A REVIEW ON NOVEL DRUG DELIVERY SYSTEM

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ABSTRACT

Plants are the medicines of nature and are used by people Earth has been for food and medicine since ancient times. Today's worldwide Movements to locate herbal medicines in laboratory plants Scale and subsequent pre-clinical and clinical trials Business with an effective human drug supply system. The fundamental elements the treatment of any disease is in nature concealed behind it. However, it needs improvements in the distribution of herbal medicines Aim for continuous release to improve patient conformity and so on. Earlier herbal remedies do not attract scientists creation of new treatment-related drug delivery technologies, Difficulties in standardization, extraction and recognition. Now, however, days New drug delivery systems (NDDS) open the door with technical innovation To build networks for the supply of herbal medicines. Latest tools for drug delivery The value of achieving changed supply of herbal medicines has thus grown both medicinal benefit and toxicity mitigation. Many new carriers for the last ten years Implants have been documented including liposomes, nanoparticles, phytosomes and ethosomes Successful modificated distribution of different herbal medicines. The aim of this article To synthesize the different new technologies developed for drug delivery Provision of herbal medicines for improved treatment response.

KEYWORDS: NDDS, NANOPARTICLES, STUDY OF DRUG RELEASE

INTRODUCTION

There are several different carriers with benefits over made on the basis types in the novel drug delivery systems (NDDS). The traditional dosage forms display high dose and low availability, in-stability, first pass effect, fluctuation of plasma drug levels, and fast release of medicinal products. By - performance, protection, compliance with patients, and product shelf life.[3] NDDS will mitigate the problems. Becoming aware of the potential effects on human health and environmental sustainability and due to the growed environmental performance of human-made nanoparticles, nanoparticles are of current interest. In several different applications, nanoparticles are used and generated by various processes. Interesting theoretical problems are their calculation and characterisation. Nanoparticles are classified as nanoparticles with a diameter between 10 and 100 nm. Their pharmacodynamics and pharmacokinetic properties are modified as a targeted supply mechanism for the distribution of small and large molecules. They can be characterized as system containing dissolved active agent, encapsulated or adsorbed in the matrix material used to deliver the target tissue.The effect of medication on the target tissue has been shown to increase the retention stability by enzymes and intravascular solubilization of nanoparticles. During the design of nanoparticles, some controls need to be vigilant, including their release pattern, dimensions and surface characteristics, which decide the particular site action at optimum rates with a right dose scheme. The first nanoparticles documented were based on a polymeric non-biodegradable framework (polyacrylamide, polymethyl-methaacrylate, polystyrene). The polymeric nanoparticles may hold pharmaceuticals or proteins, ie (s). These bioactives are traped as particulates or solid solutions in the polymer matrix, or they may be physically or chemicalally stuck to the surface of the particle. The medicine(s) may be applied to the previously prepared nanoparticles in the preparation of nanoparticles. This term does not reflect the morphological or structural organization of the system and is aresuggestively general. Nano medicine is an innovative field of medicine[1].

Definition: The drug is known as a dissolved, trapped, encapsulated, or nanoparticle-attached nanoparticle matrix as a particulate dislocation or a solid particulate with sizes between 10 and 1000NM. Nanoparticles are in solid form and are either amorphous or crystalline[4-7] like nanospheres and nanocapsules of the size 10-200 nm. For the preparation of nanoparticles, polymeric materials were commonly used[8]. Nanoparticles, nanospheres or nanocapsules may be obtained according to the preparation method. Nanocapsules are systems in which the medicinal product is confined to a cavity with a unique polymeric membrane, while the nanosphere is a matrix system that physically and consistently disperses the pharmaceutical product.

DNA carriers in the field of gene therapy have been used as potential devices to supply proteins and other nanoparticles over recent years, particularly with hydrophilic polymers like poly (ethylene glycol) (PEGs), due to their ability to circulate for a prolonging duration as a specific organ, and their ability to supply proteins, pe and other DNA in gene therapy.[1-4]

Nanoparticles have been thoroughly studied as a targeted drug delivery system[9]. Active targeting or passive targeting can achieve targeted drug delivery. Active drug targeting may occur through either the conjugation of the drug molecule with a cell or tissue-specific ligand [10]. While passive drug targeting by incorporating a drug molecule into micro-particles or nanoparticles can be achieved. The Colloidal Framework for Drug Delivery Nanoparticles (NP) consist of natural, synthetic and semi-synthetic polymers. NP particle size varies with diameter between 10 nm to 1,000 nm[11]. The different inner structure of this colloidal drug delivery system.

