

A Systemic Review on Nanoparticles

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ABSTRACT

From the ancient time nanotechnology is widely used for various treatment like cancer based treatment and presently nnds is used for treatment of psoriasis and it play good role in healthcare field nowadays one of the focused area in nanotechnology which is nanoparticles. nanoparticles are at the forefront of the rapidly developing field of nanotechnology with several potential applications in drug delivery, clinical medicine and research as well as in other varied sciences. Due to their unique size-dependent properties, nanoparticles offer the possibility to develop new therapeutics. The ability to incorporate drugs into nanocarriers offers a new prototype in drug delivery that could be used for secondary and tertiary levels of drug targeting. Hence, nanoparticles hold great promise for reaching the goal of controlled and site specific drug delivery and hence have attracted wide attention of researchers. In this review presents a broad treatment of nanoparticles discussing their advantages, limitations and their possible remedies. The different types of nanocarriers which were based on solid lipid like solid lipid nanoparticles, nanostructured lipid carriers, Different production methods which are suitable for large scale production and applications of nanoparticles are described. Appropriate analytical techniques for characterization of nanoparticles like photon correlation spectroscopy, scanning electron microscopy, differential scanning calorimetry are highlighted.

Keywords: nanoparticles (NPs), drug carriers, homogenization, TEM, nanotechnology, novel drug delivery system.

INTRODUCTION

The prefix nano comes from the ancient Greek *vavoc* through the latin names meaning very much. Nanoparticles are defined as particulate dispersion or solid particles with size range of 10-1000nm. The drug entrapped, dissolved, encapsulated or attached to nanoparticles matrix

surrounding interfacial layer.

Nano Capsules: The nano capsules are the system in which the drug us confined to cavity surrounded by a unique polymer membrane.

Nanospheres: The Nano spheres are matrix system in which the drug is uniformly and physically dispersed.

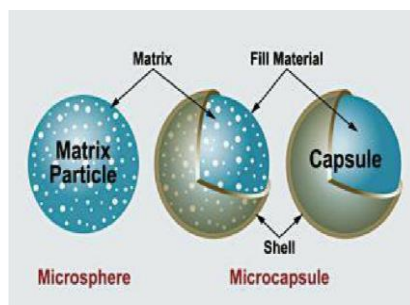


Figure1.1 Microsphere and Microcapsule

Ideal Properties of Nanoparticles Necessary for Drug Delivery

1. Stable in blood
2. Biodegradable
3. Non – Immunogenic
4. Non - thrombogenic
5. Non inflammatory

Advantages of Nanoparticles

Fairly Easy Preparation

- Well protection in encapsulated drug
- Increased the efficiency of therapeutics.

Good Control Size Reduction and Size Separation

- Longer clearance time
- Dose proportionality

Targeted Drug Delivery

- Increased bioavailability

- Retention of drug at the active site

Disadvantages of Nanoparticles

- Toxicity
- Cytotoxicity
- Disturbance of autonomic imbalance
- Limited targeting abilities
- Discountiniution of therapy is not possible

Nanomedicines for Drug Delivery

There are lots of medicine is available Dendrimer , Silica gold nanoshell, colloidal gold, polymer- protein Conjugate, functionalized quantum dot, single walled carbon nano tubes, PEGylated carbon tube, fullerene, nano Liposomal vesicle, solid nanoparticles, functionalized Nanoparticles, polymeric Micelle, functionalized magnetic , polymer – antibody conjugate, functionalized nanodiamonds.

Table1.1. Types of Nanoparticles and it's Classification, Application.

S. N. O	Types of Nanoparticles	Material Used	Application
1	Nano suspensions and nanocrystals	Drug powder is disperse d insurfactant solution	Stable system for controlled delivery of poorly soluble drug
2	Solid lipid nanoparticles	Melted liquid dispersed in aqueous surfactant	Least toxic more stable colloidal carrier system
3	Polymeric nanoparticles	Biodegradable polymer	Controlled and targeted drug delivery
4	Polymeric Micelles	Amphiphillic block co polymers	Controlled and systemic delivery of water insoluble drugs
5	Carbon nanotubes	Metals, semiconductors	Gene, DNA Delivery

Routes

- Topical Application , Non - Biodegradable implants, injectable nano rod, biodegradable implants.
- Functionalized nanoparticles pulmonary delivery.
- Permeation enhanced nanoparticles loaded delivery.
- Growth factor delivery [Future technology]
- Functionalized nanoparticles oral smart drug delivery .

Polymer

Polymer of drug delivery system play great role in the advancement of drug delivery controlled therapeutic agent for longer time cyclic dosage both hydrophilic and hydrophobic drugs.

Polymer Used In Preparation

- Natural Hydrophilic
- Proteins
 - Polysaccharides
- Synthetic Hydrophobic
- Pre- Polymerized
 - Polymerized in Process

Natural Hydrophilic Polymer

Protein Polysaccharides

1. Gelatin Alginates
2. Albumin Dextran
3. Lectins Chitosan
4. Legumin Agarose
5. Vicilin Pullulun

Techniques of Preparation



Figure1.2. Techniques of Preparation

These techniques is using for preparation of nanoparticles preformed polymers, ionic gelation, Polymerization.

Evaluation Parameters of Nanoparticles

1. Yield of Nanoparticles
2. Drug Content / Surface Entrapment/ Drug Entrapment
3. Particle Size - Particle size and it's distribution is important characteristics in nanoparticles as they plays major role in distribution, pharmacological activity, toxicity and targeting the specific sites
4. Particle Shape - Particle shape of the nano suspensions is determined by scanning electron microscopy SEM.
5. Zeta Potential - Zeta potential is the potential difference existing between the surface of solid particle immersed in conducting liquid and the bulk of the liquid.

CONCLUSION

The main goal of this review was to describe the different preparation technique available for productive of polymeric nanoparticles & Drug will be loaded nanosphere can be produced by simple, safe, reproducible technique available. One technique is not sufficient for all drugs, post preparative steps, such as preservation. These all challenges in terms of technology, nanoparticles have been showed great promise for the development.

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