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Nanoparticles for herbal extract

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ABSTRACT:
Herbal medicines have been used from years throughout the world; especially in India, herbal medicines are in high demand. The use of herbal medicines has increased because of their ability to treat different diseases with fewer side effects. The development of novel drug delivery system (NDDS) is of considerable importance to overcome various constraints like poor bioavailability, in vivo stability, aqueous insolubility, intestinal absorption and unspecific site of action. The integration of the Nano science as a NDDS in traditional system of medicine enriches the potential of herbal drugs for treating chronic diseases such as cancer and ravaging diseases. The synthesis of nanoparticles can be achieved by adopting the novel methodologies such as Polymer nanoparticle, Magnetic nanoparticle and Metallic nanoparticle depending on characteristic of the nanoparticles. The advanced technologies will shed lights for characterizing the nanoparticles to determine the toxicity profiles for their physical and chemical properties. This review article will provide a brief discussion of Nanoparticles synthesis, characterization by various techniques for production and its future impact of nanotechnology on smart herbal drugs.

I. INTRODUCTION:

Herbal medicines and Nanotechnology:

Herbal medicines have been widely used around the world since ancient times. Herbal medicines that have been used in India are termed as 'Ayurveda'. This Indian medical science uses herbs or a mixture of herbo-mineral preparation. The seven therapeutic metals used in Ayurveda are: gold, silver, copper, iron, lead, tin and zinc. These metals are passed through various processes and are transformed into their therapeutic form.

The advancement of phytochemical and phytopharmacological sciences has enabled elucidation of the composition and biological activities of several medicinal plant products. The effectiveness of many species of medicinal plants depends on the supply of active compounds. Most of the biologically active constituents of extracts, such as flavonoids, tannins, and terpenoids, are highly soluble in water, but have low absorption, because they are unable to cross the lipid membranes of the cells, have excessively high molecular size, or are poorly absorbed, resulting in loss of bioavailability and efficacy. Some extracts are not used clinically because of these obstacles.

Herbal drugs occupy a leading position in the pharmaceutical industry as their effects are known and no side effects are present. But the delivery of these herbal therapeutic molecules as drugs is difficult due to its low solubility, poor permeability, instability in biological environment and low bioavailability. These limitations can be overcome by encapsulating or attaching them with materials known as Nanomaterials.

Nanotechnology is the advanced scientific technology of the 21st century. The term nanotechnology is derived from a Greek word 'nanos' which means dwarf. It is a new technology in drug delivery system. It aims to develop devices and dosage in the range of 1 to 100 nm which can be increased up to 1000 nm. Nanotechnology makes use of nanoparticles that have a high surface area and can reach the targeted site because of its extremely small size.

Nanotechnology and Herbal science is combined to overcome the limitations of using herbal drugs.

The development of novel drug delivery system for herbal medicines includes nano dose which helps in enhancing the biosolubility and bioavailability, protection from toxicity, sustained delivery etc. Such novel drug delivery systems have site specific action and predetermined rate.

Nanocarriers are made from safe materials, including biodegradable polymers, lipids, and polysaccharides. In novel drug technology, control of drug distribution is achieved by incorporating the drug into nanocarriers. Compared to micrometer sized carriers, nanocarriers provide more surface area and increase solubility, bioavailability and enable exact drug targeting.

As a result due to specificity, the amount of drug required to be incorporated to nanocarriers is much less than required when encapsulated. This is very useful when using expensive

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phytomolecules. Optimal use of phytomolecules improves cost-effectiveness of the product.

Nanoparticles :

Nanoparticles are solid colloidal particles consisting of macromolecular substances that vary in size from 10 nm to 1000 nm.

Nano derived from the Greek word "nanos" which means dwarf or extremely small.

It can be used as a prefix for any unit to mean a billionth of that unit.

for example nanoseconds(billionth of a second), nanometre(billionth of a meter), nanoliter (billionth of a litre).

In nanotechnology a particles is defined as a small object that behaves as a whole unit with respect to its transport and properties.

Nanoparticles are characterized for various purpose, included nanotoxicology studies and exposure assessment in workplaces to assess their safety and health.