• Matrix-type nanospheres

• Reservoir-type nanocapsules

Need of Study [12]

95% of all experimental drugs have low pharmacokinetic and biopharmaceutical properties at present. Consequently, suitable medication distribution schemes must only be established at the site without harming healthy bodies and tissues, which will disperse the therapeutically activated drug molecules, lower the efficacy doses as well as improve therapeutic indices and safety profiles in new therapists. Various explanations are,

1) pharmaceutical

- Confusion in traditional dosing - Solubility

2) Biotechnology

- Poor uptake.

- High diaphragm borders

- Instability of the organism

3) Pharmaceuticals/pharmacodynamics

- Short half of a lifespan

- Wide distribution volumes

- Limited pace

4) Clinical Clinical

- Poor Index of Therapy

Objective[12]

In order to achieve site specific action at the therapeutically optimized rate and dosage scheme, the main goals when developing the nanoparts as an input device are to monitor particle size, surface properties or release of pharmacologically active agents.

The medication is therefore explicitly engineered with minimum side effects & enhanced therapeutic index to achieve a desired pharmacological response in a selected site without adverse interactions in other sites.

Ex: replacement therapy with cancer chemotherapy and enzymes.

Ideal Features [12]

Targeted framework for drug delivery

Non-immunogenic, inert biochemically (not toxic).

In vivo and in vitro, both physically and chemically stable.Drug delivery is limited to target cells (or) organs and should be standardized. Medicine release controllable and predicate rate. The release of medicines does not affect the action of drugs. Medicine release therapeutic quantity. During travel, minimal drug leak.

Carriers used have no issue or bear mediated modulation of disease without biodegradable (or) readily removed from the body. Quick (or relatively easy reproductive & cost efficient preparation of the delivery system.

Advantage & disadvantage [13]

Nano -particles benefits:

1. They are site-specific, biodegradable, non-toxic and store for at least a year.

2. You may target a drug to a particular position in the body by adding targeted ligands to particle surfaces or by using magnetic guidance.

3. They give regulated drug release rates and characteristics for particle degradation that can easily be modulated using matrix constituent selection.

4. The loading of the medication is high and without a chemical reaction drugs can be introduced into the systems; this is an essential factor to safeguard drug operation.

5. They have better therapeutic efficacy and overall response/unit dose.

6. The system can be used on different routes such as oral, nasal, maternal, intraocular, etc.

7. Nanoparticles can easily be manipulated to achieve both passive and active drug targets following parenteral administration, particle size and surface characteristics.

Disadvantages

1. There are limits on bioacceptability.

2. Hard to produce in big quantities.

3. The small amount of particles and the large area can make it difficult to aggregate particles due to their small size, thereby making it difficult to physically handle nanoparticles in liquid and dry form.

4. Restricted loading and explosion contributes to the small particle size, as well as large surface area. Until nanoparticles can be clinically or commercially available, these practical problems should be solved.

5. The present work is a step towards the production of drug delivery systems for nanoparticles, surface modulation, drug loading strategies, release control and future applications for nanoparticles.[14]

Drug delivery mechanism by nanoparticles

Nanoparticles deliver the drug onsite by preventing the reticulo endothelial system, using improved permeability, retention effect and targeting. Dogs with nano particles as carriers apply two forms of approaches[15].

a. Surface bound: The drug molecules are connected to the nano particles surface

b. Core bound: The drug particles are concentrated in such a technique into the nano pharma matrix and transported into the body to the target. Drugs can be loaded onto nano particles by adding or adding to the reaction mixture during polymerization to a solution that includes previously prepared nano particles. Chemistry, superficial adsorption or any binding or contact may be the essence of the interaction of nano particles to drug products. The number

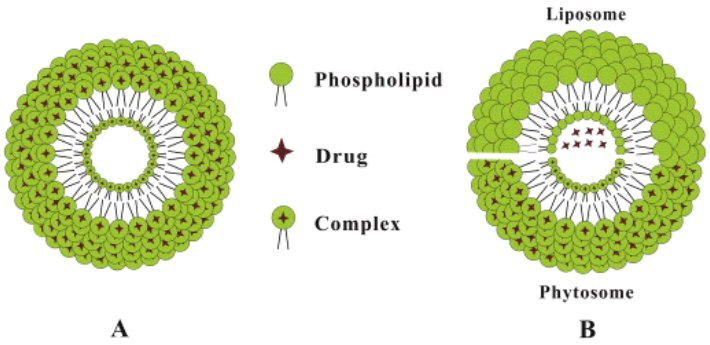
Rely on the chemical structure of the drug and polymer and the conditions for drug loading, the binding drug and the form of interaction of drug and nanoparticles [15.]

