Nanoparticles: A Method for New Drug Delivery. Chapter

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Abstract: Over the last few years, nanotechnology has been shown to be useful in drug delivery. Nanoparticles can be defined as a useful method for new drug delivery systems that have many applications in medicine and scientific fields. They have advantages such as improved drug use, safety, biodegradability, bioavailability and recovery index compared to the standard use of similar medical drugs.

Various polymers are involved in the production of nanoparticles. Basically, nanoparticles are prepared by various methods such as dispersion of prefabricated polymers, polymerization of monomers, and ionogelation or copolymerization of hydrophilic polymers. Evaluation of nanoparticles, drug retention, particle shape, drug release studies etc. performed with the help of parameters. This article only introduces drug nanoparticles such as nanotubes, solid lipid nanoparticles, superparamagnetic nanoparticles, liposomes, quantum dots, dendrimers, ceramic nanoparticles and nanored bodies and their applications in various applications.

Keywords: nanoshells, nanofibers, liposomes, dendrimers, quantum dots, polymers, gold nanorods, nanored bodies, solvent evaporation, phase separation, salting.

INTRODUCTION

1989, Rolland et al. al. has successfully developed and demonstrated a specific location for a drug delivery system consisting of polymethacrylic acid nanoparticles. The main goal in the development of nanoparticles as a new drug delivery system is to control the size of the particles, the substrate, and the release of the drug in order to reach the specific location of the drug and how much to eat in the appropriate therapy. . Various nanocarriers have been shown to be more effective than prescription drugs in novel drug delivery systems (NDDS).

There are problems with dosage information such as high dose, lack of bioavailability, lack of stability, first pass, and changes in drug concentration in the blood. [Buzea et al., 2007]. The new Drug Delivery System NDDS seeks to reduce drug delivery issues by improving efficacy, safety, patient compliance and product shelf life. [Roco and Bainbridge 2005]

Nanoparticles: Nanoparticles [Babaei et.et al., 2008]. Polymeric materials are widely used for the preparation of nanoparticles. [Sopimat et al. Get., 2001] It is well known that polymeric materials are important in terms of biodegradability and biocompatibility [Kumari et al. et al., 2010]. Collaboration of natural and synthetic polymers is recommended for the preparation of nanoparticles. Nanoparticle formulations have attracted extensive research interest as targeted drug delivery [Moghimi et al.et al., 2001]. Active targeting and passive targeting are two ways to achieve targeted drug delivery. The main target includes binding of drug molecules to tissue-specific or cell-specific ligands [Lamprecht et. get.

ADVANTAGES:

1. The stability of the drug.
2. Is easy and inexpensive to produce in large quantities using many methods.
3. These have improved the effectiveness and efficiency of oral and intravenous administration procedures.
4. Increases bioavailability in the body over time.
5. Special Delivery of Targeted Drugs
6. These are the best candidates for cancer therapy, vaccine administration, antiviral drug administration, and antibiotic administration due to largescale drug release from polymeric nanoparticles and selected polymer. [1999; Xia et al. et al., 2000].

DISADVANTAGES:

1. Particle aggregation due to size and large area.
2. Physical processing of nanoparticles in liquid and dry forms is difficult.
3. Drug loading is limited.
4. May produce toxic metabolites.

NANOPARTICLE TYPES

Polymeric Nanoparticles:
Biodegradable nanoparticles have been widely used in recent years as an effective method for drug delivery [Brigger et.İb., 2001].
This is a drug delivery system that allows targeted drug delivery, improves bioavailability and drug release, and protects drug from enzymatic degradation [Kim and Lee 2001].

Fullerene:
Fullerene is a molecule made of carbon and has many shapes such as tubes, hollow spheres, and ellipsoids. Compares fullerenes and graphite structures. [Dresselhaus et al.ib., 1996].

Nanotubes:
nanotubes are molecules formed as cylindrical fullerenes. Nanotubes have closed and open ends. Fullerenes have many therapeutic applications, such as targeting cancer cells, linking certain antibiotics to certain diseases. [Tagos et al. et al., 2005].