Nanoparticles are unlike conventional chemicals in that their chemical composition and concentrations are not sufficient metrics for a complete description, because they vary in other physical properties such as size, shape ,surface properties, crystallinity and dispersion state.

Depending upon the method of preparation, Nanoparticles, nanospheres or nanocapsules can be obtained with different properties and release characteristics for the encapsulated therapeutic agent.

Types of nanoparticles :

There are two sorts of nanoparticles and that they are inorganic or organic.

Inorganic nanoparticles :

there are various varieties of inorganic particles namely, magnetic metallic ceramic and non shells.

Organic nanoparticles :

there are various kinds of organic nanoparticles namely, carbon nanotubes, quantum dots, dendrimers, liposomes and polymers.

Nanoparticles may be classified into differing kinds per the dimensions, morphology, physical and chemical properties.Some of them are carbon based nanoparticles, ceramic nanoparticles, metal nanoparticles, semiconductor nanoparticles, polymeric nanoparticles and lipid based nanoparticles.

- **Carbon based nanoparticles :**

carbon based nanoparticles includes two main materials carbon nanotubes (CNTs)and fullerenes. CNTs are nothing but graphene sheets rolled into a tube.These materials are used for the structural reinforcement as. they're hundred times stronger than steel. CNTs are often classified into single walked carbon nanotubes (SWCNTs) and multi walled carbon nanotubes (MWCNTs).

- **Ceramic Nanoparticles :**

ceramic nanoparticles are inorganic solids made of oxide,carbides, carbonate and phosphate. This nanoparticles have high heat resistance and chemical inertness. they need applications in photocatalysis, drug delivery imaging and photo degradation of dyes. This nanoparticles used effectively as a drug delivery system for variety of diseases like bacteria infections, cancer, glaucoma etc.

- **Metal Nanoparticles:**

Metal nanoparticles are prepared from metal precursor. These nanoparticles will be synthesized by chemical, electrochemical or photochemical methods in chemical methods. The metal nanoparticles are obtained by reducing the metal ion precursor ions in solution by chemical reducing agents.This nanoparticles applications in research areas, detection and imaging of bio- molecules and environmental and bioanalytical applications.

- **Semiconductor Nanoparticles :**

Semiconductor nanoparticles have properties like those of metals and nonmetals. they're found within the tabular array in groups II-VI,III-V,or IV-VI. they're utilized in photocatalysis, electronics devices, photo optics and water splitting applications.

- **Polymeric Nanoparticles :**

Polymeric nanoparticles are organic based nanoparticles. Depending upon the tactic of preparation these have structure, shaped like nanocapsule or nanospheres. Nanosphere particle includes a matrix like structure where as a nanocapsule particles have cell morphology.

- **Lipid based nanoparticles :**

Lipid nanoparticles are generally spherical in shape with a diameter starting from 10 to 100 NM. It consists of a solid core made of liquid and a matrix containing soluble lipophilic molecules .The external core of this nanoparticles is stabilized by surfactants and emulsifiers. This nanoparticles applications in biomedical field as a drug carrier and delivery and RNA release in Cancer therapy.

❖ **Advantages of nanoparticles :**

- Nanoparticles can be used for controlled delivery of drugs.
- Nanoparticle reduces dosing frequency.

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- Feasibility of incorporation of both hydrophilic and hydrophobic substances.
- Nanoparticle drug Carriers have higher stability.
- Nanoparticles have higher carrier capacity.
- Protect drugs from degradation.
- Increases drug solubilisation.
- Produces a prolonged release of drug.
- It as feasibility of various route of administration
- Improve the bioavailability and decreases toxic side effects.

❖ **Disadvantages of nanoparticles** :

- Polymeric nanoparticles possess limited drug loading capacity.
- Polymeric nanoparticles are a relatively slowly biodegradable with might cause systemic toxicity.
- Repeated administration toxic metabolites may be formed due to bio transformations of polymeric carriers.
- Poor drug loading capacity.
- Unpredictable gelation tendency.
- Very costly formulations with no low yield.
- Reduced ability to adjust the dose.

