International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 05 | May - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Review on Nanotechnology

Lohakane Disha Ajit , Sabale Rohini Machhindra

Department of Bachelor in Pharmacy

Pratibhatai Pawar College of Pharmacy. Wadala

Mahadev, Shrirampur Ahilyanagar- 413721

Email I'd- lohakanedisha10@gmail.com

Corresponding author - Disha A. Lohakane

Abstract

study of microscopic objects (0.1_100 nm) is known as nanotechnology , and it is relatively new area of science and technology. Because biogenic synthesis of nanoparticles (Nps) has so many advantages over chemical approaches , including cost -effectiveness, zero environmental concerns and biological reduction , it is an appealing alternative. This study describe the feature and therapeutic applications of nanoparticles in addition to providing an objective an comprehensive summary of the state of knowledge about nanoparticles absorption into mammalian cells and the underlying process driving nano cellular interaction . The application of nanotechnology in electronics, health, medicine and the environment was covered in detail in this paper. Pharmaceutical nanotechnology can help progress technology in areas where more established and conventional technologies could be reaching their limits . It can also help improve material and medical technology . In conclusion , there is a great deal of promise and range for nano – based drug delivery systems in the near future due to recent advancement , various pharmaceutical nano -tools, and the growing attention of governments, business and academia .

INTRODUCTION

The nanoparticles originate from the biomaterials used in orthopaedic or dental implants, as well as scaffolds for tissue engineering products. Pharmaceutical nanotechnology deals with small structure like atom , molecules or compound of size 0.1 to 100 nm. These categories contain the two primary categories of pharmaceutical nanotechnology: nanomaterials and nanodevice , both of which have important application in other industries. They can have their surface coated or altered to improve their biocompatibility with human tissue.

creation and use of nanoparticles small enough to be measure in nanometers – is the subject of nanotechnology. Stated differently , nanotechnology refers to the methodical identification, modification, and arrangement of materials at the nanoscale level, transforming several field such as science ,engineering, technology, medicine and therapeutics . Typical accessible structures are often sub -micrometer in size , located inside the optical resolution envelope ,and only marginally observable when examining the structure under a microscope. Recent developments have focused on the size range below these dimensions with the procedure and technologies referred to as "nanotechnology" .

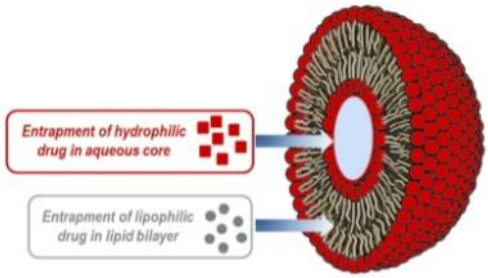
History of nanotechnology

The background of nanotechnology although nanotechnology appears to be a relatively new field of study, human application of it is not at all new . Natural asbestos nanofibres used for ceramic matrices 4500 years ago, which is when nanomaterials were first used in construction . Four millennia ago , the Egyptians-among the world's most ancient, affluent and forward thinking cultures realized the potential of nanotechnology. The historical trajectory of nanomaterials and nanotechnology prior to the millennial[2].

