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A REVIEW ON NANOROBOTS

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ABSTRACT

Nano-robots are the robots that are the technology of creating machines or robots close to the microscopic scale of a nanometer (10-9 metre). These devices range from 0.1-10 micrometres. Nano–robots are the advances in technology. Nano-robots are considered a new possibility for the health sector to improve medical instrumentation, diagnosis and therapeutic treatments. Using nano robotic technology, the drug can be targeted to a precise location which would make the drug much more effective and reduce the chances of possible side effects. The application of nano technology to the field of medicine is commonly called as nano medicine. Nanotechnology promises futuristic applications such as microscopic robots, nano technology in dosage form development have many advantages like enhanced solubility, increased dissolution rate, enhance stability, reduction in dosage, increasing in bio availability and rapid onset of action. That assembles other machines or travel inside the body to deliver drugs or do microsurgery. The current review focus on the applications of nano technology in the field of pharmaceutical drug delivery applications like Quantum dots, dendrimers, carbon nanotubes, liposomes, polymeric nano particles, metallic nano particle, polymeric micelles, non composite and many more. Advances in nano technology include diagnosis , medicine, prevention, treatment through drug delivery like glucose monitoring in diabetes, gout,cancer,lidney, Brain aneurysam, diabetes, heart disease, surgery like brain, gene delivery and gene therapy through delivery.

INTRODUCTION

Nanotechnology is the study, design, creation, synthesis, manipulation and application of materials devices and systems at the nanometer scale (one meter consists of 1 billion nanometer). It becoming increasingly important in fields like engineering, agriculture contraction, Microelectronic and health care Nanotechnology when used with biology or medicine, is also called as nano biotechnology. It was first proposed by Richard Feynman in 1959. According to Richard Feynman, it was his former graduate student and collaborator Albert Hibbs who originally suggested to him the idea of a medical use for Feynman's theoretical micro machines. Nanotechnology is the influencing a bit of almost each industry containing preventive medicine. The Nano medicine is the medical application of nanotechnology. Nanomedicine: Nano medicine is a branch of medicine seeks to apply nanotechnology

.That is the manipulation and manufacture of materials and device to the prevention of disease and to imaging, diagnosis, monitoring, treatment, repair and regeneration of biological systems.Nano medicine ranges from the medical application of nanomaterials and biological devices, to Nano electronics biosensors, and even future applications of molecular technology, and it allows working atomic level [1]. A nanometre is a unit of length in the metric system, equal to one billionth of a meter. One nanometre can be expressed in scientific notation as in engineering as 1E-9m. Simply, Nano robot is small device used to carry out few specific and accurate piece of work in the body. As shown in figure 1. In 1986, K. Eric Drexler first launch the project and design of using Nano robots for therapy in human body and theis idea exist further deliberate and planed by a robot. The names Nano robots, ganoids, nannies or nanomits. Succession in medicine has been marked by the capability of analyst to study and recognize the globe around us on developing minor scale.

What Are Nano Robots:

A nanorobot is microscopic robot built with nanotechnology. It performs tasks at nanoscale level. The size of Nano robot is 10-9nm. A Nano robot is tiny machine designed to perform a specific task and with precision at nanoscale dimensions, that is, dimensions of a few nanometres (nm) [2].Nano robots have potential applications in the assembly and maintenance of sophisticated systems. Nano robots might function at the atomic or molecular level to build devices, machines, or circuits, a process known as molecular manufacturing. Nano robots are special interest to researchers in the medical industry.This has given to rise to the field of Nano medicine. It has been suggested that a fleet of Nano robots might serve as antibodies or antiviral agents in patients with compromised immune system.There are numerous other potential medical applications, including repair of damaged tissue unblocking of arteries affected by plaques, and perhaps the construction of complete replacement body organs[3] .

Advantages of Nano Robots:

- Rapid elimination of disease
- The microscopic size of Nano-machines translates into high operational speed
- Faster and more precise diagnosis
- Non- degradation of treatment agents
- they can remain operational for years, decades or centuries

Nano robots might function at the atomic and molecular level to build devices, machines or circuits known as molecular manufacturing. Nano robots might also produce copies of themselves to replace worn-out units, a process called self-replication, less risk and no operation failures [4].

Disadvantages of Nano Robots:

- The Nano robot very accurate.
- The initial design cost is very high
- The design of this robot is very complicated
- Hard to design. • Regulatory issue
- Difficulty of communicating with organic systems
- Must carry own (limited) payload
- Environmental hazards
- Nano implements could adjust human DNA structure
- Lack of knowledge
- Possible food chain interruption[5]

Different Approaches to Nanorobotics:

- Biochip
- Unboots
- Positional
- Nano Assembly
- Bacteria Based

Biochip

The combination use of Nano electronics, photolithography, and new biomaterials provides a possible approach to manufacturing Nano robots for common medical applications. Eg; surgical instrumentation, diagnosis and drug delivery.[6]

Nubots

Unbolt is a contraction for nucleic acid robot. They are organic molecular machines at the nanoscale. Biological circuit gates are based on DNA materials, which have been engineered As Molecular Machines To Allow In Vitro Drug Delivery For The Specific Region.[7]

Postional Nano Assembly

Nano factory collaboration, founded by Robert Freitas and Ralph Warble in 2000, is a focused ongoing effort that is developing controlled diamond synthesis Nano factory that would have the capability of building medical Nano robots.[8]