Properties of Nanoparticles:

- The term nanoparticle are defined as solid submicron sized drug carrier that may or may not be biodegradable.
- The term nanoparticles acombined name for both nanospheres and nanocapsules.
- Nanospheres is metric system in which drug is uniformly dispersed, while Nanocapsule is a system in which drug is surrounded by a unique polymeric membrane.
- Nanoparticles consists of three layers : the surface layer, the shell layer and the core. The surface layer usually consists of variety of molecules such as metal ion surfactants and polymers.
- Nanoparticles can exist as suspensions, colloids, or dispersed aerosols depending on their chemical and electromagnetic properties.
- The properties of nanoparticles is based upon their size.For instant copper nanoparticles than are smaller than 50 nm are super hard material and do not exhibit the properties of malleability or ductility of copper. Other changes that are dependent on the size of nanoparticles are super magnetism exhibited by magnetic materials, quantum confinement by semiconductor Q- particles , and surface plasmon resonance in some metal particles.
- Nanoparticles is the bridge between bulk materials and atomic or molecular structures.
- Due to the higher surface area to volume ratio of nanoparticles they shows a tremendous driving force for diffusion, specially for temperature at elevation thus it can take place for lower temperature, over short time scales than for larger particles.
- Nanoparticles posses unexpected optical properties as they are small enough to confine the electrons and produce quantum effects.
- Nanoparticles with one half hydrophilic and the other half hydrophobic are term Janus particles and effective for stabilizing emulsion.
- Suspension of nanoparticles are possible,thus the interaction of particle surface with solvent is strong enough to overcome density differences, which results in a material floating in a liquid.

Methods of preparation of nanoparticles

The properties of preparation of nanoparticles need to be optimized reckoning on the actual application. so as to realize the properties of interest, the mode of preparation plays a significant role. Thus, it's highly advantageous to possess preparation techniques at hand to get PNPs with the specified properties for a selected application. Different techniques like polymerization, preformed polymers or ionic gelation etc are used. the choice of appropriate method for the preparation of nanoparticles depends on the physicochemical character of the polymer and also the drug to be loaded. the first manufacturing methods of nanoparticles from preformed polymer includes:

Solvent Evaporation:

- Polymer is dissolved in organic solvent like acetone, chloroform etc.
- The drug is dissolved or dispersed into the preformed polymer solution.
- Then the mixture is emulsified with aqueous phase to prepare o/w emulsion by using a surfactant.
- After formation of a stable emulsion, the organic solvent is evaporated either by increasing temperature/under reduced pressure or by continuous stirring.
- The w/o/w method is also applied to prepare water soluble drug loaded NPs.

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- Both the above method uses a high speed homogenization or Sonication.

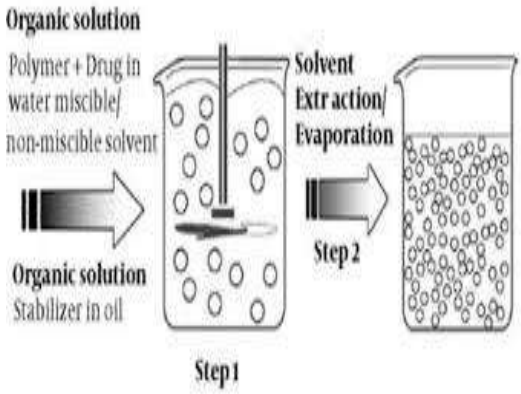

Fig.Schematic representation of solvent evaporation technique.

Spontaneous emulsification/ solvent diffusion method:

- It is a modified version of solvent evaporation method.
- Here water soluble solvent like acetone along with water in soluble solvent like chloroform are used as an oil phase.
- Due to spontaneous diffusion of water-soluble solvent and interfacial turbulence is created between two phases that leads to formation of smaller particles.
- The concentration of water soluble solvent increases a considerable decrease in particle size can be achieved.

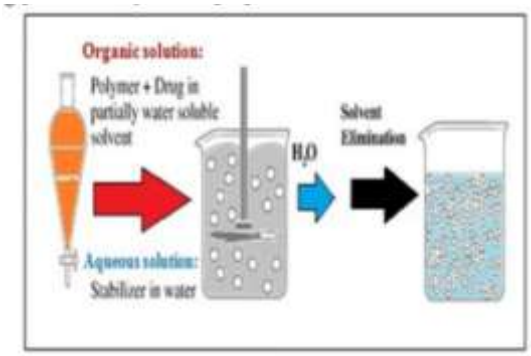

Fig. Schematic representation of emulsification/ solvent diffusion method.

