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## Review on nanopraticles for herbal extracts

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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 better therapeutic value as they have fewer adverse effects as compared with modern medicines. Phototherapeutics need a scientific approach to delivering the components in a sustained manner to increase patient compliance and avoid repeated administration. This can be achieved by designing novel drug delivery systems (NDDSs) for herbal constituents. NDDSs not only reduce the repeated administration to overcome non-compliance but also help to increase the therapeutic value by reducing toxicity and increasing the bioavailability. One such novel approach is nanotechnology. Nano-sized drug delivery systems of herbal drugs have a potential future for enhancing the activity and overcoming problems associated with plant medicines. Hence, integration of the nanocarriers as an NDDS in the traditional medicine system is essential to conflict more chronic diseases such as asthma, diabetes, cancer, and others. The article describes nano drug delivery systems, properties, advantages, disadvantages, types of nanoparticles, their method of preparation, different nano herbal medicines, and nano herbal cosmetics available in the market.

**Keywords:** herbal drugs, nanotechnology, novel drug delivery systems

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### Introduction

From ancient ages, herbal medicines and natural products are used to cure the various diseases, which are isolated from plants are known of herbal remedies. Nanoparticles are the roots of medicines, which are based on where herbal remedies. Herbal preparations are one of most important segments of historic system of medicine which contributes extremely to the welfare of human health sector. Herbal formulation is also used in Chinese system for the positive health of an individual the diameter of nanoparticles is approx. 10-1000 um the potency of nano herbal drug is often limited by their potential to reach various rehabilitation. Nanosized drug delivery system of herbal drugs which is obtain from plant medicine. As compared to micrometre size carriers, nanocarriers provide more surface area and have ability to increase solubility, bioavailability, improve controlled release and unable targeting of entrapped compounds to their greater extend. As outcome of improved stability and targeting the amount of material require to exert effect when encapsulated or included to nanocarriers is much less than amount required when encapsulated. There is mainly used when dealing with expensive Phyto molecules. The targeted release improves effect of Phyto molecules. Nowadays nanoparticles are used for production and smart herbal drugs inculcating botanicals, medicinal use of specific drug and factor effecting efficacy. When techniques were developed to produce a synthetic replacement for many medicines that have been derived from forest, then pharmaceutical companies were laid out. In this reaction article we will discuss about general overview on nanoparticles. Nanodrug delivery system, property's role and technique, types, use of NPs. The last part also discuss with future aspect and prospective.

### Nanoparticles

Nanotechnology is known field of research since last century which was represented by Nobel laureate Richard Feynman nanoparticles are wide class of materials that include particulate substances, which have one dimension less than 100 nm which are classified according to diameter. Nanoparticles has greater importance due to its size which can influence the physiochemical property.eg: optical properties. Nanoparticles stable in a high protein environments even in whole animal milieus. Nanoparticlle does not have simple molecules itself but they are composed of three main layers:

### Nanodrug Delivery System

Nanoparticle drug delivery system are technologies that which are used nanoparticle for targeted delivery and controlled release of therapeutic agents. In the modern form of drug delivery system, it should minimize side effect and reduce dosage and dosage frequency. Nanoparticulate drug delivery system is required to provide a therapeutic amount of drug to specific site in the body on time and then maintain specific concentration. In nanodrug delivery system the primary areas of research they are transdermal delivery, oral system, liposomes, microcapsules, noisome and polymers in drug delivery.

### Properties of Nanoparticles

1. Nanoparticles are linked between bulk materials and atomic or molecular structures.
2. When nano size of materials is reduced their properties also differs.
3. Inner materials become catalyst eg: Pt, Au.
4. Nanomaterials are strong, hard, ductile at high temperature. Nanomaterials are very erosion resistant, corrosion resistant and chemically very active.

