OPINION

Nanotechnology and it's application

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ABSTRACT

Exploiting the special characteristics of materials at the nanoscale is known as nanotechnology. Due of the improved quality and smarter goods that nanotechnology offers, it has becoming more popular across a variety of industries. Nanomedicine is the use of nanotechnology in healthcare and medicine, and it has been utilised to treat some of the most widespread illnesses, such as cancer and cardiovascular conditions.

Key Words: *Nanomedicine; Cancer*

INTRODUCTION

Nanotechnology is the use of such research to make or change novel products. Nanoscience is the study of the special properties of materials between 1 nm-100 nm. Nanomaterials can be produced thanks to the atomic-scale structure manipulation. Nanomaterials can be employed in a variety of applications, including electronics and medical, since they exhibit special optical, electrical, and/or magnetic capabilities at the nanoscale. Because they offer a high surface area to volume ratio, nanomaterials are exceptional. Nanomaterials are regulated by the principles of quantum mechanics rather than the classical laws of physics and chemistry, in contrast to conventional large-scale manufactured objects and systems. Nanotechnology, in its simplest form, is the creation of usable items and functional systems at the atomic or molecular size.

NANOTECHNOLOGY IN MEDICINE

The word "nanomedicine" is used to describe the use of nanotechnologies in healthcare and medicine. In particular, diseases can be prevented, detected, monitored, and treated using nanoscale technologies and nano-enabled methods. Nanotechnologies have the potential to significantly advance the field of medicine, including in imaging and diagnostic tools, drug delivery systems, tissue-engineered constructs, implants, and pharmaceutical therapeutics. They have also advanced the treatment of a number of diseases, such as diabetes, bacterial and viral infections, cancer, cardiovascular diseases, and musculoskeletal conditions.

NANOPARTICLE TYPES

Some typical nanoparticle kinds are covered below.

Micelles

Lipids and amphiphilic molecules combine to form micelles, which are amphiphilic surfactant molecules. Micelles can be used to integrate hydrophobic therapeutic medicines because they spontaneously aggregate and self-assemble into spherical vesicles with a hydrophilic outer monolayer and a hydrophobic core in aqueous conditions. Hydrophobic medications' solubility can be increased thanks to the special characteristics of micelles, which also increases bioavailability.

Liposomes

Liposomes are lipid bilayer-containing spherical vesicles with particle diameters ranging from 30 nm to several microns. Hydrophobic therapeutic compounds can be encapsulated in the liposomal membrane layer and hydrophilic therapeutic agents can be encapsulated in the aqueous phase using liposomes. Liposomes are adaptable; by modifying their surface properties with polymers, antibodies, or proteins, it is possible to incorporate macromolecular medicines, such as nucleic acids and crystalline metals, inside them.

Dendrimers

Dendrimers are macromolecules made up of external functional groups and have repeated branches that extend from a central core. These functional groups, which can have anionic, neutral, or cationic terminals, can be employed to change a structure's overall makeup as well as its chemical and physical characteristics. Dendrimers can be made highly bioavailable and biodegradable by adding therapeutic substances to the surface groups or the internal space of the dendrimers.

Carbon nanotubes

Carbon nanotubes are cylindrical molecules made of sheets of a single layer of carbon atoms that have been wrapped up (graphene). They may have one or more walls, or they may consist of a number of concentrically connected nanotubes. Carbon nanotubes can attain significantly high loading capacities as drug carriers due to their high exterior surface area.

Diagnostic nanotechnology

One of the most important steps in the medical procedure is the diagnosis of a condition. All diagnosis should be made as quickly, precisely, and specifically as possible to avoid "false negative" cases. Using a non-invasive method called in vivo imaging, symptoms or

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signals can be found in a patient's live tissues without requiring surgery. Biological markers that may identify changes in tissues at the cellular level are a previous advancement in diagnostic imaging techniques. The purpose of utilising a biological marker is to identify diseases or symptoms, acting as a tool for early detection.

Nanotechnology in drug delivery

Drugs are frequently administered to a specific target place during therapy. If there is no internal channel for drug delivery, external therapeutic approaches including radiotherapy and surgery are used. To combat diseases, these techniques are frequently combined or used interchangeably. The aim of treatment is to permanently eliminate the tumours or illness-causing factors through targeted removal. Nanotechnologies are significantly advancing this field by creating novel drug delivery systems, some of which have been tested in clinical settings and are currently being used. Control of drug release and targeting capabilities make up the ideal drug delivery system. By properly identifying and eliminating dangerous or malignant cells, side effects can be drastically avoided, and drug efficacy can be guaranteed.

Cardiovascular disease treatment with nanotechnology

Another area where the advantages of nanoparticles may be used is cardiovascular illnesses. The main cause of death worldwide is cardiovascular disease, and the rates are frighteningly rising as a result of an increase in sedentary lifestyles. Stroke, high blood pressure, and a restriction or blockage of blood flow in a particular place are typical examples of cardiovascular illnesses that affect many people. The majority of deaths and permanent disabilities are brought on by these illnesses. The management of cardiovascular disorders can now be approached from different therapeutic and diagnostic angles thanks to nanotechnologies.

Nanotechnologies risks

Although the rapidly developing area of nanotechnology has attracted the attention of the general public, it has also sparked considerable debates about its safety and any potential health hazards. With the usage of nanomaterials, there are new difficulties, particularly in foreseeing, comprehending, and managing the possible health concerns.