Salting-out :

- Drug and polymer first dissolved in a solvent and then they are subjected to homogenization with aqueous solvent having salting out agent and at last salts are removed by cross flow filtration.

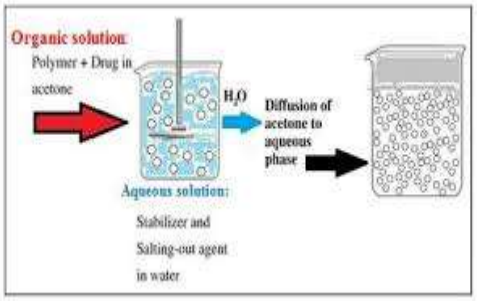

Fig.Schematic representation of salting-out techniques

Monomer Polymerization:

- Monomer polymerization: Here we will see NPs formation using poly (alkyl cyano acrylate).
- The cyanoacrylic polymer is added to an aqueous acidic solution of surface active agent (polymerization medium) under vigorous mechanical stirring.
- Drug is dissolved in the polymerization media either before the addition of monomer or at the end of polymerization reaction.
- The NP suspension is then purified by ultracentrifugation or by resuspending the particles in an isotonic surfactant free medium.
- Particle size and molecular mass of NP depend upon the type & conc. of surfactant, pH of the medium, conc. of monomer and stirring speed.

Nanoparticle prepared by hydrophilic polymers :

1. Denaturation : It involves emulsification of an aqueous solution containing a natural polymer and the drug to be interrupted in an oil emulsion. The particles are hardened by heat denaturation, cooling below the gelation point or by cross linking with suitable agent.
2. Desolvation : Commonly known as coacervation.
3. Ionic gelation : Ion induced gelation results into formation of nanoparticles.

Supercritical fluid technology :

Rapid expansion of supercritical solution

- The solute of interest is first discovered in SEF.
- Then the solution is expanded through a nozzle.
- Thus the solvent power of SCF decreases and so the salute precipitates.
- This technique is clean because the precipitated solute is completely solvent free.

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- Unfortunately, most polymers exhibit little or no solubility in SCF, thus making the technique of practical interest.

Supercritical antisolvent (SAS)

- Both the solution of solute in a suitable solvent of and SCF are charged in the precipitation vessel.
- Because of high pressure, enough antisolvent will enter into the liquid phase so the solvent power will be reduced and solute precipitates.

Gas antisolvent technique (GAS)

- It is a modified version of SAS method.
- The solution of solute is rapidly introduced into the SCF through a narrow nozzle.
- The SCF completely extracts the solvent causing precipitation of solute.

❖ **Characterization of nanoparticles :**

Characterization refers to study of materials in its physical and chemical properties, composition and structures. Nanoparticles are generally characterized by their size, morphology and surface charge, using advanced microscopic techniques such as scanning electron microscopy (SEM), transmission electron microscopy (TEM) and atomic force microscopy (AFM). Electron microscopy techniques are very useful in ascertaining the overall shape of polymeric nanoparticles, which may determine their toxicity.

Scanning electron microscope (SEM)

Scanning electron microscopy (SEM) is giving morphological amination with direct visualization. The technique is based on electron microscopy in which we used for morphological and sizing analysis; however, they provide limited information about the size distribution. For SEM characterization, nanoparticles solution should be first converted into a dry powder, which is then mounted on a sample holder followed by coating with a conductive metal, such as gold, using a sputter coater. The sample is then scanned with a focused fine beam of electrons. The surface Characteristics of the sample are obtained from the secondary electrons emitted from the sample surface. The nanoparticles must be able to withstand vacuum and electron beam which can damage the polymer. The mean size obtained by SEM is comparable with results obtained by dynamic light scattering.