TYPES OF NOVEL DRUG DELIVERY SYSTEM

Phytosome

The word "Phyto" indicates plant while others means cell-like. "Phyto" means plant. Phytosomes were the Method of vesicular supply of herbal extract phytoelectric ingredients and Lipid bound (one molecular phyto-constituent, bound to a phospholipid at least molecular).). Phytosomes guard against degradation of important herbal extract components Digestive secretion and intestinal bacteria which have increased absorption Provides improved pharmacological and pharmacokinetic biological and improved availability Parameters of herbal extract traditional.[16] and the distinction between phytosomes and liposome.

Figure 1. shows liposome & Phytosomes



Phytosome Benefits

1. Improved phospholipid complex bioavailability.

2. Enhanced GIT absorption.

3. Improved therapeutic results are attributed to increased bioavailability.

4. High bioavailability requires less dosage.

5. Greater stability. More stability.

6. High lipophilicity causes high pene

tration and is thus used over liposomes in cosmetics

7. Significant clinical advantages.

8. Phosphatidylcholine is not a carrier, but serves as a liver protection.[17]

Method for preparation for Phytosomes: [16]

Phospholipids

Dissolved in organic solvent Containing Drug/Extract.

Solution of phospholipids in organic Solvent with drug/extract

Drying

Formation of thin film

Hydration

Formation of phytosomal suspension

Figure 2: Common stages for preparation of Phytosome

Liposomes

Liposomes are condensed bilayered vesicles with a completely contained aqueous volume A lipid membrane bilayer consisting mainly of natural or synthetic phospholipids. The Face The liposome name comes from two Greek words: "Lipos" which means fat, "Soma" The flesh. A liposome can be produced in a range of sizes as single or multi-lamella the house, and its name concerns its building blocks, phospholipids, not Its dimension. Its scale. A liposome has no lipophobic substance, for instance water, even if it does not Typically does. Usually does. Artificial vesicles consisting of bilayer lipid are liposomes. Liposomes. Liposome Liposomes Drugs may be filled and used to administer cancer and other diseases medicines. Liposome Liposomes Biological membranes such as sonic disruption can be prepared. Liposome Liposomes They are microparticulate or colloidal carriers, typically 0.05-5.0 μm in diameter, spontaneously forming in aqueous media as such lipids hydrate. Liposomes are made up a relatively bio-compatible, biodegradable and aqueous material A amount of natural and/or synthetic lipids entangled in one or more bilayers. A large variety of medications In liposomes, either in phospholipids bilayer, varying lipophilicity can be encapsulatedThe captured amount of aqueous substances or at the interface of the two-layers.

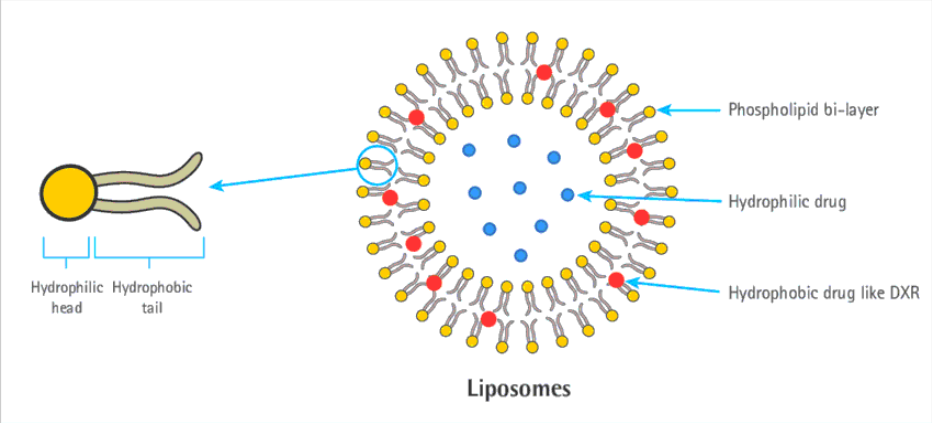


Figure 3. Liposomes.