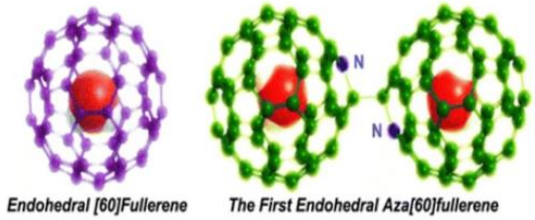

Figure No.2: Carbon Nanotubes (Xia and Li, 2014)

Solid Lipid Nanoparticles (SLN):
Solid Lipid Nanoparticles (SLN) are molecules that contain lipids in nature and are in the solid phase at room temperature. Generally, the sizes of lipid nanoparticles range from 50 nm to 1,000 nm.
They have a hydrophobic core found in nature and a single phospholipid that acts as a layer. Surfactants act as emulsion stabilizers and are involved in improving biodegradability, improving bioavailability, and targeting drugs in the brain [Yang et. et al., 1999; Cavalli et al.et al., 2014; Mudshinge et al. et al., 2002]. For the formulation of solid lipid nanoparticles, various formed of lipids are preferably used which includes:

- Fatty acids: palmitic acid, decanoic acid and behenic acid.
- Triglycerides: tri-larin, tri-myristin and tri-palmitin.
- Cholesterol
- Partial glycerides: glyceryl mono-stearate and glyceryl be-henate
- Waxes: cetyl palmitate.

Lecithin, phosphatidyl choline, poloxamer 188, sodium cholate and sodium glycol-cholate are various types of surfactants which are engaged in stabilization of lipid dispersions [Yang et. al., 2014; Mudshinge et. al., 2002].

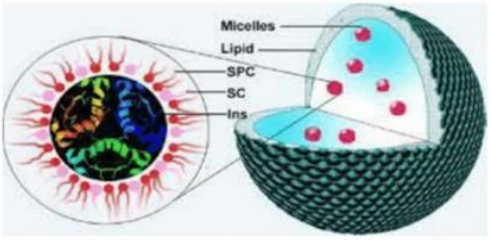

Figure No. 3: Solid Lipid Nanoparticles (Yadav et al., 2013)

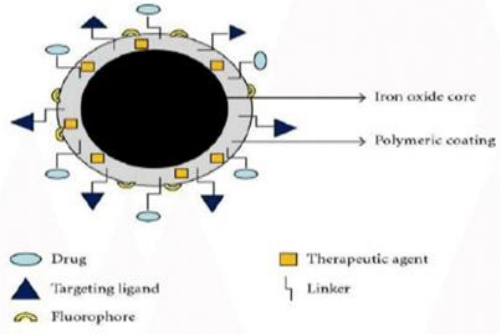

Figure No. 4: Super Paramagnetic Nanoparticle

Super Paramagnetic Nanoparticle:
Superparamagnetic nanoparticles are molecules that are attracted to magnetic fields. They have been found to be important in the diagnosis and treatment of cancer. [Zhang et al. et al., 2002]. A device called a superconducting quantum interference device

(SQUID) is a highly efficient, unique and versatile device made of superparamagnetic nanoparticles and a microscope. The tools demonstrate its importance in the study of biological targets. [Chemla et al. et al., 2000].

Liposomes:
Liposomes are molecules in the form of vesicles made of phospholipids and cholesterol, with a hydrophilic core surrounded by a hydrophobic lipid bilayer.
Vesicular liposomes, called nanosomes, have nanometer dimensions [Zhang and Granick 2006]. Liposome composition, size, surface charge and structure are some of the factors that affect liposome properties. Nanoparticles function as carriers of antibiotics, antibiotics, insulin, antibodies and plasmid DNA [Cevc 1996].

Nanostructured Lipid Carriers:
Nanostructured Lipid Carriers are carriers that are a mixture of solid and liquid lipids. At normal room temperature, the particles are always solid.
Matrix paper is involved in the preparation of nanoparticle lipid carrier (NLC) and lipid drug conjugate (LDG) nanoparticles. Improved drug loading capacity and bioavailability are better achieved by the matrix. [Wissing el. of., 2004].
They are suitable for drug delivery via a variety of administration methods such as oral, topical and parenteral (subcutaneous, intramuscular, intravenous, etc.). Other applications include cosmetics, food and agriculture. These are important for the delivery of anti-inflammatory, cosmetic and topical cortical treatments [Muller et al. Get.Ib., 2002].