Bacteria Based

This approach proposes the use of biological microorganisms, like E. coli bacteria. Thus, the model uses flagellum for impulse purposes.[9]

Reciprocate

A reciprocate is an engineering design for a machine than cannot be built with current technology an artificial red blood cell a micron in diameter. Reciprocate can deliver 236 times more oxygen per unit volume than a natural red cell. Reciprocate measure about a micron in diameter and just floats along in the blood stream, it is a spherical Nano robot made up of 18 billion atoms. Nano robot is for more efficient because its diamond construction permits a much higher operative pressure.[10]

MICROBIVORES

Hypothetical structures which function as white blood cells in the blood stream designed to trap circulating microbes. They are expected to have greater efficacy than cellular blood cells in phagocytes. The microbivores surface is arranged with processes which can extend in length and secure the microbe which gets in contact.[11]

CHROMALOCYTES

Nano robot capable of cellular chromosome replacement, it replaces entire chromatin content of nucleus of living cell with prefabricated detect free chromosomes. It can travel vascular surface into the capillary bed of the targeted organ and leaves human body after completed mission.[12]

CLOTTOCYTES

It acts as an artificial platelet. It reduces the time for blood clotting. It may allow to complete haemostatic in little as ~1 second, even in large wounds. The robots function similarly to the platelets in our blood.[13]

Pharmacies

An ideal nanotechnology-based drug delivery system is a pharmacy a self-powered computer controlled medical Nano robot system capable of digitally precise transport, timing, and targeted delivery of pharmaceutical agents to specific cellular and intracellular destination within the human body [14]. There are different natotechnology in pharmaceuticals fig 3.

Figure.1. Nano robot in drug delivery

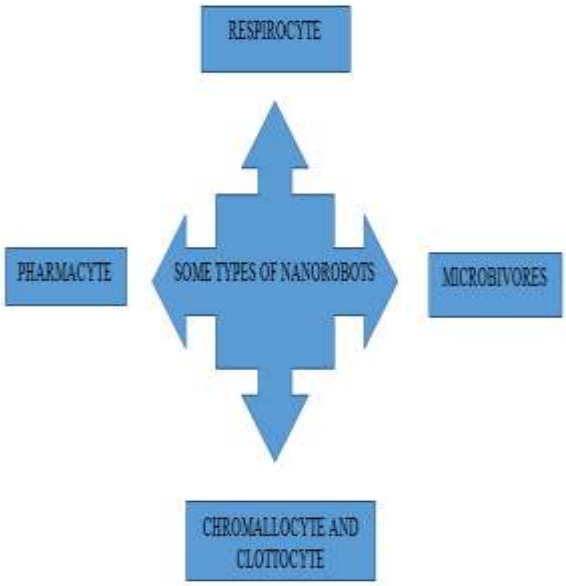

Figure.2. TYPES OF NANO ROBOTS

Quantum dots: Quantum dots are made up of semi-conducting material having improved optical properties having a semi-conductor core coated by a shell. Size of quantum dots ranges from 10-100A in radius which gives them unique physical characteristics. As shown in figure 4.Quantum dots are used in various techniques like in-vitro, in-vivo analysis, imagining, immunoassay, analysis of biomolecules, DNA hybridization and in non-viral vectors for gene therapy. Quantum dots are primarily used for labelling of cells and in cancer treatment as therapeutic tool.[15]

Figure.3. Nanotechnology in Pharmaceuticals

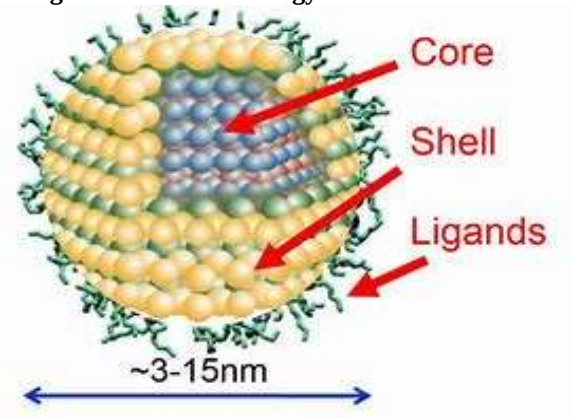

Figure.4. Basic structure of quantum dot

Dendrimers: Dendrimers are nanosized macromolecules having hyper-branched spherical structure and are extensively used for drug delivery system. In difference with traditional polymeric nano-vehicles, dendrimers have monodispersity and well recognized chemical structures.the advantages of dendrimer is due to specific structure, drugs can be loaded in dendrimer structure by either covalent conjugation or electrostatic adsorption[16]. Dendrimers is mainly made up of three parts, 1st part is a fundamental core consisting of single atom or group of atoms, 2nd part consists of building blocks of dendrimers called as generations attached to central core and 3rd part is functional groups present on surface of dendrimer. Dendrimer consist of huge void space in which drug molecules can be entrapped which helps in improvement in solubility of drug molecule.As shown in fig 5.

Dendrimers are typically manufactured by using two tactics. First technique known as divergent method in which dendrimers are constructed from core to border and in second method dendrimers are constructed from border to core and known as convergent method [17].

