbal drug delivery system will not only increase the market of herbal drugs but will also play a major role in providing better and effective therapy to humans.

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INTRODUCTION

There are many traditional systems of medicine in the world, each with different associated ideas and cultural origins. Some of these, such as Tibetan traditional medicine, remains relatively localized in their country of origin; while others such as Ayurvedic and Chinese traditional medicines are increasingly used in many different areas of the world. India has a very long, safe, and continuous usage of many herbal drugs in the official recognized alternate science of health. The traditional formulation contains plant material as its core ingredient. [1] There are three main reasons for the popularity of herbal medicines: There is a growing concern over the reliance and safety of drugs and surgery.

Modern medicine is failing to effectively treat many of the most common health conditions. Many natural measures are being shown to produce better results than drugs or surgery without side effects. [2] India has the unique distinction of having six recognized systems of medicine in this category. They are Ayurveda, Siddha, Unani, Yoga, Naturopathy, and Homoeopathy. [3]

Herbal novel dosage forms:

In phytoformulation research, developing Nano-dosage forms (polymeric Nanoparticles and Nanocapsules, liposome's, solid lipid nanoparticles, Phytosomes, and Nanoemulsions, etc.) have several advantages for herbal drugs, including enhancement of solubility and bioavailability, protection from toxicity, enhancement of pharmacological activity, enhancement of stability, improving tissue macrophages distribution, sustained delivery, protection from physical and chemical degradation, etc. Thus the Nano-sized novel drug delivery systems of herbal drugs have a potential future for enhancing the activity and overcoming problems associated with plant –medicines. [4]

Advantages of Novel Drug Delivery Systems:

1. Increased bioavailability.
2. Enhancement of pharmacological activity.
3. Enhancement of stability.
4. Improved tissue macrophages distribution.

5. Sustained delivery.

6. Protection from physical and chemical degradation. [5]

IMPORTANCE OF NOVEL DRUG DELIVERY SYSTEMS IN HERBAL MEDICINES

Novel drug delivery system is a novel approach to drug delivery that addresses the limitations of the traditional drug delivery systems**.** Our country has a vast knowledge base of Ayurveda whose potential is only being realized in recent years. However, the drug delivery system used for administering the herbal medicine to the patient is traditional and out-of-date, resulting in reduced efficacy of the drug. If the novel drug delivery technology is applied in herbal medicine, it may help in increasing the efficacy and reducing the side effects of various herbal compounds and herbs. This is the basic idea behind incorporating a novel method of drug delivery in herbal medicines. Thus it is important to integrate novel drug Delivery systems and Indian Ayurvedic medicines to combat more serious diseases. For a long time, herbal medicines were not considered for development as novel formulations owing to a lack of scientific justification and processing difficulties, such as standardization, extraction, and identification of individual drug components in complex polyherbal systems**.** However, modern phytopharmaceutical research can solve the scientific needs (such as determination of Pharmacokinetics, mechanism of action, site of action, the accurate dose required, etc.) of herbal medicines to be incorporated in novel drug delivery system, such as nanoparticles, microemulsions, matrix systems, solid dispersions, liposome's, solid lipid nanoparticles and so on.

Various drug delivery and drug targeting systems are currently under development to minimize drug degradation and loss, to prevent harmful side-effects and to increase drug bioavailability and the fraction of the drug accumulated in the required zone.[6]

Figure No. 1: Types of Novel Drug Delivery System

1. LIPOSOMES

A liposome is a bilayer vesicular carrier system of phospholipids/cholesterol that varies in size from 25 to 2.5 nm. The distinct advantages are their ability to encapsulate various materials and their structural versatility. The liposome can encapsulate drugs with widely varying solubility or lipophilicity. They encapsulate a fraction of the solvent, in which they freely diffuse [float] into their interior. They can have one, several or multiple concentric membranes. Liposomes are constructed of polar lipids which are characterized by having a lipophilic and hydrophilic group on the same molecules.