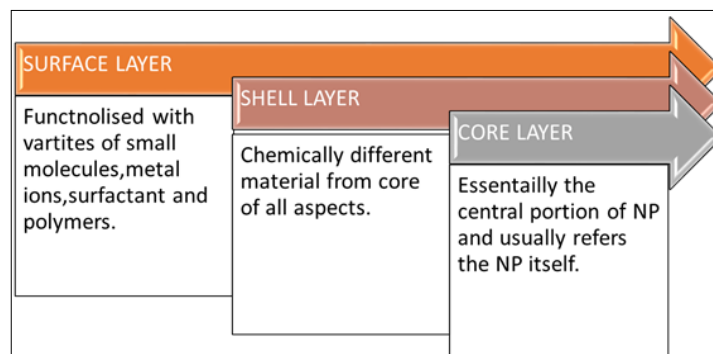


Fig 1

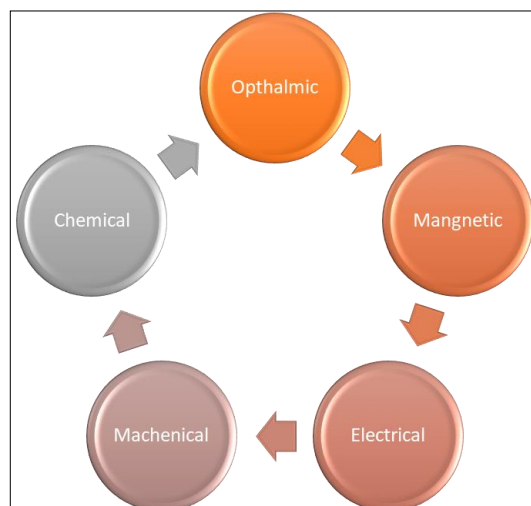


Fig 2

### Roles of Nanoparticles

1. When small particle size nanoparticles are used then they show rapid dissolution in blood.
2. In clinical applications ranging from contrast agents in imaging to carriers and gene delivery into tumors.

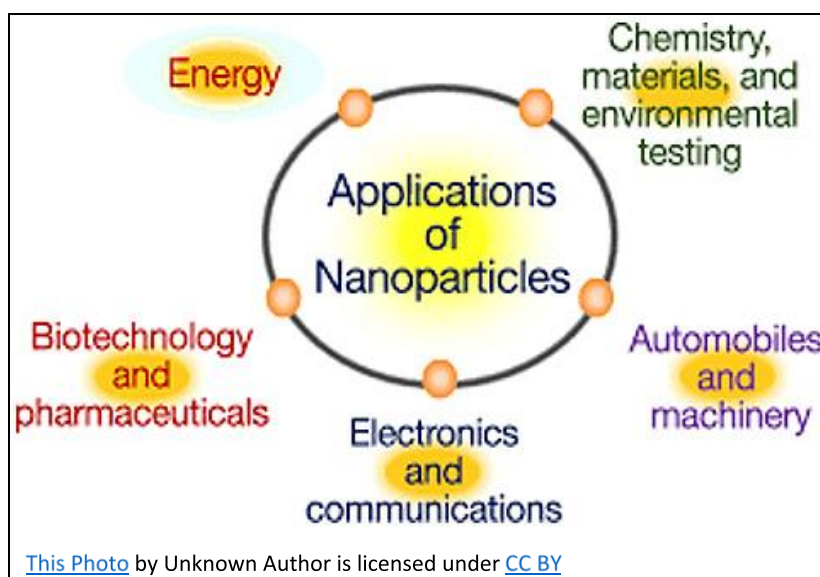






Fig 3

Table 1

| Name of Drug               | Properties   | Part of plant used  | Example   |
|----------------------------|--|---|---|
| Paclitaxel                 | Anticancer drug, treatment of ovarian and breast cancer.   | Isolated from bark of <i>Taxus brevifolia</i> Nutt.                               |   |
| Curcumin                   | Potent anticancer, inhibit malignant brain tumour  | Isolated from rhizome of turmeric   |    |
| Dodder                     | Improve sexual function, prevent senescence and regulates immune system, antioxidant, Anticancer, antiaging, Immunostimulatory effect, flavonoids and lignans. | Isolated from seeds of <i>Cuscuta Chinensis</i> Lam                               |    |
| Quercetin                  | Antioxidant, flavonoid, anticancer antiviral   | Dried leaf and bark of <i>Spohora japonica</i> L                                  |   |
| Ginkgo Biolobal            | Treatment of Alzhemers dementia  | Isolated from leaf of <i>Ginkgo biloba</i> L                                      |  |
| Breviscapine               | Therapeutic effect on lung and vascular disease. Increase plasma concentration.  | Extracted from the whole plant of perennial herb <i>Erigeron breviscapus</i> Vant |   |
| Triptolide                 | Treatment of inflammatory and autoimmune disease.  | Isolated from extract of whole plant <i>Tripterygium Wilford</i> hook             |   |
| <i>Salvia miltiorrhiza</i> | Used as medicines for promoting circulation and improving blood stasis. Treatment of coronary heart, cerebrovascular diseases and hyperlipdemia.               | Isolated from dried roots of <i>S. miltiorrhiza</i>                               |   |
| Naringenin                 | Antioxidant, antitumor, antiinflammoty, hepato protective effect, antiapoptotic  | Isolated from citrus fruit  |   |
| Silymarins                 | Therapeutic effect in many liver disorders, antihepatotoxic activity   | Extracted from fruit of milk thistle <i>silybum marianum</i>                      |   |
| Genistein                  | It is a phytoestrogen antioxidant and also decreases risk of osteoporosis, cardiovascular  | Isolated from soyabean  |   |