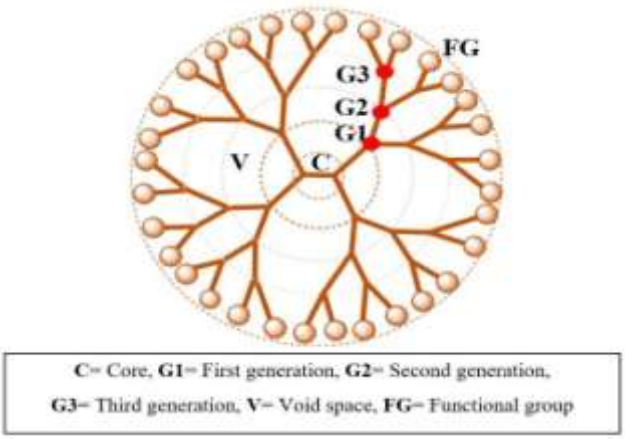

Figure.5 .Dendrimers

The peripheral functional groups may have positive, negative, and neutral charges depending upon which, appropriate dendrimer can be used for preferred drug delivery system [18].

Carbon nanotubes: sp^2 hybridized carbon have different structures. Graphite is well known example. Apart from graphite, carbon can form honeycomb like closed cages. Graphene is known as 2D single layer of graphite.sp^2 hybridization graphene is stronger material than diamond which is sp^3 hybridized [19]. Diameter of these tubes in nano scale. Carbon nanotubes have many structures depending upon length, thickness, number of tubes rolled up and type of helicity. Depending upon number of tubes coiled to form tube, carbon nanotubes can be classified as single walled carbon nanotube (SWCTs) and multi walled carbon nanotube (MWCTs). Single walled carbon nanotubes have simple structure and can easily be twisted. These nanotubes have poor purity and less complex structure. SWCTs require catalyst for synthesis and diameter can is from 0.5 to 1.5 nm. MWCTs are complex in nature, can't be easily twisted and have high purity. Diameter of MWCTs is up to 100 nm. A s shown in fig 6.

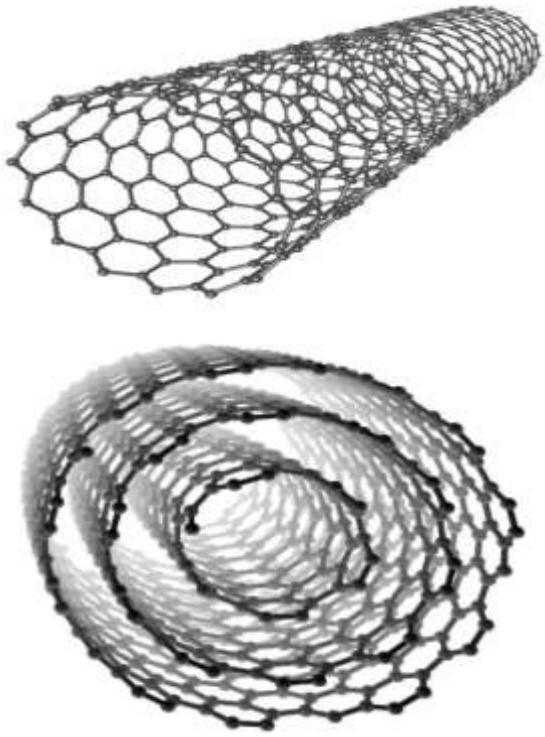

Figure.6. Carbon nanotubes

carbon nanotubes can be prepared by various techniques like arc discharge method also known as plasma-based synthesis method, C chemical vapor deposition and laser method. [20].

Liposomes:

Liposomes are the vesicles which are made up of phospholipids and cholesterol having bilayers or multilayers surrounding an aqueous compartment. Aqueous as well as lipidic drugs can be entrapped within the liposome. Liposomes have discovered in 1960 and since then it has gained lot of attention in drug delivery because of its unique properties and have been used in delivery of various biologicals, anticancer drug as well as cosmetics. Liposomes are colloidal transporters, having a diameter of 0.01–5.0 μm. Liposomes have several advantages like increase in bioavailability of certain drugs, helps in drug targeting, biocompatibility, provide sustain release action, can be encapsulate to use biodegradable drug, can be administered through various route and helps to reduce toxicity of certain drugs[21]. As shown in fig7.

Classification: Based on upon number of layers present in liposomes they are classified as multilamellar vesicle (MLV), large unilamellar vesicle (LUV), small unilamellar vesicle (SUV). Based upon material from which liposomes are made, they are classified as conventional liposomes (CL), pH-sensitive liposomes, cationic liposomes, long circulating liposomes (LCL) and immuno-liposomes. Methods are used for formulation of liposome such lipid film hydration, freeze drying, micro emulsification, sonication, French pressure cell, membrane extrusion, ethanol injection, ether injection, double emulsification method, lyophilization,[22].

Applications: Liposomes have several applications in drug delivery like gene therapy, as carrier for vaccines, pulmonary drug delivery, topical drug delivery and ophthalmic drug delivery [23].