Because of their unique properties, liposomes can enhance the performance of products by increasing ingredient solubility, improving ingredient bioavailability, enhanced intracellular uptake, and altered pharmacokinetics and bio-distribution. [5]

2. PHYTOSOMES

Phytosome is a novel technology that emerged in 1989. The term "Phyto" means plant/herb while "some" means cell-like structure. Phytosome is a technology used as controlled- and sustained-release delivery systems consisting of phospholipids complex system of herbal extract or phytoconstituents in the Nano size range [<100nm] of particles. Phytosomes result

from the reaction of a stoichiometric amount [1:1 or 1:3] of the phospholipids [phosphatidylcholine] with the standardized extract or phytoconstituents in a nonpolar solvent. [5]

3. NANOPARTICLES

Nanoparticles are nano- or sub–nano-sized structures composed of synthetic or semi-synthetic polymers. In recent times, nanoparticles of herbal medicines have attracted much attention. Nanoparticles are colloidal systems with particles varying in size from 10 nm to 1000nm. It is an effective system as the formulation is encapsulated in it easily and can easily reach an effective site. The nano-spheres are the solid-core spherical particulates which are nanometric in size 15. [5]

4. MICROSPHERES

Microsphere refers to spherical microparticles with a diameter of 1-1000 mm. Biodegradable polymers are frequently used for the development of microsphere matrixes such as polylactic acid and copolymer of lactic acid and glycolic acid. Apart from them, there is an extensive range of microspheres prepared from albumin, albumin dextran sulfate, and fibrinogen.[6]

5. TRANSFEROSOMES

The name means "carrying body", and is derived from the Latin word 'transferred', meaning 'to carry across', and the Greek word 'soma', for a 'body'. A Transferosome carrier is an artificial vesicle that resembles the natural cell vesicle. Thus it is suitable for targeted and controlled drug delivery. Transferosomes are vesicular systems consisting of phospholipids as the main ingredient with 10-25% surfactant [such as sodium cholate] and 3-10% ethanol. The surfactants work as "edge activators," conferring ultra-deformability on the structure of transfer some, which helps them to squeeze through pores in the stratum corneum. [7]

6. TRANSDERMAL DRUG DELIVERY

Tran dermal drug delivery is carried out by a patch that is attached to the body surface. This patch is a medicated adhesive pad that is designed to release the active ingredient at a constant rate over a constant period of several hours to days after application to the skin. The drug present in the transdermal patch permeates into systemic circulation by diffusion through various layers of skin which lead further to the affected organ. This system provides

drug delivery at a controlled rate, high bioavailability, easy application, sustainable action. Limitations are hepatic first-pass metabolism, maintenance of a steady plasma level of the drug. [8]

Table No: 1 Herbs used to manage chronic disorders: [9]

Botanical name	**Parts used**	**Therapeutic uses**
Allium sativum (Alliaceae)	Bulbs	Anti-inflammatory; Anti-hyperlipidemic.
Aloe barbadensis (Alliaceae)	Gel	Skin diseases- mild sunburn, frostbite, scalds; wound healing.
Crocus sativus (Iridaceae)	Stigma	Aphrodisiac, Anti-stress, Anti-oxidant.
Gymnema sylvestre (Asclepiadaceae)	Roots and leaves	Anti-diabetic; Anti-hyperglycemic.
Ocimum sanctum (Lamiaceae)	The whole plant, root, leaf, seed	Adaptogen; anti-oxidant, hypoglycemic immune modulator, radio-protector.

Table No: 2 Herbs used to manage chronic diseases: [10]

Botanical name	**Parts used**	**Therapeutic uses**
Andrographis paniculata (Acanthaceae)	Whole plant	Cold- flu, hepatoprotection.
Asparagus racemosus(Alliaceae)	Roots	Adaptogen, galactogogue.
Berberis aristata (Berberidaceae)	Bark, fruit, root, stem, wood	Anti-protozoa, hypoglycemic.
Boerhavia diffusa (Nyctaginaceae)	Roots	Diuretic; Anti-inflammatory, Anti-arthritic.
Boswellia serrata. (Burseraceae)	Oleo resin	Anti-rheumatic; Anti-colitis.
Clerodendrum serratum (Verbenaceae)	Root, leaf, Stem	Malaria; Anti-asthmatic, Anti-allergic.
Curcuma longa (Zingiberaceae)	Rhizome	Anti-inflammatory, wound healing enhancer, Anti-cancer.
Glycyrrhiza glabra (Papillionaceae)	Stem	Expectorant; peptic ulcer treatment.
Phyllanthus amarus (Euphorbiaceae)	Whole plant	Hepatoprotective.