Transmission electron microscope

The sample preparation for TEM [15] is complex and time consuming because of its requirement that sample should be ultra-thin for the electron transmittance. The nanoparticles dispersion is deposited onto support grids or films. To make nanoparticles withstand the instrument vacuum and facilitate handling, they are fixed using either a negative staining material, such as phosphor tungstic acid or derivatives, uranylacetate or by plastic embedding. Alternate method is to expose the sample to liquid nitrogen temperatures after embedding in vigorous ice.

Particle size analyzer

Particle size distribution and morphology of the Nanoparticles are most important parameters for characterization of synthesized Nanoparticles. The major application of nanoparticles is in drug release and drug targeting. It has been found that particle size affects the drug release, smaller particles offer larger surface area as a result, most of the drugs loaded onto them will be exposed to the particle surface leading to fast drug release. Whereas other side, drugs slowly diffuse inside larger particles. As a drawback, smaller particles tend to aggregate during storage and transportation ofNanoparticle dispersion. Hence, there is a compromise betweena small size and maximum stability of Nanoparticles .

Dynamic light scattering (DLS)

Currently most popular method of determining particle size is photon-correlation spectroscopy (PCS) or dynamic light scattering (DLS). DLS is widely used to determine the size of Brownian nanoparticles in colloidal suspensions in the range of nano and submicron. A shining monochromatic light (laser) onto a solution of spherical particles in Brownian motion causes a Doppler shift when the light hits the moving particle, changing the wavelength of the incoming light .

Atomic force microscopy (AFM)

AFM offers ultra-high resolution in particle size measurement and is based on a physical scanning of samples at sub-micron level using a probe tip of atomic scale. Samples are usually scanned in contact or noncontact mode depending on their properties. In contact mode, the topographical map is generated by tapping the probe on to the surface across the sample and probe hovers over the conducting surface in non-contact mode. The prime advantage of AFM is its ability to image non-conducting samples without any specific treatment, thus allowing imaging of delicate biological and polymeric nano and microstructures . AFM provides the most accurate description of size and size distribution and requires no mathematical treatment.

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Surface area analysis

The specific surface area of the particles is the summation of the areas of the exposed surfaces of the particles per unit mass. There is an inverse relationship between particle size and surface area. Nitrogen adsorption can be used to measure the specific surface area of a powder. The method of Brunauer, Emmett, and Teller (BET) is commonly used to determine the total surface area . If the particles are assumed to be as spherical and in a narrow size distribution, the specific surface area provides an average particle diameter in nanometer as formula below:

dBET =6000/ñs Where, S is specific surface area in m2/g ,ñ is the theoretical density in g/cm3

Parameter	Methods
Particle size	Photon correlation spectroscopy, transmission electron microscope, scanning electron microscope, scanned electron microscopy,fraunhofer diffraction LASER diffractometry, coulter counter.
Molecular weight	Gel permeation chromatography
Density	Helium compression pnycnometry
Crystallinity	X-ray diffraction, DSC,DTA.
Surface charge	Electrophoresis Laser Doppler anemometry.
Hydrophobicity	Hydrophobic interaction chromatography Contact angle measurement
Surface properties	Static secondary ion mass spectroscopy
Surface element analysis	X-ray photoelectron spectroscopy for chemical analysis.

Application of Nanoparticles...

- Targeted drug delivery.
- Alternative drug and vaccine delivery (mechanism example inhalation oral in place of injection.)
- Bone growth promoters.
- Cancer treatments.
- Biocompatible coating for implants.
- Sunscreen cosmetics.
- Bio labelling and detection.
- Career for drugs with low water solubility fungicides.
- In mitigating climate change.
- In thermal
- Enhance heat transfer from solar collector to storage tanks.
- Improve efficiency of coolants in transformers.
- In mechanical

Improved wear resistances.

New anti corrosion properties.

New structural materials compositor stronger and lighters.

- Bio-imaging applications due to their ability to produce varying intensity of colours in solution by changing the thickness of the nano shell the aspect ratio and the percent of gold.
- Used in the cosmetic technologies for instant zinc oxide particles have been found to have superior UV blocking properties compared to its bulbk substitute, it is used in preparation of sunscreen lotions.

- **Herbal Extracts :**

Herbal extract is a liquid solution of herbs and alcohol. The dried or fresh herbs are combined with alcohol, then the solid matter is removed leaving only the oils of the herbs mixed with the alcohol. This process is called extraction, hence the name, herbal extract. for instance an extract made from peppermint and alcohol would be called " peppermint extract."