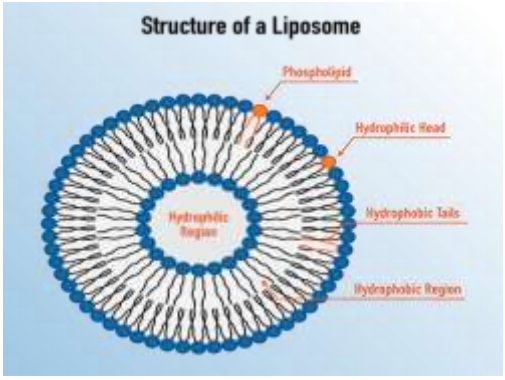

Figure.7. Strucuture of a Liposome

Polymeric nanoparticles:

Polymeric nanoparticles are synthetic nano sized colloidal particles having size range of 10 nm- 1000 nm. These nanoparticles advantages like biocompatibility, non-immunogenicity, non-toxicity, biodegradability, polymeric nanoparticles like active and passive targeting, control as well as sustain release of drug, high drug loading, can be administered by various routes. Nanocapsules and nanosphere are the two types of polymeric nanoparticles. In nanocapsules drug is present in central core surrounded by polymeric capsule and in nanospheres dug is dispersed throughout in polymeric matrix. Natural as well as synthetic polymers are used for preparation of polymeric nanoparticles. Natural polymers like gelatin, albumin and alginate while synthetic polymers like polyesters are used in preparation of nanoparticles[24]. Various methods are used for manufacturing of nanoparticles like solvent evaporation method, solvent diffusion method, polymerization method, ionic gelation method and supercritical fluid technology.[25] As shown in fig 8.

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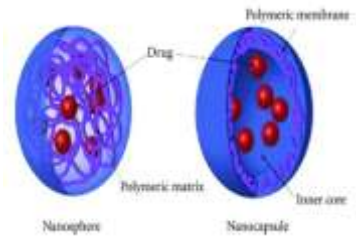


Figure.8. Polymeric Nanoparticles

Metallic nanoparticles:

Metallic nanoparticles are majorly made up of silver and gold though other material can be used. Gold and silver nanoparticles are of prime importance. Metallic nanoparticles are used for drug delivery as well as biosensor. Large number of biomolecules like sugar, peptides, proteins and DNA can be linked to metallic nanoparticles and can be targeted. Biomolecules and ligands can be easily attached on the surface of metallic nanoparticles.polymeric nanoparticles are used for active delivery of biomolecules, in bioassays, detection, imaging and many more other applications. Metallic nanoparticles have vast therapeutic applications like delivery of anti-infective agents, anti-angiogenic agents, anti-tumour agents, anti-leukaemia drugs and anti-rheumatoid drugs[26]

Polymeric micelles: Micelles are spherical structure where lipid molecules or polymers orient themselves in such a manner that hydrophilic end orient towards aqueous phase and lipophilic end towards oily phase. In polymeric micelles, amphiphilic end copolymers orient into nanoscopic supra molecular core shell structure known as 'polymeric-micelles'. Size of polymeric micelles is less than 100 nm. Hydrophilic surface of polymeric micelles protects them from nonspecific uptake by reticuloendothelial system. These micelles are used for systemic delivery of aqueous insoluble drugs. Drug molecules can be linked covalently to polymeric micelles or entrapped within hydrophobic core. [27].

Nanocomposites:

The word composite indicates any material made up of two or more different material. If among these materials any one material is in nano range then it is called as nanocomposite. Nanocomposite material have properties of all the material from which it is made. Nanocomposite consist of one or more discontinuous phase dispersed through continuous phase. The continuous phase is called as matrix while discontinuous phase is called as reinforcing material.

Advantages: uniform distribution of active component in matrix, sustain release of active ingredient, reduced frequency of administration and increase in stability[28].

COMPONENTS OF NANO ROBOTS:

Introduction of Nano Robots into the Body

The Nano robot, gets access into the body through a large diameter artery so that it may be without being too destructive in the first place. Nano robots are introduced into the body by surgery. So the Nano robots is injected in femoral artery.

Direction of Device: The flaw tissues are verified by the sensors. The long-range sensors are used to navigate to the site of unwanted tissue. Short range sensors are used to locate the tumour. Another purpose of using Nano robots is to locate the position of the micro robot in body.

Movement of Device around the Body: Firstly, the machine is move to the site of working using regular blood flow. To extend the site of action there should be a number of impulses such as cilia, jet pump, Electromagnetic pump membrane impulse.

Control of Device:

The Nano robot control design (NCD) software is a system designed to serve as a test bed for Nano robot 3D prototyping. An advanced simulator that provides physical and numerical information for Nano robot task-based modeling. Simulations the control dynamics of a Nano robot inside a human body, the device is analysed using a camera, spectroscopic technique, UHF (ultra-high frequency) sonar for resolution.

Removal of Nano Robots after Treatmen:

The removal of Nano robot is made possible by guiding the Nano robot to anchor a blood vessel that is easily accessible from outside, and perform a small surgical operation is performed to remove it. The area where the temperature exceeds than the maximum limit set in the Nano robot, will be operated on by the Nano robot i.e. that part will be cut the rotator needle attached to the Nano robot.

Powering of Nano Robots:

The powering of the Nano robots can be done by metabolizing local glucose and oxygen for energy. In a clinical environment, externally supplied acoustic energy. Other sources of energy within the body can also be used to supply necessary energy for the device. A Nano robot would hold a small supply of chemicals that would become a fuel source when combined with blood

Medical Applications of Nano Robots:

Nano robots are use in new treatments for patients suffering from different disease. To identify cancer cells and destroy them. Detection of toxic chemicals and the measurement of concentrations in the environment, the use of Nano robots may advance biomedical mediation with minimum intrusive surgeries and help patients who need stable body functions monitoring, or ever progressive treatment regulation through instantly diagnosis of possible serious disease [29]

NANO ROBOTS IN DRUG DELIVERY:

Nano robots can be useful tool in drug delivery applications. Nanoparticles drug delivery systems come in many shapes and sizes.Mesoporous silica nanoparticles are very effective for controlled drug delivery. The Nano pore openings of these nanoparticles can be easily controlled. Three dimensional DNA crystals can be used as molecular container to build biochips, Nano robots, biosensors or drug delivery systems. Drug targeting can be achieved by physical, biological, or molecular systems that result in high concentrations of the pharmacologically active agent at the pathologically relevant site. Affinity ligands (example- antibodies, DNA/RNA) are attached to nanoparticle surface, this allow the nanoparticles carrying drug to recognize and bind to target cells having specific receptors on their surface, e.g. tumour cells. After the nanoparticle is bound the target cells, the drugs carried within is released inside the target cells.Nanoparticles act as a vehicle on which the drugs are encapsulated within or chemically bonded. Biocompatible as it has similar membrane as human cells, specifically targets certain molecules to bind to Nano drugs within are protected during travel. Nano drugs of different solubility properties are carried within the liposome.