LITERATURE REVIEW

1. Shahira F el-Menshawe *et al.,* (2018) formulated Nano-sized soy Phytosomes based Thermo gel as topical anti-obesity for an acceptable level of evidence of an effective novel herbal weight loss product. [11]

2. Claudia JanethMartínez-Rivas *et al.,*(2017) done qualitative estimation of the *Leucophyllum frutescens* fraction before and after encapsulation in polymeric Nanoparticles.[12]

3. Bala Tripura Sundari *et al.,* (2017) formulated & evaluated the ethosomal gels of *Mangiferaindica* leaf extract and characterized the ethosomes and gel formulations using various parameters.[13]

4. Hamid Reza Rahimi *et al.,* (2016) formulated Nano curcumin formulations from *curcumin longa* extract and regulate the intracellular signal pathways which control the growth of cancerous cells, inflammation, invasion, and apoptosis, they target the intracellular enzymes, genome, and messengers.[14]

5. R. Thadakapally *et al.,* (2016) prepared and characterized PEG-albumin-curcumin nanoparticles intended to treat breast cancer. They prepared Polyethylene glycol albumin-curcumin nanoparticles using serum albumin and polyethylene glycol by desolvation techniques. [15]

6. N. A. Zainol *et al.,* (2015) cinnamon leaf oil Nano creams for topical application. They identified that cinnamon leaf oil contains a high percentage of eugenol and it has antimicrobial antioxidant and anti-inflammatory properties and the undiluted oil can cause irritation to the skin.[16]

7. PranjalSaikia *et al.,*(2013) mucoadhesive nanoparticles from tamarind seed polysaccharides for sustained delivery of the anticancer drug. They studied the mucoadhesive polysaccharides extracted from tamarind seeds *(Tamarind indica)* for the sustained delivery of the anticancer drug.[17]

8. Ravi Shankaran D *et al.,* (2013) prepared Ayurvedic Nanomaterials and characterized the ginger loaded polymeric Nanofibers for drug delivery applications, their study is to combine nanotechnology.[18]

9. J. Chen, W. T. Dai, *et al.,* (2013) evaluated the curcumin loaded nanoparticles based on solid lipid as a new type of colloidal drug delivery system. Their study aimed to optimize the best formulation on curcumin loaded solid lipid nanoparticles by the optimization of single-factor analysis and orthogonal test. [19]

10. Mehdi Ansari *et al.,* (2013) formulated zinc oxide nanoparticles as carriers and sun protecting agents for *Teucriumpolium* leaf extract to enhance sun protection property.[20]

11. Ke Wang *et al.,* (2012) developed the novel micelle of curcumin for enhancing antitumor activity and inhibiting colorectal cancer stem cells. It also developed a novel nanoparticulated formulation of curcumin encapsulated in stearic acid-g-chitosan oligosaccharide (CSO-SA) polymeric micelles to overcome the hurdles.[21]

12. B. Patel Mikesh *et al.,* (2012) formulated kinetic modeling of *curcumin longa* loaded intranasal mucoadhesive microemulsion. They developed the optimum dosage form of poorly water-soluble chemical entities and target these entities for their low aqueous solubility followed by limited bioavailability.[22]

13. JessyShaji *et al.,* (2012) encapsulating Quercetin and Quercetin beta-cyclodextrin complexes and characterized by Differential Scanning Calorimetry (DSC) and Fourier Transform Infra-Red spectroscopy (FTIR), they prepared plain Quercetin liposome's using phosphatidylcholine and cholesterol & optimize.[23]

14. AV Jithan *et al.,* (2011) prepared and characterized the albumin nanoparticles by encapsulating curcumin for the treatment of breast cancer. They clinically utilized the curcumin to treat breast cancer.[24]

15. P. K. Gogu *et al.,* (2010) the objective of their study was to prepare and characterize *in vivo* and *in vitro* performance of microsphere formulation of 4-chloro curcumin. They prepared the microspheres of 4- chlorocurcumin with ethyl cellulose for sustain release.[25]

SUMMARY

From this study, it is clear that medicinal plants play a vital role in various diseases. Various herbal plants and plant extracts have significant and enhanced activities when converted into Novel drug delivery systems such as Anti rheumatic activity of boswellic acid and curcumin in the form of transdermal patches, Liposomal formulation of neem gel has enhanced

antimicrobial activity. Curcumin microspheres are used to treat colon cancer. Polysaccharide extract of tamarind seed used as a carrier for nanoparticles in the treatment of cancer.

Our review is concluded that the Novel Drug Delivery System has greater potentials, being able to convert poorly soluble, poorly absorbed and labile herbal drugs into favorably bioavailable forms. The Novel herbal drug delivery system will not only increase the market of herbal drugs but will also play a major role in providing better and effective therapy to humans.