Types of pharmaceutical nano-particles

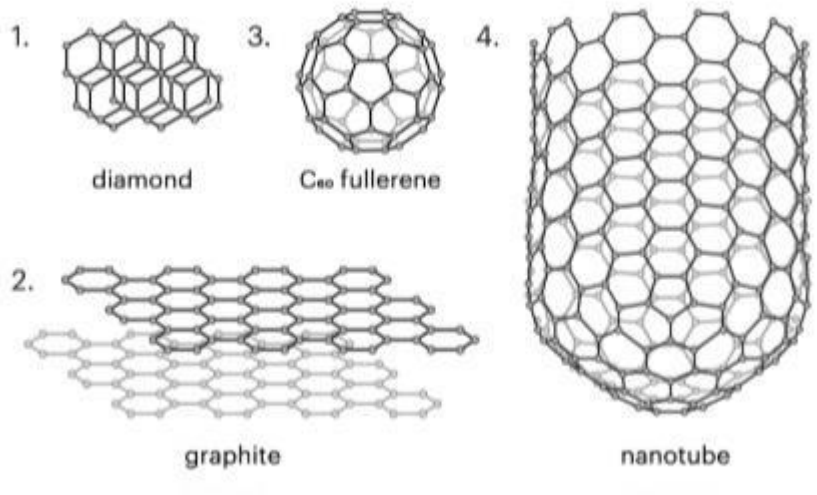
Liposomes

Initially identified in 1976, liposomes also referred to as lipid vesicles were the first kind of nanomaterial to be used in drug delivery. Liposomes are spherical vesicles made of cholesterol and amphiphilic phospholipids that self-assemble into bilayers around an aqueous core. With their hydrophilic head group allowing them to stay in contact with the aquatic environment , the amphiphilic phospholipid molecules create a tight bilayer sphere to protect their hydrophobic corre from it. A Liposome containing an aqueous solution has a hydrophilic barrier that prevents hydrophilic salutes from passing through the lipids. Therefore, the outer membrane of lipsomes (the inner watery core) contains both hydrophobic and hydrophilic molecules.



Carbon nanotubes =

Carbon nanotubes are Carbon cylinders made of benzene rings that are employed as sensors for DNA and protein detection,carriers of drugs, vaccines or proteins ,and diagnostic tools for differentiating between proteins in serum samples. Single-walled carbon nanotubes have been widely used as a platform for the development of highly accurate electrical biomolecule detectors as well as research into protein-protein and external interactions. Hexagonal carbon networks are what make up carbon nanotubes. These tubes have a diameter of 1 nm and a length of 1 to 100 nm. Single -wall nanotubes are the two types of **nanotubes.**



Polymermeric nanoparticles

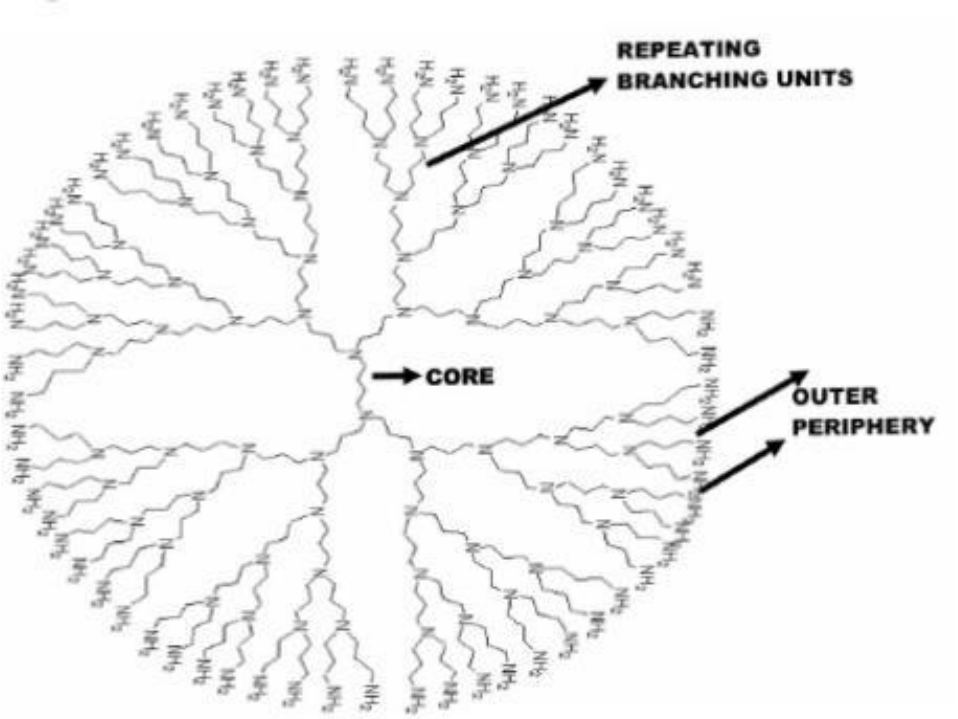
Because of their passive tumor-targeting capabilities, polymeric nanoparticles are being developed as efficient delivery systems to increase chemotherapeutic medication efficacy and decrease adverse effects.