Drug targeting is defined in the broadcast sense, that is, to optimize a drugs therapeutic index by strictly localizing its pharmacological activity to the site or organ of action. This is an important distinction from the basic targeting concept, where the specific drug receptor is the target and objective is to improve fit, affinity, and binding to the specific receptor that ultimately

will trigger the pharmacological activity. By using Nano robots to delivery drug, >95% administered drug still ends up at nontarget site. But it is still 5x more efficient delivery than nonfan drug delivery method. This 5x more efficient delivery can be exploited for maximizing drug efficacy.[29]

DIAGNOSIS AND TESTING:

The medical Nano robots are used for purpose of diagnosis testing and monitoring of microorganisms, tissue and cells in the blood stream. These Nano robots are capable or observing of the record, and report some vital signs such as Temperature, pressure, immune system different part of human body continue. [29]

NANOROBOTICS IN SURGERY/SURGICAL NABOB

Surgical nabob, planned by a human surgeon, act as an autonomous on-site surgeon inside the human body. Nano robots will have the ability to execute specific and purified intracellular surgery, which is far away the availability of betray by the human hand. Surgical Nano robots are introduced into the human body through vascular system and other cavities. Surgical Nano robot functions like searching for pathogens, and then diagnosis.[30]

NANO ROBOTS IN GENE THERAPY:

Nano robots can be used to be different modifications and corrections to DNA or the proteins attached to the DNA in the right place. A major application of medicine would be in surgery. Cell repair machine can be used to perform genetic surgery. Gene therapy is unique medical therapy that can treat cancer tumours and bodily functions. The method involves using inorganic nanoparticles attached with compressed strands RNA and DNA to pass inside the sales and drop off the genes into the cell. The non-viral technique has improved safety precautions making gene therapy is possible,[31]

NANOPARTICLES USED IN GENE DELIVERY:

Polymer Nanoparticles: Polymer nanoparticles (PNPs) transport genes ormedicinal proteins containing drugs have existence each and every be dissolved within them forming a nanoparticle and Nano capsule. The transported medicinal protein or drugs act by make change of faulty or defective proteins or genes in the patient'scell. polymer nanoparticles (NPs) are particles within the size range from 1to 100nm and be loaded with active compounds entrapped within or surface absorbed onto the polymeric core. The term nanoparticle stands for both Nano capsules and Nano spheres, which are distinguished by morphological structure. [32]

Liposome for Gene Delivery: Method of transformation first described in 1965 as a model of cellular membranes using liposomes. Liposomes are artificial phospholipid vehicles used for the delivery. They can be preloaded with DNA by two common methods membrane fusion and endocytosis thus forming DNA liposome complex. Liposomes possess properties such as reduced toxicity, safe preparation and reduced risk of immunological rejection, which enable its use for non-viral gene delivery.

Magnetic Nanoparticles : For gene delivery, magnetic nanoparticles (MNPs) are typically combined with delivery platform to encapsulate the gene, and promote cell uptake. Magnetic nanoparticles are incorporated into existing delivery platforms. Binding strategies include electrostatic and hydrophobic interactions. Magnetic nanoparticles allow for targeting with systemic delivery.

NANOROBOTICS DENTIFRICES:

Dentifrobots in the form of mouthwash or toothpaste left on the surface of teeth can clean organic residues by moving throughout the gingival and sub gingival surfaces. It metabolizes trapped organic matter into harmless or odourless vapours and performing continuous calculus debridement. These Nano robots can move as fast as 1-10 microns and are safely deactivated when they are swallowed invisibly small dentifrobots, crawling would be inexpensive, purely manufactured non agglomerated discrete nanoparticles mechanical devices that would be programmed with strict avoidance protocol.[33]

Nano dentistry as the top down approaches are the including Nanocomposites, Nano Light Curing Glass Ionomer Restorative

materials.Nano dentistry will make possible the maintenance of comprehensive oral health by employing nanomaterials, biotechnology, including tissue engineering, and ultimately, dental nanorobotics. The era of nanotechnology is fast approaching the various approach that is the inducing anaesthesia, Major tooth repair, hypersensitivity cure, dental durability and cosmetics, nanorobotics dentifrice, Treatment tooth repositioning, local drug delivery, Nano diagnostic, therapeutic aid in oral disease. The application of nanotechnology to local anaesthesia, dentition denaturalization, the permanent cure for hypersensitivity, complete orthodontic realignment in single visit, covalently bonded diamond zed enamel, and continuous oral health using mechanical dentifrobots.