|                            |   |  |  |
|----------------------------|---|--|--|
|                            | disease breast and uterine cancer                                       |  |  |
| <i>Centella asiatica</i>   | Medicinal herb in Ayurvedic medicine. It has antioxylytic activity.     | Isolated from small herbaceous creeping plant <i>C. asiatica</i> L urban         |  |
| <i>Artemissia aanua</i> L. | Antimalarial action   | Single stemmed annual herb <i>Artemisia aana</i> L                               |  |
| Berberine                  | Antitumor, malignant brain tumor, oesophageal cancer and human leukemic | Alkalioids present in roots, rhizome and stem bark of <i>Berberis vulgaris</i> L |  |

### Techniques and Methods of Preparation of Nanopraticles

There are various techuiques and methods of preparations used for formulation such as,

1. High pressure homogenization method
2. Complex coacervation method
3. Co precipitation method
4. Salting out method
5. Nanoprecipitation method or solvent displacement method
6. Solvent emulsification diffusion method
7. Supercritical fluid method
8. Self-assembly method

#### 1. High pressure homogenization method-

This method is a very constant and poetent technique for the large scale in the production of nanostructured lipid transmit lipid drug interfuse and parental emulsions. The lipid is active with high pressure submicrometer or nanometer range 100-200bar and then it shows a very high shear stress.

#### 2. Complex coacervation method-

This is a voluntary phase detachment process of two liquid phases in act colloidal system and which results by interlinkaged of two contrasting charged polyelectrolytes which mixing in an aqueous solution. Complex coacervation is a cationic and anionic water-soluble polymer which is interact in water to form a liquid in the water of polymer this phase is called complex coacervation.

#### 3. Salting out method

This method is based on the phenomenon the stability of non-electrolyte in water is decreased upon addition of an electrolyte.

#### 4. Nanopartiction method or solvent displacement method

The solvent displacement method is most suitable method for the dynamic analysis of structures. This method based on interfacial deposition of polymer after displacement of semipolar solvent miscible with water from a lipophilic solution there by resulting decrease in superficial tension between two phases which increases surface area with subsequent formulation of small droplets of organic solvent even without any mechanicals stirring.

#### 5. Solvent emulsification-diffusion method-

This method involves o/w type of emulsion using oil phase containing polymer and oil in organic solvent and they are emulsified with aqueous phase which contain stabilizer, high shear mixture, followed by addition of water two induce diffusin of organic solvent it leads to formation of nanoparticles.

#### 6. Supercritical fluid methods

This method is used to prepare nanosized formulations. Supercritical fluid is used in this method can be liquid or gas, the most commonly used supercritical fluids are Co<sub>2</sub> and water.

#### Types of Nanoparticles-

1. Metal and inorganic nanoparticles
2. Polymeric micelles
3. Dendrimers
4. Polymeric nanoparticles
5. Quantum dots
6. Magnetic nanoparticles
7. Solid lipid nanoparticles
8. Phospholipids micelles
9. Colloidal nanoparticles

### Recent Development and Future Prospective-

The nanoparticles have come forward in drug delivery system for well-organized delivery of drugs, utilized in treatment of various diseases such as, cancer by crossing reticuloendothelial system, Enhanced permeability and retention effect and tumours specific targeting. Using scientific approach pharmaceuticals scientists have shifted their focus to designing a drug delivery system for herbal medicine. To nourish liver and kidney cuscuta Chinese is used as traditional Chinese medicine. Due to poor water solubility of its major constituents such as flavonoids and lignans its absorption upon oral administration could be limited. So, the nanoparticles for the same were developed. A recent experimental study of polylactic acid nanoparticles of lipophilic anticancer herb drug using a precipitation method have been developed. Work has also been carried out in development and characterization of SLNs for the traditional Chinese medicine for their targeted delivery and increased bioavailability and efficacy.

### Conclusion

Nanotechnology will substantially change the manufacturing process of almost every product in existence. Whatever happens it is likely to be the human races greatest scientific achievement to date and will probably change all our lives.

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