Herbal extracts are substances extracted from the plant using different solvents—some combination of water, alcohol, chemicals, or other liquid that works to delay beneficial plant components. “Extracts can contain the total spectrum of plant chemicals—it’s typically

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highlighted on the packaging,. "And it's rather more common to standardize extracts to a marker of potency and consistency."

Most commercially sold extracts have a herb to alcohol ratio printed on the label. When dry herbs were accustomed make the extract the ratio is usually 1 part dried plant to 4 parts liquid, (alcohol and water). When fresh herbs are used the foremost common ratio is 1:1. This doesn't indicate the number of that herb within the bottle, rather the ratio employed in making the extract. Example: Dry herb strength: 1:4 implies that the mixture wont to produce the extract was 4 parts liquid, (alcohol and water) and one part dried plant. this can be not the identical as an ingredients list which is additionally present on most commercial extracts.

Hebbal extracts are sold as dietary supplements and alternative medicine and commonly used for flavoring in baking and other cooking much like vanilla extract.Herbal extracts are often cited as tinctures by herbalists and medicine practitioners.

Standardization is usually done by measuring the number of a minimum of one or two phytochemical compounds that are researched and identified as having beneficial effects at a specific level. If these compounds are present at the expected levels, the remaining phytochemicals within the plant's matrix are likely where they must be in addition.

The amount of the measured compound is typically written as a percentage on the label. as an example, a supplement containing andrographis might say that it's standardized to contain a minimum of 33% andrographolides (substances known for their immune-supporting abilities).

There are four main types of extracts:
Liquid extracts (aka tinctures):

To make these, the whole herb is soaked in a solution that's more than just water—typically it's a mix of water and alcohol, but it can also be done with vegetable glycerine or apple cider vinegar. "The solution pulls crucial plant chemicals out of the herb, and it acts as a preservative,"

Dried powdered extracts:

Powdered extracts are made by soaking the herb in a solvent that is later evaporated. What's left behind is a concentrated powder of plant chemicals that's typically mixed with some whole herb powder to add consistency and sold in capsule, tablet, or powder form.

Essential oils:

These are made by a steam distillation of the plant, which removes its oil-based chemicals into a very concentrated liquid. Essential oils are typically inhaled (for aromatherapy) or used topically; a few specific oils can be taken orally.

Liposomal blends:

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A relatively new preparation, these are phytochemical compounds combined with liposomes (fat), which encapsulates the chemicals. They're sold as either a capsule or tincture.

- **Benefits or advantages of herbal extract:**
- First and for most things that comes in our mind the 'natural' word is that 100% pure and organic.
- The extracts are mainly concentrated liquid possess various benefits for the betterment of mind kind and environment.
- Ayurvedic and herbal extracts are great for healing owing to their high concentration of active herbal ingredients and constituents. These extracts are widely used in cosmetics and food owing to their various nutritional contents.
- As the natural extracts are fillers and binders,these are considered beneficial to get direct into the bloodstream. The therapeutic benefit of these extracts also make them highly demanded in the market along with this this naturally extracted products ensure good health and diseases free living.
- In herbal cosmetics... They do not provide allergic reactions and do not have negative side effects.
- They are easily incorporated with skin and hair.
- With small quantity they are very effective as compared to synthetic cosmetics.
- Extracts of plants decreases the bulk property of cosmetics and give the appropriate pharmacological effects.
- Easy to manufacture and cheap in cost.
- Easy available and found in larger variety and quantity.
- **What is the influence of nanoparticle for nanotechnology on herbal drugs:**

Herbal medicines are widely used everywhere world. It have various therapeutic values and fewer adverse effect as compared to model medicines. By reducing toxicity and increasing the bioavilability.One such a appropriate is nanotechnology. Nanosized drug delivery system of herbal drugs have a possible future for enhancing the activities and overcome problems associated with plant medicines.Hence integration of the nanocarriers as a NDDS in an exceedingly traditional medicine system is crucial to conflict more chronic diseases like asthma , diabetes and cancer.