MOUTH WASH: A mouthwash full of smart nanomachines could identify and destroy pathogenic bacteria while allowing the harmless flora of the mouth to flourish in a healthy ecosystem. Further, the devices would identify particles of food, plaque, or tartar, and lift them from teeth to be rinsed away.Being suspended in liquid and able to swim about, devices would be able to reach surfaces beyond reach of toothbrush bristles or the fibres of floss. As short-lifetime medical nanodevices, they could be built to last only a few minutes in the body before falling apart into materials of the sort found.

Teeth Implant :A dental implant also known as Endosseous implant or fixture is a surgical component As shown in fig 9. that interfaces with the bone of the jaw or skull to support a dental prosthesis such as crown, bridge, denture, facial prosthesis or to act as an orthodontic anchor. The basis for modern dental implant fixture is first placed so that it is likely to Osseo integrate, then a dental prosthetic is added. A variable amount of healing time is required for Osseo integration before either the dental prosthetic is attached to the implant or an abutment is placed which will hold a dental prosthetic.

Periodontics: Periodontology or periodontics is the speciality of dentistry that studies supporting structures of teeth, as well as disease and condition that affect them. The supporting tissues are known as the periodontium, which includes the gingiva, alveolar bone, cementum, and the periodontal ligament. A periodontal is a dentist who specializes in the prevention, diagnosis, and treatment of periodontal disease, and in the placement of dental implant. Periodontists are also experts in the treatment of oral inflammation.

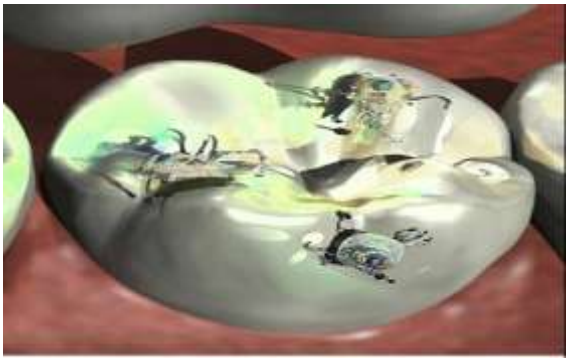


Figure.9.TEETH IMPLANT

Restorative Dentistry: Restorative dentistry procedures are important because filling empty spaces in the mouth helps keep teeth properly aligned. Replacing teeth makes it easier to maintain good oral care habits to prevent plaque build-up and the problems. plaque build-up and the problems plaque can lead to missing teeth can affect your health, appearance and self –esteem.

Preventive dentistry: Preventive dentistry to avoid cavities, gum disease, enamel wear, and more. There are many forms of preventive dentistry, such as daily brushing and dental cleanings. In the sphere of preventive plaque control measures, dentifrices and mouthwashes from the most widely used products. Dentifrices can be incorporated with specific agents. That help prevents dental caries, demineralize early carious lesions, and aid in desensitization o/f abraded teeth. The process of enamel crystals are similar to the morphology and crystals structure of enamel. Dentifrices for hypersensitivity that incorporate Nano hydroxyapatite (n-HAP) or Nano carbonate apatite (n-CAP) particles are currently being tested. n-CAP is similar to the inorganic component of teeth and is known to have a high solubility and a more neutral pH. nanotechnology research

into implant care and the prevention of peril-implant diseases. Mouthwashes containing biomimetic carbonate hydroxyl apatite nanocrystals have been shown to preserve the implant titanium oxide layer by protecting it against surface oxidative processes remineralisation is governed by the local concentration of apatite minerals. Nano sized calcium carbonate particles or hydroxyl apatite crystals are similar to the morphology and crystals structure of enamel.

Gout: Gout is a condition where the kidneys lose the ability to remove waste from the breakdown of fats from the bloodstream. This waste sometimes crystallizes at points near joints like the knees and ankles. People suffer with gout experience intense pain at these joints. A nanorobot could break up the crystalline structures at the joints, providing relief from the symptoms.[34]

Nanorobots in cancer therapy:

In Cancer Therapy, targeting and localized delivery are the key challenges. To overcome the shortcomings of conventional methods, we have to selectively attack the cancer cells, while saving the non-malignant tissue from excessive burdens of drug toxicity. Theoretically, the proposed nanorobot should do the following :

1. Nano-Sensors to sense the presence of malignant cells in body.
2. Nano carriers to carry the combined Nano Sensor-Nano Drug Encapsulate to vicinity of cancerous tissues.
3. Nano drug delivery particles to encapsulate drugs to be delivered at specific cancerous tissue sites and controlled drug-delivery at specific sites. As shown in fig 10.
4. A Nano-Computer/Brain to integrate the above activities in a complex In-Vivo environment.[35]

Nanoshell combination with nanodevice in cancer therapy

Nanodevice like as nanorobot used in drug delivery along with nanoshell containing polymer and drug will give the better drug load at targeted site.

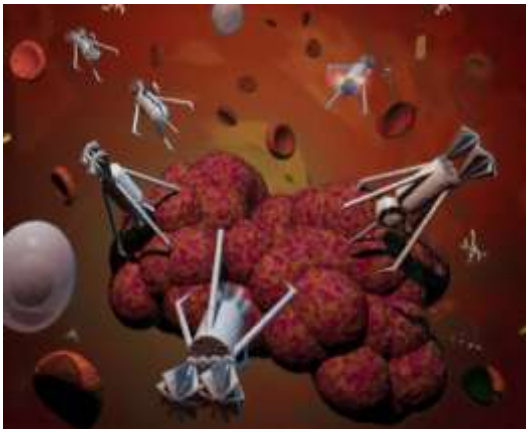


Figure.10. NANOTECHNOLOGY USED IN CANCER THERAPY

It have developed a platform for nanoscale drug delivery called the nanoshell-dielectric metal (gold coated silica) nanospheres whose optical resonance is a function of the relative size of the constituent layers. These nanoshells, embedded in a drug containing tumor targeted hydrogel polymer, and then injected into the body, accumulate near tumor cells. When heated with an infrared laser, the nanoshells (each slightly larger than a polio virus) selectively absorb a specific infrared frequency, melting the polymer and releasing the drug payload at a specific site. Nanoshells might prove useful in treating diabetes-a patient would use a ballpoint pen sized infrared laser to heat the skin site where nanoshell polymer had been injected, releasing a pulse of insulin. Unlike injections, which are taken several times a day, the nanoshell polymer system could remain in the body for months.

