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Prominent Role Nanorobot in Human Disease

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ABSTRACT

Nanorobots from the field of medicine can be a new invention supporting and hopeful medicine technology for patients to treat the disease and diagnosis of the life treating disease or disorder. Especially since there no showing the any side effect current medicine like radiation and chemotherapy. Future medicine or medical research will focus more on medical engineering and medical science with the Nano robotic technology during the any new technology. This technology is very important benefits and prevention of life-threatening disease in the future more advance Nano robot technology cool be effective therapy can be show. The most recent application of these devices are, the brain targeted delivery of drugs, glucose monitoring in diabetes patients, bone reconstruction, cancer treatment, removal of blood clots, nerve regeneration and protein and peptide drug delivery system.

INTRODUCTION:

Build massive structures with fundamentally novel molecular organization, nanotechnology must be able to manipulate molecules atom by atom. The objective is to take use of these qualities by gaining control over atomic, molecule, and device levels supra molecular levels, as well as to become proficient Create and employ these tools. Nanorobotics which an aspect of nanotechnology focuses on the research of designing, the creation, control, and programming of robots at nanoscale. [25] It alludes to speculative nanotechnology engineering is a design and construction-based subject. Nanorobots with sizes between 0.1 and 10 mm. A little robot is a very small robot created to carry out a specific. Task at the nano scale with accuracy. [1]

Micro and Nano robots can swim in liquid environments by drawing energy from their surroundings or from outside sources including light, ultrasound, electrical or magnetic fields, or combinations of these. These innovations have potential for use in a variety of fields, including manufacturing, material removal, information security, micro assembly, localized diagnosis, targeted medicine delivery, and implanting active components.[2]

Shrinking of microelectronics to nano electronics, nano robots are anticipated to deliver advancements in medicine. With the development of nanotechnology, new tools for medical processes Nano robots that are artificially made but are not biological are yet just theories. These fictitious devices have also been referred to as nano robots. Through the might be possible, such as automated molecular machines with embedded nano technique devices. [3]

NANOTECHNOLOGY:

The Greek term for "dwarf" is where the word "nano" comes from. The Nobel Prize-winning physicist Richard Feynman initially introduced the idea of nanotechnology in 1959 in a presentation titled "There's Plenty of Room at the Bottom." He concluded his speech by saying, "This a trend that, in my opinion, cannot be stopped. [26] After that, nanotechnology has discovered. Use for a variety of purposes, such as dental diagnostics, materials, and treatment The study, design, development, synthesis, manipulation, and use of materials, devices, and systems at the Nano scale is known as nanotechnology. The easiest way to describe nanotechnology is as a description of activity at the level of Molecules and atoms that are used in the actual world. A billionth of a meter is a nanometer. Meter, or around 10 times the diameter of a human hair, or 1/80,000 of a millimeter. Atom of hydrogen. Control is

the focus of the applied science field of nanotechnology. [4]

Nanomedicine -

The atomic and molecular structure of the stuff. It is growing more significant in various industries. Including, but not limited to, engineering, agriculture, construction, microelectronics, and health care. The use of nanotechnology in the medical field has attracted a lot of attention.in the recent past. Many treatments available today are time-consuming and expensive. Nanotechnology enables the creation of faster and significantly less expensive treatments. [4]

The spatial and temporal scales under consideration directly influence the possible impact of nanotechnology: Materials and equipment created at Nanometer-scale manipulation implies precision. Each of the molecules and atoms that make up in what configuration they make up the main macroscopic substrate. As a result, Nano engineered substrates can be created to display specified, tightly regulated bulk chemical and physical characteristics as a result of the manipulation of their creation and assembling of molecules. [5]

Nanotechnology's impact will be a significant effect on our culture and economy; it is a contemporary industrial revolution. A megatrend that is bringing disruptive innovation is nanotechnology. It has become a technology with broad applicability. Among different industrial sectors. [6]

Goods, particularly nanomaterial, despite the fact that its practical use is still somewhat limited. nanomaterial are used in a variety of industries to enhance product functionality for electronic, magnetic, optoelectronic, biomedical, pharmaceutical, cosmetic, energy, catalytic, and materials applications, according to data from the National Nanotechnology Initiative (NNI) website. Additionally, it has been noted that the industries now making the most money are those utilizing nanoparticles for chemical-mechanical polishing. [7]

Optical fibers, electro conductive coatings, sunscreens, automotive catalysts, biolabeling, and magnetic recording tapes. Advances in nanotechnology, however still in their infancy, are anticipated to accelerate the creation of additional cutting-edge applications in Nano electronics, Nano medicine, nanomaterial (such as Nano composites), nanoelectrome chemical systems (NEMS), and Nano robotics. The Intelligent Systems and Robotics Centre (ISRC) is particularly interested in understanding its place in the expanding science of nanotechnology. The field of Nanorobotics, specifically, is the one that the ISRC is most interested in and is covered in further length in this paper. [7]

NANOROBOTICS:

Nanorobots

Nano robots are Nano devices that are used to treat or protect humans against diseases. It is a tiny machine with Nano scale dimensions between 1 and 100 nm, and it is intended to carry out a certain duty or tasks occasionally. They must perform their duties at atomic, responsibilities in the medical and industrial areas at the molecular and cellular levels. Nano robotic theory states that because they are so small, they are likely to be the collaboration of a very big number of people to carry out microscopic and macroscopic activities. [17]. Advancements in nanotechnology, medicine, and robotics, Computers and bioinformatics could lead to the creation of Nano robot drug delivery systems. System reciprocate Nano robots are one type of Nano robot. Surgical Nano robots, cellular repair Nano robots, and microbivore Nano robots. [2]