- **Novel Drug Delivery System for herbal remedies :**

NDDS is designed to overcome the drawbacks of the traditional herbal drug system due to its wide applications to mankind. Nanoparticle can be used to target the herbal medicines to individual organ which improves the selectivity, solubility, drug delivery, safety, effectiveness and reduces the frequent dose.

The nanoparticle size drug delivery enhances the entire surface area of the drugs therefore allocating quicker dissolution in the blood. Reduction in toxicity while maintaining therapeutic effects. The enhanced permeation and retention of nanoparticles can cross Blood Brain Barrier (BBB).

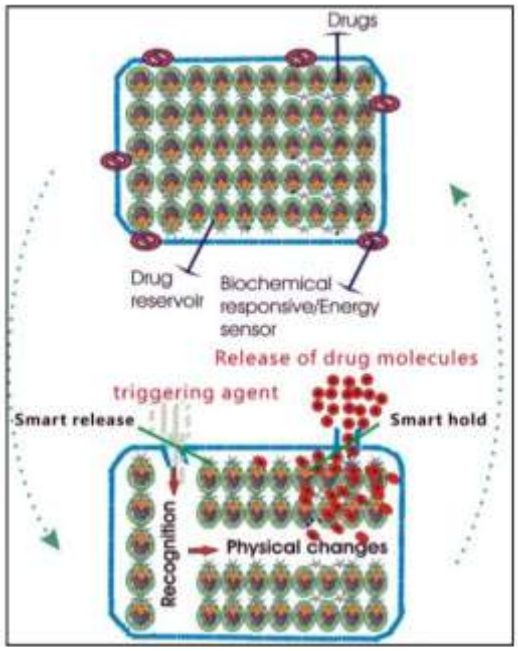

Fig. Release of drug molecules to the targeted site.

Why nano is sized delivery system needed for herbal drugs:

Nano-sized herbal delivery system was selected to overcome the drawbacks of the traditional herbal drug delivery systems because of the following reasons:

- Nanoparticle can be used to target the herbal medicine to individual organ which improves the selectivity, drug delivery, effectiveness and safety and thereby reduces dose and increases patient compliance.
- Nanoparticles can be utilized to increase the herbal drug solubility and help to localize the

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drug in a specific site thus resulting in better efficacy.

- They appear to be able to deliver high concentrations of drugs to disease sites because of their unique size and high loading capacities.
- Delivering the drug in small particle size enhances the entire surface area of the drugs therefore allocating quicker dissolution in the blood.
- Shows EPR (enhanced permeation and retention) effect, i.e., enhance

permeation through the barriers because of the small size and retention due to poor lymphatic drainage such as in tumor.

- Exhibits passive targeting to the disease site of action without the addition of any particular ligand moiety.
- Decreases the side effects.
- Decrease within the dose of the drug formulation.

Recent development of novel drug delivery system of herbal drug:

Novel technologies are developed recently for drug delivery systems. the utilization of herbal formulations for novel drug delivery systems has more advantageous and has more benefits compared to others. the utilization of liposome, ethosome, phytosomes, emulsion, microsphere, solid lipid nanoparticles of herbal formulation has enhanced the therapeutic effects of plant extracts. With the utilization of of these, targeted delivery of the formulation is achieved, because of which the formulation demonstrates effect on the positioning, and therefore the bioavailability of the formulation is additionally increased, Microencapsulation of herbal extract in nanopaticulate is an efficient way accustomed protect drug or food ingredients against deterioration, volatile losses, or premature interaction with other ingredients. the benefits of the nanoparticle are that it improves the absorbency of the herbal formulation, reduces the dose of formulation and increases its solubility.

Advantages of herbal nanoparticle delivery system

1. Nanoparticulate system delivers the herbal formulation on to the positioning of action.
2. Encapsulating drugs within nanoparticles can improve the solubility and pharmacokinetics of medication.
3. Nanoparticles can even reach the selection of formulations, promote the drugs through the biological barriers and increase the bioavailability of medicine.
4. It can take the drug on to the positioning of action without destroying surrounding environment.

Herbal Nanoparticles Formulations...