Nanorobots in kidney diseases: Nano nephrology will be based on discoveries in the above areas that can provide nano-scale information on the cellular molecular machinery involved in normal kidney processes and in pathological states. By understanding the physical and chemical properties of proteins and other macromolecules at the atomic level in various cells in the kidney, novel therapeutic approaches can be designed to combat major renal diseases.The nano-scale artificial kidney is a goal that many physicians dream of. Nano-scale engineering advances will permit

programmable and controllable nano-scale robots to execute curative and reconstructive procedures in the human kidney at the cellular and molecular levels. [36]

BREACKING OF KIDNEY STONES: Kidney stones can be intensely painful the larger the stone the more difficult it is to pass. Doctors break up large kidney stones using ultrasonic frequencies, but it's not always effective. As shown fig 11.

Figure.11.Role of NanoRobots in treatment of kidney diseases

Nano Robot in Brain Aneurysm: Nano robots in Brain Aneurysm predicting, using computational nanotechnology. Nano robots used to detect brain aneurysm, the Nano robot enter the vessel and flow with the blood stream. The Nano robots are moving through the vessel with fluid. The aneurysm bulb begins to become visible at the vessel wall. Nano robots move closer to the vessel deformation mixed with plasma. , Nitric oxide synthesis signal can be detected as the chemical gradient changes, denoting proteomic over expression the same workplace viewed without red cells the Nano biosensors is activated as the Nano robots move closer to the aneurysm, emitting RF signals send to the cell phones as the Nano robots chemical signals weaker , deactivating the Nano robot transmission red cells and Nano robots flow with bloodstream until they leave the vessel . The Nano robot sensors indicate position at they detect high NOS proteins concentration providing useful information about vessel bulb location and dimensions.[37]

Nanorobots in brain targeted drug delivery: Chromosome Replacement Therapy (CRT) will be more challenging in a few organs CRT in the brain requires nanorobotic passage through the blood brain barrier (BBB), or alternatively through nanocannula placed directly into the neuropil. Chromallocyte mobility systems must carefully avoid mechanical disruption of dendrites and synaptic connections by reducing transit velocities, applied forces, and mechanical frequencies. Mechanical pathologies of neural tissue include spinal cord dysfunction from mechanical compression, enhanced vulnerability to secondary insults following sub lethal mechanical stretch, glial reaction to vestibular nerve dendrite lesions, and waves of apoptotic neurodegeneration.

NANOTECHNOLOGY IN DIABETICS: Nanotechnology is increasing importance in diabetics' research in the recent decade. It is a field that involves nanomaterials, nanostructures, nanoparticle design and their applications in humans etc. It also provides more accurate information for diagnosing diabetes mellitus. Nanotechnology has enhanced drug delivery to those areas which were unfavorable for macromolecules. It is offering new implantable sensing technologies thus providing accurate medical information. The combination of nanotechnology and medicine has created a new field "nanomedicine" to enhance human health care. Some of the applications of nanotechnology in treating diabetes mellitus are artificial pancreas, instead of pancreas transplantation use of artificial beta cells, for oral delivery of insulin use of nanospheres as biodegradable polymeric carriers etc.[38]

Microphysiometer: In the presence of glucose, insulin molecules get oxidize leading to continuous electron transfer and thus microphysiometer (sensor) detects the insulin level. The current in the sensor is directly proportional to the insulin molecules produced by the cells and through this mechanism monitoring of insulin concentration can be done. As shown in fig 12.