Liposome classification based on structural features[17]

1. MLV - Multilamellar large vesicles
2. OLV - Oligolamellar vesicles
3. UV - Unilamellar vesicles
4. SUV- Small unilamellar vesicles
5. MUV - sized unilamellar vesicles
6. LUV - Large unilamellar vesicles
7. GUV - Giant unilamellar vesicles
8. MVV -Multivesicular vesicles

Liposome classification based on method of liposome preparation. [17]

1. REV -Single or oligolamellar vesicle made by reverse phase evaporation method.
2. MLV / REV -Multilamellar vesicles made by reverse phase evaporation method.
3. SPLV -Stable plurilamellar vesicles.
4. FAT-MLV Frozen and thawed MLV
5. VET- Vesicles prepared by extrusion method.
6. FUV-Vesicles prepared by fusion
7. FPV -Vesicles prepared by French press
8. DRV- Dehydration- rehydration vesicles

Advantages of Liposome[18]

1. Provides selective passive targeting to tumor tissues (Liposomal doxorubicin).
2. Increased efficacy and therapeutic index.
3. Increased stability via encapsulation.
4. Reduction in toxicity of the encapsulated agents.
5. Site avoidance effect.
6. Improved pharmacokinetic effects (reduced elimination, increased circulation life times).
7. Flexibility to couple with site specific ligands to achieve active

NIOSOMES

They are lamellar microscopic structures which are produced by a nonionic surfactant, cholesterol admixture and a charges-inducer with a subsequent hydrating in watery media. Niosomes have a hydrophobic and hydrophilic moiety infrastructure, which allows drug molecules with a large range of solubilities to be accommodated. In several pharmaceutical applications, niosomes have been assessed. Significant benefits in clinical application such as the ability to reduce systemic toxicity by encapsulating treatment agents include the ability to decrease clearance from the body by slowing drug release of such agents. [19] and the niosome structure of figure 4 .[20]

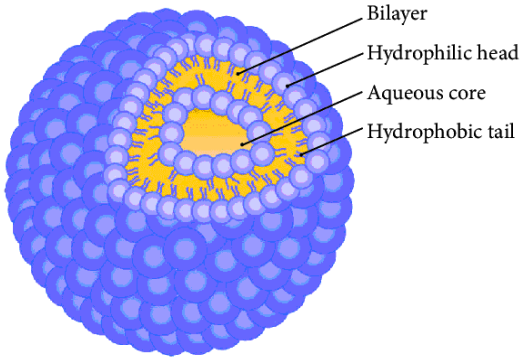


Fig. 4: Structure of Niosome

Types of Niosomes[19]

1. Niosomes are classified based on number of bilayer, size
2. and method of preparation.
3. Mulitlamellar- 0.5µm to 10µm in diameter.

4. Larger unilamellar- 0.1μm to 1μm in diameter

5. Small unilamellar – 25-500nm in diameter

Advantages of Niosome[21]

1. Niosomes are non-toxic, non-immunogensic, biodegradable and compatible.

2. In a small volume of vesicles, niosomes can encapsulate large amounts of material.

3. Niosomes have greater compliance, happiness and efficacy than Common oily formulae.

4. Niosomes can trap a broad range of (hydrophilic, lipophilic, and amphiphilic) chemicals.The unique structure of drugs).

5. Niosome features such as type, flow and size can easily be monitored Modification of structural structure and manufacturing processes.

6. Niosomes can be administered through several routes including oral, parenteral and administrative.Available in various types, such as semisolids, powders or suspensions, topical, etc.