Active ingredients	Biological activity	Applications of nanostructure formulations.
Berberine	Antineoplastic activity	H.pyroli growth inhibition
Quercitrin	Antioxidant	Better therapeutic for intestinal anti inflammatory
Hypocerellins	Antiviral activity	Improved performance in both stability and hydrophilicity
Silybin	Antihepatotoxic activity	Show sustained release and targeting system
Ginseg	Anti-oxidant activity	Improvement instability and improvement in its action
Radix salvia miltiorrhiza	Antiangina activity	Improve bioavailability
Paclitaxel	Anti-tumor activity	Show Sustained release

Nano herbal Formulations:

Nanophyto medicines are prepared from plant extracts or their therapeutically active constituents. Nano drug delivery systems help in better bioavailability, decreases side effects and toxicity. a number of the marketed nano herbal medicines are described as below.

Texel-loaded nanoparticles

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Taxel-loaded nanoparticles:
• Formulation: Taxel-loaded nanoparticles
• Active ingredient: Taxel
• Applications of nanostructured formulations: Enhance the bioavailability and sustained
• Biological activity: Anticancer
• Method of preparation: Emulsion solvent evaporation method
• Route of administration: IV.

Barberine Loaded Nanoparticles

Berberine-loaded nanoparticles:
• Formulation: Berberine-loaded nanoparticles
• Active ingredient: Berberine
• Applications of nanostructured formulation: Sustained drug
release
• Biological activity: Anticancer
• Method of preparation: Ionic gelation method
• Route of administration: IV.

Nanoparticles of Cuscuta chinensis Cuscuta:

• Formulation: Nanoparticles of Cuscuta chinensis
• Active ingredients: Flavonoids and lignans
• Applications of nanostructured formulations: Improve water solubility
• Biological activity: Hepatoprotective and antioxidants effect
• Method of preparation: Nanosuspension method
• Route of administration: Oral.

Artemisininnanocapsule

Artemisinin nanocapsule:
• Formulations: Artemisinin nanocapsules
• Active ingredients: Artemisinin
• Applications of nanostructured formulations: Sustained drug release
• Biological activity: Anticancer
• Method of preparation: Self-assembly procedure
• Route of administration:

Radix salvia miltiorrhizananocapsule

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Radix salvia miltiorrhiza:
• Formulations: R. salvia miltiorrhiza nanoparticles
• Active ingredients: R. salvia miltiorrhiza
• Applications of nanostructured formulations: Improve the bioavailability
• Biological activity: Coronary heart diseases, angina pectoris, and myocardial infarction
• Method of preparation: Spray-drying technique
• Route of administration: IV

Nano herbal cosmetic formulations:

Sunscreens

Ultraviolet (UV) filters are employed in nano form instead of bulk form to create the sunscreen transparent instead of white. it's also claimed that they're simpler when employed in nano form. SLN can act as a physical UV blocker them and are able to improve the UV protection

Breast cream

St. herb nano breast cream claims it is a combination of "nanotechnology and the timeless Thai herb, Pereira mirifica" and that niosomes "expands the cellular substructure and development of the lobules and alveoli of the breasts," with increased size from one to three cups.

Hair care

Red blood cell Life Science's Nanoceuticals Citrus Mint Shampoo and Conditioner are made with Nano Clusters "nanoclusters to give your hair a healthy shine." Shampoo with herbal blend of nettle leaf extract, black elderberry extract, chamomile combined with citrus and mint oils.
• Strengthens hair follicles
• Improves scalp circulation
• Helps diminish inflammation and dandruff
• Enhances hair volume and shine.

II. CONCLUSION:

Herbal drugs have been recently getting more attention because of their potential to treat almost all diseases. However, several problems such as poor solubility, poor bioavailability, low oral absorption, instability and unpredictable toxicity of herbal medicines limit their use. In order to overcome such problems, nanoparticles can play a vital role. Hence, different nanoparticles including polymeric nanoparticles, liposomes, proliposomes, solid lipid nanoparticles and microemulsions showcase potential utilization to deliver herbal medicines with better therapy.

Nanotechnology is rapidly expanding and potentially beneficial field with tremendous implication for industry, medicine, and cosmetics. The combination of nanotechnology with traditional herbal medicine may provide a very useful tool in designing future herbal medicine with improved bioavailability profile and less toxicity.

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