Nanoshells:
nanoshells are also known as core shells. These nuclei are spherical and have concentric grains and are coated with other materials to form a thin layer. [Jiang et al. Get.[Leo et al. et al., 2004].

Quantum Dots (QD):
Quantum dots are molecules that behave like electronic devices, including nanocrystals and core framework nanocrystals. The sizes of quantum dots range from 2 nm to 10 nm [Cloi Hak et al.
et al., 2007]. Many hydrophilic drugs such as small interfering RNA (si-RNA) and antisense oligonucleotides (ODN), as well as antibiotics, peptides, etc. Quantum dots are a good way to deliver these drugs.

Dendrimer:
'Dendron' is derived from the Greek word dendrimer, which is a polymer molecule composed of various branched monomers.
The formulation of dendrimers contains various polymers such as polyamidoamine (PAMAM), melamine, poly-L-glutamic acid, polyethyleneimine (PEI), polypropyleneimine (PPI), polyethylene glycol and chitin. Dendrimers are widely used in magnetic resonance imaging and targeted recruitment in the reticuloendothelial system [Gref et al., 1994].
They are used as non-infectious agents as a new gene delivery method [Zhu et al. 2002; Li et al., 2005], can be used in photodynamic therapy [Konan et al., 2002; Roy et al., 2003] and wound healing in diabetics [Mishra et al., 2008] some are unable to make dendrimers. application form.
Dendrimers have also shown importance in orthopedics and have been shown to be useful as orthopedic biomaterials as they provide support to natural bone [Liu and Webster 2010; Liu and Wester 2011]

XP clad® nanoparticles:
XP clad® nanoparticles are nanocarriers that are a new way to solve the problems of bioavailability and poor absorption of hydrophilic drugs. The preparation of these nanoparticles involves a new method using spherical ball milling and vibratory ball milling techniques. This method intelligently ensures the smallest product and maximum drug loading. These nanoparticles have demonstrated their utility in functional, dermal and oral delivery of antineoplastic drugs, vaccines and therapeutic proteins [Koo et al., 2005; Gu et al.İb., 2006]. These have been shown to have lower toxicity and less damage to prostate cancer cells, thus having a positive effect on cancer treatment. [Tan et al., 2011].

Nanofibers:
nanofibers are molecules made of high molecular polymers in a network structure, the network structure is fine and dense, need electricity and work directly from the solution of the problem.
The technique used to prepare nanofibers is electrospinning. The size of nanofibers is less than 100

nm. Polymer nanofibers have a unique property that has proven beneficial such as small pore size, porosity, low toxicity, improved healing effect and biocompatibility [Yang et al., 2007; Jia et al., 2007].
Various polymers used to make nanofibers are polyvinyl alcohol (PVA), gelatin, collagen, chitosan and carboxymethylcellulose (CMC). As a new drug, nanofibers have been shown to be suitable for biosensor and biochip fabrication, wound healing and scaffold engineering. Indomethacin nanofibers are effective in colonic drug release [Akhgari et al., 2013].

Gold Nanorods:
In the mid-1990s, gold nanorods were first prepared [Foss Jr et al.1994; Hornyak et al., 1997. Gold nanorods exhibit a wide variety of optical and electrical properties depending on shape, size, and aspect ratio. [Vigderman et al., 2012; Chen et al., 2013]. It can be stabilized and combined with antibiotics and have specific biological uses [Liao and Hafner 2005; Niidome et al., 2006] as shown in Figure 10.
nm RBCs: nm RBCs are derivatives of red blood cells filtered by the hemodialysis process. Nanovesicles are composed of phospholipids, proteins and cholesterol with different pore sizes.
It can be loaded with different types of bioactive materials such as proteins.
Nanored bodies are made by conventional methods and allow recombinant ligands to be incorporated again with good stability. This native membrane allows conjugation of simple and well-known molecules such as monoclonal antibiotics [Lejeune et al., 1996]. 4 444