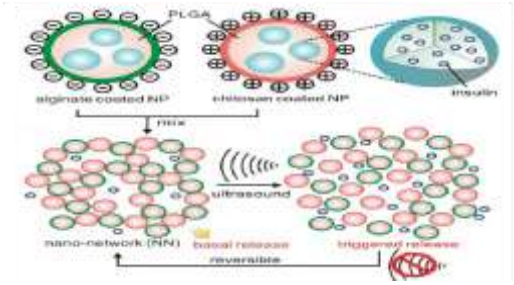


FIGURE.12. MICROPHYSIOMETER

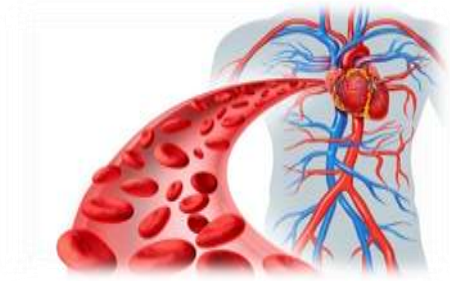
Application in diabetes: Nanorobots are considered a new possibility for the health sector to improve medical instrumentation, diagnosis, and therapeutic treatments. Patients with diabetes must take small blood samples many times a day to control glucose levels. Such procedures are uncomfortable and extremely inconvenient. To avoid this kind of problem the level of sugar in the body can be observed via constant glucose monitoring using medical nanorobotics. This automatic information can help doctors, specialists and professionals from formulation field to provide a real-time health care, improving the patient's medication regimen. Use of large numbers of independent nanorobots can offer many advantages. Medical nano robot manufacturing should include embedded and integrated devices, which can comprise the following parts : Nanotechnology is increasing importance in diabetics' research in the recent decade. It is a Field that involves nanomaterials, nanostructures, nanoparticle design and their applications in humans etc. It also provides more accurate information for diagnosing diabetes mellitus. Nanotechnology has enhanced drug delivery to those areas which were unfavorable for macromolecules. It is offering new implantable sensing technologies thus providing accurate medical information. The combination of nanotechnology and medicine has created a new field "nanomedicine" to enhance human health care. Some of the applications of nanotechnology in treating diabetes mellitus are artificial pancreas, instead of pancreas transplantation use of artificial beta cells, for oral delivery of insulin use of nanospheres as biodegradable polymeric carriers etc. In this study, applications of nanotechnology in treating diabetes mellitus are discussed Nanotechnology is increasing importance in diabetics' research in the recent decade. It is a field that involves nanomaterials, nanostructures, nanoparticle design and their applications in humans etc. It also provides more accurate information for diagnosing diabetes mellitus. Nanotechnology has enhanced drug delivery to those areas which were unfavorable for macromolecules. It is offering new implantable sensing technologies thus providing accurate medical information. The combination of nanotechnology and medicine has created a new field "nanomedicine" to enhance human health care. Some of the applications of nanotechnology in treating diabetes mellitus are artificial pancreas, instead of pancreas transplantation use of artificial beta cells, for oral delivery of insulin use of nanospheres as biodegradable polymeric carriers etc. In this study, applications of nanotechnology in treating diabetes mellitus are discussed Sensing Actuation Data transmission Remote control uploading, Coupling power supply subsystems addressing the basics to biomedical instrumentation. The integrated platform, with nanorobots for diabetes monitoring, discloses painless and useful information for persons with diabetes. It offers a practical way to improve the person's awareness with regard to daily intake of proteins and calories—thus effectively reducing the patient's time spent suffering from hyperglycemia [39]

Heart disease: There is a possibility that nanobots could perform a number of heart related functions in the body. The repair of damaged heart tissue is only one possibility. Another option is to use nano devices to clean out arteries, helping unclog those that have buildup due to cholesterol and other problems [40]

Nanotechnology vs. Heart Disease

The use of nanotechnology to treat heart disease offers some exciting possibilities, including the ability to:

1. Treat defective heart valves
2. Detect and treat arterial plaque
3. Understand at a sub-cellular level how heart tissue functions in both healthy and damage organs and design better treatment. As shown fig 13.



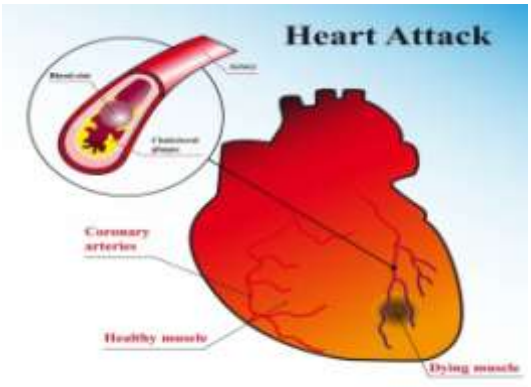


Figure.13. freely circulating the blood

Applications of nanotechnology in drug delivery systems

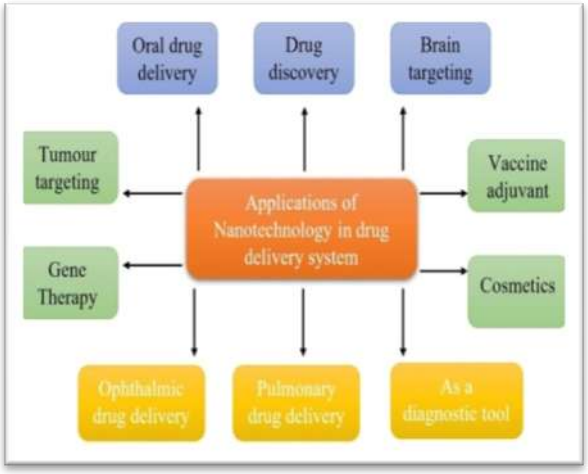


Fig.No.14.Applications of nanotechnology in drug delivery systems

FUTURE FOOTSTEPS OF NANOROBOTICS:

In the future, nanorobots could revolutionize medicine. Doctors could treat everything from heart disease to cancer using tiny robots the size of bacteria, a scale much smaller than today's robots . Robots might work alone or in teams to eradicate disease and treat other conditions. Some believe that semiautonomous nanorobots are right around the corner doctors would implant robots able to patrol a human's body, reacting to any problems that pop up. Unlike acute treatment, these robots would stay in the patient's body forever . Another potential future application of nanorobot technology is to re-engineer our bodies to become resistant to disease, increase our strength or even improve our intelligence.

CONCLUSION:

All currents developments in nanotechnology directs human a step closer to nano robots production. Nano robots can theoretically destroy all common disease of the 20th century. Recent advancement in the field of nano-robotics gives the hope of the effective use of this technology in medical field. Thus in future nano robots will play an important role.

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