Moreover , the ability of nanoparticles to selectivity gather within and surrounding the tumor mass provides a means of enhancing tumour detection and establishes the groundwork for the creation of multipurpose nanoparticle systems for cancer treatment .

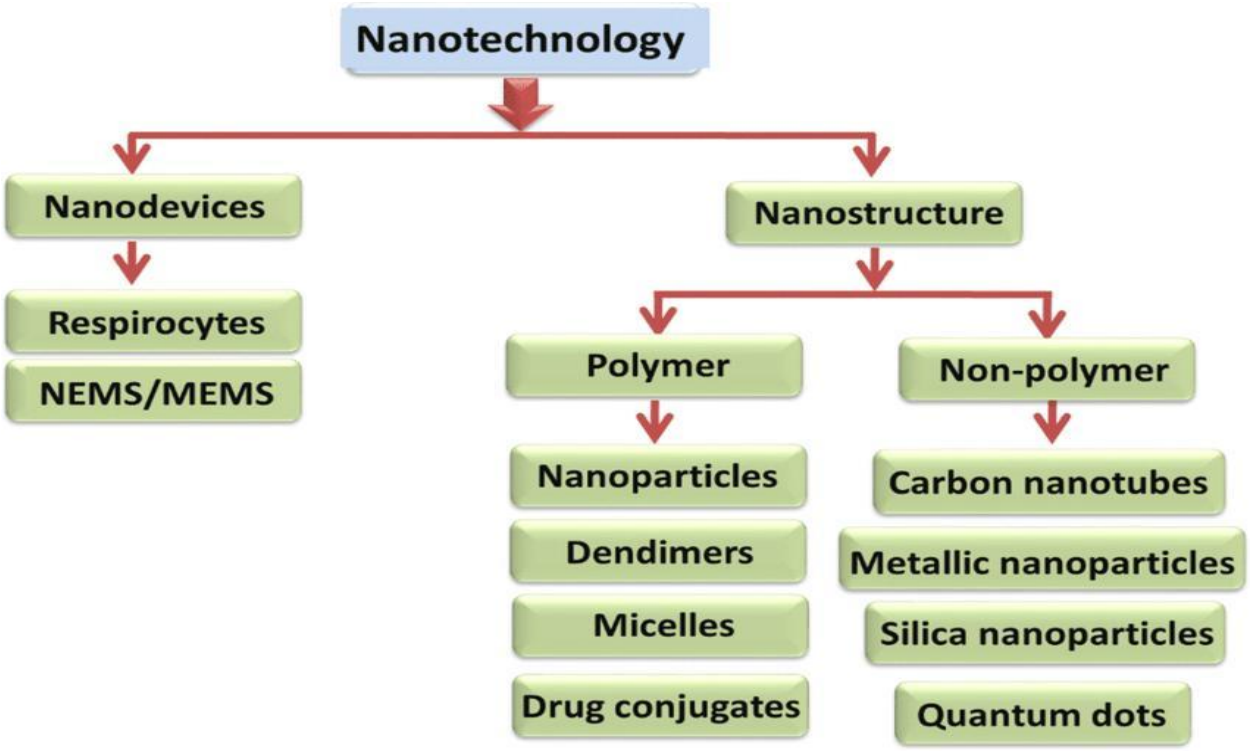
Dendrimers

Dendrimers are artificial polymers that have globular , branching structure with many layers that have active terminal groups and an initiating core. These layers consist of repeating units , each of which is described by a generation. The core of dendrimer is referred to as generation zero. Due to their unique chemical makeup, dendrimers can bind a variety of medications to their multivalent surfaces by electrostatics adsorption or covalent conjugation. Because of the numerous functional groups on their surface, dendrimers-which are typically 10 to 100 nm in diameter and used in drug administration and imaging make excellent transporters for targeted drug delivery.