7. Since the structural structure's chemical stability, the niosome is simple to store.

TRANSFERSOME

Gregor Cevc introduced the definition and idea of transfersome in 1991. The Title is derived from the Latin word 'transferre' which means, "to carry" means "to transport" Through' and "soma" fora, the Greek term "body." A translator is an artificial carrier A vesicle similar to the normal vesicle of the cell. It is therefore suitable for managed and targeted Delivery of drugs. Transfersome is a dynamic aggregate that is highly adaptable, stress reactive. It is a deformable vesicle with an aqueous center surrounded by the complex Fat bilayer. Fat bilayer. The vesicle depends on the local composition and the form of the bilayer.Self-regulation as well as self-optimisation. This helps the customer to cross different effectively convey barriers and then act as a non-invasive target drug transport agent.Provision of therapeutic agents and their continuous release. These self-optimized components.The ultra-flexible membrane can supply either into or via a drug reproducibly. The skin has high quality, depending on the option of application or administration. These transfers are more elastic than the regular liposome in various orders of magnitude and are therefore well suited to skin penetration. The transfers occur by squeezing them through the intracellular lipid of the stratum corneum to induce skin penetration difficulties. The transfersoma membrane versatility is achieved by mixing of appropriate surfactive components 22-28 .structure ratios as shown in fig.5 [24].

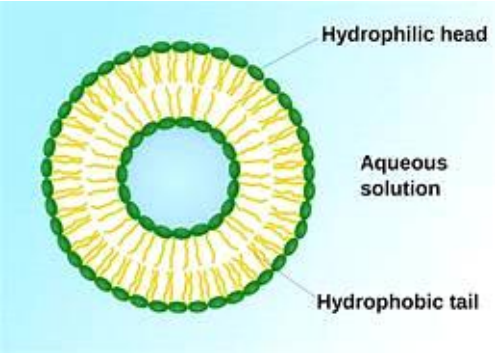


Fig. 5: Undeformable Vesicle (Transferosome)

· Transfersomes Advantage [23]

1. Small constriction (5-10 times smaller) can be caused by transfers. Without observable loss, except their own diameter.

2. In the case of lipophilic medicine they have a high capture efficiency of about 90%.

3. This high deformity gives the intact vesicles a greater penetration.

4. They can be used to supply low and high molecular weight medicines like analgesics.Bluetongue, anesthetic, corticosteroids, gender hormone, anticancer, insulin, andAlbumin.

5. Transfers have a hydrophobic and hydrophilic infrastructure Together and as a result, drug molecules with a wide variety of Solubility

6. They function as a warehouse, slowly and steadily releasing their contents.

Evaluation of Nanoparticles29

The nanoparticles are generally evaluated for the following:

1) Size and morphology
2) Specific surface
3) Surface charge and electrophoretic mobility
4) Density of nanoparticles
5) Molecular weight
6) Nanoparticle recovery and drug incorporation efficiency
7) In vitro release

Size of nanoparticle is determined by

a) Photon correlation spectroscopy(PCM)
b) Electron microscopy(EM): This include
1)Scanningelectron microscopy(SEM)
2)Transmission electron microscopy(TEM)
3)Freez fraction electron microscopy(FFEM)

c) Atomic force microscopy Electron microcopy the internal morphology of FFEM particles is less time consuming and the distinction between nanoparticles and nanocapsules and the emulsion droplets is given by FFEM. Both particles have a non-conductive gold coating (thickness of gold coast is 30-50nm). Thus a given size should be defined as being the particle size coated with gold. Microscopy of Atomic Force (AFM) is an innovative nanoscopic technique and used to describe the porositometer of PLA for nanosphere.

2)Specific surface:

Specific surface of freez dried nanoparticles is determined with sorptometer and it is calculated by using the formula:

A= 6/ D.d

Where

A= Specific surface

D= Density

d= Diameter of the particle

3)Surface charge and electrophoretic mobility:

Surface charge of nanoparticles can be determined by measuring the velocity of particle in an electronic field. It can also be measured as electrophoretic mobility. The electrophoretic mobility is determined in phosphate saline buffer & human serum. Laser Doppler anemometry or velocimetry is widely used techniques for determination of velocities. Phosphate saline buffer (PH-7.4) reduces the charge value of nanoparticles, zeta potential can be obtained by measuring the electrophoretic mobility applying Helmholtz-Smoluchowski equation.

4)Density of nanoparticles:

Density of nanoparticles is determined with helum or air using a gas pychnometer

5) Molecular weight:

Molecular weight of polymer and its distribution in the matrix can be evaluated by Gel permeation chromatography.