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REFERENCES

1. Qadir *et al.,* Introduction of Indian system of medicine; Int.J.Pharm Sci.Res.2015;Volume 6(10): 4137
2. Parth Sharma, SurajpalVerma, PlakshiMisri, Introduction of Indian system of medicine; Int J Pharmacognosy and Phytochemical Res, 2016; Volume 8(9): 1535.
3. Ravishankar. B and Shukla, V.J. Introduction of Indian system of medicine*;* Afr.J.Traditional, Complementary and Alternative Medicines, 2007; Volume 4(3): 319.
4. Ravishankar. B and Shukla, V.J. Herbs used to manage chronic disorders; Afr. J. Traditional, Complementary and Alternative Medicines, 2007; Volume 4(3): 328-331.
5. Ajazuddin, Saraf S. Applications of Novel Drug Delivery System for herbal formulations. *Fitoterapia*.Elsevier B.V.; 2010; 81(7):680–9.
6. Mukherjee PK, Harwansh RK, Bhattacharyya S. Elsevier Inc.; 2015. Page:217-245.
7. Moscarella S, *et al*., Curr Ther Res 1993; 53: Page: 98-102.
8. Bhujbal S, *et al.,* Int J. of Pharm Inv, 2011, Vol: 1, issue 4, Page:222-226.
9. Kumar, K.A.K.Rai, “MiraculousTheraphy Effects of Herbal Drugs Using Novel Drug Delivery Systems”, IRJP 2012; 3(2): 27-30.
10. Dhiman A., Nanda A. and Ahmad S., **“**Novel Herbal Drug Delivery System (NHDDS): the need of Hour”. IPCBEE 2012; 49: 171-175.
11. Shahira F el-Menshawe, Adel A Ali, Mohamed a Rabeh, Nermeen M Khalil., Nanosized soy phytosome-based Thermo gel as topical anti-obesity formulation: an approach for an acceptable level of evidence of an effective novel herbal weight loss product, Int J N. Med; *2018:*13; Page-307–318.
12. Claudia Janeth Martínez - Rivas, Rocío Álvarez-Román, Catalina Rivas-Morales, Abdelhamid Elaissari, HatemFessi, and Sergio Arturo Galindo-Rodríguez., J.AnalyticalMethods in Chemistry; Volume 2017; Page-1-7
13. Bala Tripura Sundari, P. SailajaRao, K. Sireesha, Y. Krishna Sai, Indo American J Pharm Sci. (IAJPS); 2017; 4 (06); Page-1755-1761.
14. Hamid Reza Rahimi, RezaNedaeinia, AlirezaSepehri Shamloo1, Shima Nikdoust, Reza Kazemi Oskuee, Asian J. Pharmaceutics; Vol. 6; No. 4; Jul-Aug 2016;383-398.
15. R. Thadakapally, ArshiyaAafreen, J. Aukunuru, M. Habibuddin and S. Jogala,Ind. J Pharm Sci.; 2016;78(1): Page;65-72.
16. N. A. Zainol, T. S. Ming And Y. Darwis, Ind. J. Pharm Sci.; July - August 2015; P-422- 433.

17. PranjalSaikia, Bhanu P. Sahu, S. K. Dash., Asian J. Pharmaceutics; October-December 2013; Page-163-169.
18. Ravi Shankaran D, Roshan Jesus M, Sarika R, Ancient Science of Life 2013; 32 (s2):22.
19. J. Chen, W. T. Dai, Z. M. He, L. Gao, X. Huang, J. M. Gong1, H. Y. Xing And W. D. Chen, Ind. J Pharm Sci.; March - April 2013; 75(2); Page-178-184
20. Mehdi Ansari, FaribaSharififar, MaryamKazemipour, ZarrinSarhadinejad, Hamid Mahdavi, Int J Pharm Inv; October 2013; Vol 3; Issue 4.
21. KeWang, TaoZhang, Lina Liu, XiaoleiWang, PingWu, ZhigangChen, ChaoNi, JunshuZhang, FuqiangHu, Jian Huang, Int J N. Med; 2012:7; Page-4487–4497.
22. B.PatelMikesh, MandalSurjyanarayan, K. S. Rajesh, J. Pharm Bio allied Sci.; March 2012; Page-164-171.
23. JessyShaji, SnehaIyer, Asian J. Pharmaceutics; July-September 2012; Page-218-225.
24. AV Jithan, K Madhavi, M Madhavi, K Prabhakar, Int J. Pharm Inv; April 2011; Vol 1; Issue 2; Page-119-125.
25. P. K. GoguAnd A. V. Jithan, Ind. J Pharm Sci.; June 2010; 72 (3); Page; 346-352.