Systems under nanotechnology



Applications of pharmaceutical nanotechnology



Drug delivery systems :The shortcomings of conventional drug delivery systems include poor patient compliance, cytotoxicity , high dose requirements, increase drug metabolism, lack of specificity, and more.

These can be addressed by medication delivery systems designed with pharmaceutical nanotechnology concepts in mind.

Diagnosis :

Molecular imaging is the scientific study of biological processes In animals , such as intracellular and intracellular trafficking ,signal transduction, cellular metabolism, gene expression , and protein-protein interactions .

Drug discovery:

pharmaceutical nanotechnology is crucial to the process of finding and developing new treatments since it helps to improve the qualities of powerful medications and excitements, such as their solubility and bioavailability.

Np characteristics

Size and shape are two example of characteristics that affect how NPs are used .The nanoscale particles are generated ,analysed ,measured ,and worked with. These days ,a lot of nanomaterials are created with the aid of this emerging nanotechnology, which plays a significant role in scientific investigation. The synthesis process addresses the chemical structure, Size, shape and appearance of nanoparticles which is important for nanotechnology research. Due to their extensive.

Limitations of NPs :

although the use of Nps in medicine has many advantages, there are also some drawbacks and restrictions.

Toxicity of Nps

In addition to providing their many industrial and therapeutic uses ,

Nps and other nanoparticles have particular toxicities linked to them. In order to effectively address these detrimental effects , a foundational understanding of nanoparticles (Nps) enter the ecosystem through the soil, water and air as a result of various human activities . Further more research has demonstrated that nanoparticles can enter living things by ingestion or inhalation and can move throughout the body.

Future aspects of pharmacological nanotechnology

The pharmaceutical industry is having difficulties. As more patents for "blockbuster" drugs expire, leading pharmaceutical companies look for creative ,competitive ways to stay in business. By 2011, a number of medications could loss their patent protection, potentially costing the pharmaceutical industry between $70 -80 billion in lost sales. A large number of novel drugs are not able to reach the market due to inadequate ADMET profiles . Many nanotechnologies have been effectively applied recently to treat drugs with low water solubility . Using nanotechnology, many pharmaceutical companies are revolting discontinued medications that were deemed "difficult "to produce because of their solubility characteristics.

Conclusion

Pharmaceutical nanotechnology offers new for research and improve prospects in various fields of diagnosis and therapy.

Pharmaceutical nanotechnology has emerged as a promising field with considerable potential for delivering powerful medications and diagnostics. With its nanoengineered instruments, it is a well -established specialised sector for medication delivery, prognosis and treatment of diseases. It offer a chance to enhance medical equipment, materials and aid in the creation of new technologies while overcoming the drawbacks of traditional methods. It is now believe that nanotechnology will be the foundational technology of the Twenty first century . These days, nanostructured materials and nanotechnology techniques are used to produce better composite materials, materials with increase catalytic activity, materials with increased hardness and abrasion resistance, and a variety of consumer good that improve people's

Reference:-

1] Feb2022 Salman khan, Shazia Mansoor , :A review on nanotechnology: Properties, applications, and mechanistic insights of cellular uptake mechanisms

2] Saha D, hosen SM , Paul S. Pharmaceutical nanotechnology strategies and technique of drug therapy, disease and delivery through pharmaceutical biotechnology. university of Mauritius research journal. 2015 sept 14 ;21

3] Adesina SK , et al, Nanoparticle characteristics Affecting efficacy. J pharm Drug Delivers 2016

4] Kanchan RBS and Dutta T. Engineered nanoparticles for the delivery of anticancer Therapeutics. J pharm Drug Delivers 2015

5] Khuspe P, Kokate K , Mandhare T, Sangre P, Rathi B. A comprehensive review on novel pharmaceutical nanotechnology and it's applications; Indo American journal of Pharmaceutical Sciences. 207:4(12):4640-7

6] Bozzuto G, Molinari A. Liposomes as nanomedical devices Int J Nanomedicine 2015