STABILITY UPON STORAGE OF THE NANOPARTICLES [30]

The need and degree of purification depend on the final purpose of the formula. Gel filtration, ultra-centrifuge, dialysis and, recently, cross-flow filtering are the most frequently mentioned procedures. Freeze-drying appears to be a highly stabilizing method. The technique involves freezing of the suspension and subsequent reduction of the water content by sublimation by lower pressures. Freezing is the most aggressive step in this regard. A complete preclusion must be avoided by adding certain additives. In order to prevent alteration of the suspension[31] it is therefore necessary to enhance the resistance of an anoparticles by adding a cryoprotector. At times the glucose, trealose, mannitol, and sorbitol cryoprotectants were

added to ensure redistribution or to permit the suspension to be vitrified in refreshment and to prevent liquid suspension crystallization [32]

Future Opportunities and Challenges

Nanoparticles and nanoformulations have already been applied as drug delivery systems with great success; and nanoparticulate drug delivery systems have still greater potential for many applications, including anti-tumor therapy, gene therapy, and AIDS therapy, radiotherapy, in the delivery of proteins, antibiotics, virostatics, vaccines and as vesicles to pass the blood - brain barrier34. Nanoparticles and nanoformulations have already been applied as drug delivery systems with great success; and nanoparticulate drug delivery systems have still greater potential for many applications, including anti tumour therapy, gene therapy, AIDS therapy, radiotherapy, in the delivery of proteins, antibiotics, virostatics, vaccines and as vesicles to pass the blood-brain barrier. Nanoparticles provide massive advantages regarding drug targeting, delivery and release and, with their additional potential to combine diagnosis and therapy, emerge as one of the major tools in nanomedicine. The main goals are to improve their stability in the biological environment, to mediate the bio-distribution of active compounds, improve drug loading, targeting, transport, release, and interaction with biological barriers. The cytotoxicity of nanoparticles or their degradation products remains a major problem, and improvements in biocompatibility obviously are a main concern of future research[32].

There are many technological challenges to be met, in developing the following techniques[32]: a)-Nano-drug delivery systems that deliver large but highly localized quantities of drugs to specific areas to be released in controlled ways; b) -Controllable release profiles, especially for sensitive drugs;
c) -Materials for nanoparticles that are biocompatible and biodegradable;
d) -Architectures / structures, such as biomimetic polymers, nanotubes;
e) -Technologies for self-assembly;
f)- Functions (active drug targeting, on-command delivery, intelligent drug release devices/ bioresponsive triggered systems, self-regulated delivery systems, systems interacting with the body, smart delivery);
g) -Virus-like systems for intracellular delivery;
h) -Nanoparticles to improve devices such as implantable devices/nanochips for nanoparticle release, or multi reservoir drug delivery-chips; i) -Nanoparticles for tissue engineering; e.g. for the delivery of cytokines to control cellular growth and differentiation, and stimulate regeneration; or for coating implants with --nanoparticles in biodegradable polymer layers for sustained release;
j) -Advanced polymeric carriers for the delivery of therapeutic peptide/proteins (biopharmaceutics), And also in the development of: k) -Combined therapy and medical imaging, for example, nanoparticles for diagnosis and manipulation during surgery (e.g.

thermotherapy with magnetic particles); l) -Universal formulation schemes that can be used as intravenous, intramuscular or peroral drugs m) -Cell and gene targeting systems. n) -User-friendly lab-on-a-chip devices for point-of-care and disease prevention and control at home. o)-Devices for detecting changes in magnetic or physical properties after specific binding of ligands on paramagnetic nanoparticles that can correlate with the amount of ligand. -Better disease markers in terms of sensitivity and specificity.

Marketed Products of Nanomedicine[12]

1. Nanoparticle
2. Nanocrystal
3. Nanotube
4. Superparamagnetic iron oxide
5. Liposomes
6. Micelle

Conculsion

Nanoparticles are a promising controlled and selective release mechanism for drug delivery. The advancement of nanotechnology would undoubtedly have important consequences for the drug supply industry, affecting virtually every route from oral to injectable. And lower drug toxicity, lower cost of treatment, greater bio-availability and expanding the economic life of patented medicines are projected to pay for both physicians and patients. This will increase the efficacy of drug therapies and reduce the side effects before and after diagnosis and treatment. Nanoparticles are also a promising platform for the synthesis of molecular contrast agents12. Significantly capable of transforming poorly soluble, poorly absorbed and labile biological active material into promising administerable drugs nanoparticulate systems. Nanoparticles typically have comparatively greater intracellular absorption than microparticles, and because of their small size and relative mobility, are accessible to a wide range of biological goals [31.]

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