Nano robotics are mainly classified into the two types:

1. The first area

2. The second area

The first area deals with the design, simulation, control, and coordination of robots with Nano scale dimensions, or "Nano robots, "The overall sizes of Nano robots, Nano machines, and other Nano systems are in the micrometer range or less. Consist of assemblies of nanoscale parts, each with dimensions ranging from somewhere between 1 and 100 nm. The most of the research done in this field remains largely theoretical at the moment, mainly due to the challenges in creating such gadgets. Although there are yet no manufactured Nano robots, nature's there are biological Nano robotic systems and they serve as proof that these systems are at least problematic. Consequently, Nano robots have primarily been used in examined in the perspective of Nano medicine in biology. [1]

The second area deals with Nano manipulators focuses on the manipulation and/or construction of Nano scale components using macro scale tools or robots. In this field, research articles have been produced in substantially greater numbers. It is obvious that there is a need for the development of effective technologies for the manipulation and assembly of Nano scale structures into useful Nano devices given the developments in nanotechnology and their fast expanding number of possible applications. The creation of artificial Nanorobots themselves may also be significantly influenced by Nano manipulation and Nano assembly. [1]

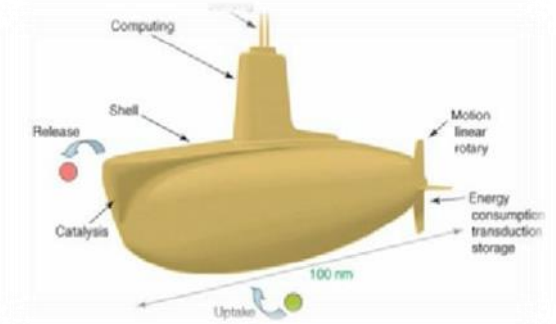
They are includes large scale manipulator with an Nano scale precision, accuracy and manipulation capabilities and micro scale robotic devices with an least one Nano scale component The community was also able to demonstrate and development of the several Nano components such as various types of Nano sensors , nanostructures, Nano motors , etc.[8]

Robotics for nanotechnology allows the production of various items and operations.

Nano robots are robots that carry out a very specific function and are 50–100 nm wide. They can be used very effectively for drug delivery. For example: Nano positioning robots are used in fiber optic component assembly. Nanotech robots are used in the high-density pharmaceutical assay process. [16]

CLASSIFICATION OF NANOROBOTS:

1. **Pharmacyte:**
2. **Respirocyte:**
3. **Microbivores:**
4. **Clottocytes:**
5. **Chromallocyte:**
6. **Diagnosis and Imaging:**



1. Pharmacyte:

Pharmacyte

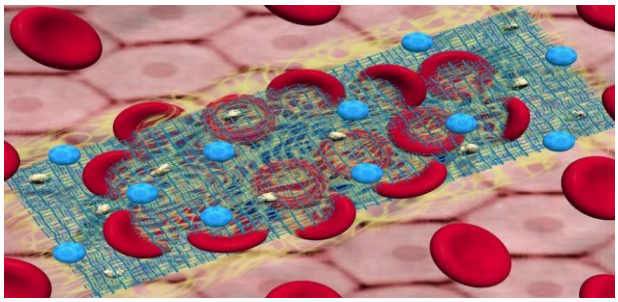
That useful is a medical Nano robot with a size of 1-2 m and the capacity to transport up to 1 m3 of a specific medicine in tanks. They are managed by mechanical sorting pumps and systems. They are given chemotactic sensors or molecular markers, which ensure complete targeting precision. The on board power source is glucose and oxygen drawn from local surroundings like blood, intestinal fluid, and cytosol. The Nano robots can be removed or recovered via centrifuge Nano apheresis after finishing their activities. Technologies that are used to manipulate. It is a medical Nanorobot having a size of 1-2 μm able to carrying up 1 μm3 a given drug in the tank. They are used in medicine are predicted to a wealth. When the server side effect of the existing therapies are considered, the nanobots are found to be more innovative, supportive to the treatment and diagnosis of vital disease. [4]

2. Respirocyte:

Respirocyte

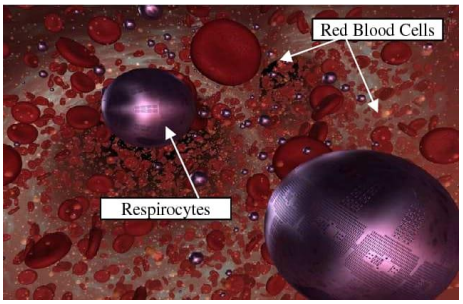
It's a Nanorobot called an Artificial Oxygen Carrier that functions similarly to an artificial red blood cell. The energy comes from the body's own stored glucose. Compared to red blood cells, this artificial cell can provide 236 times more oxygen and acidity to the tissues per unit volume. They are micron-scale spherical robotic red blood cells comprised of nanometer-scale components, containing an internal pressure of 1000 atmospheres of compressed oxygen and carbon. [4]

3. Microbivores:



Microbivores

It is an oblate spheroidal device having 3.4 m along its major axis and 2.0 m along its minor axis that is used in Nano medicine. Up to 200 pW can be continuously used by the nanobots. Microbes that are imprisoned are broken down using this power. The capacity nanobots. Microbes that are imprisoned are broken down using this power. The capacity to phagocyte around 80 times more efficiently than macrophage agents, measured in volume/sec digested per unit volume of phagocytic agent, is another unique characteristic Oblate spheroidal Nano medical device consisting of 610 billion precisely arranged structural atoms plus another ~150 billion mostly gas or water molecules when fully loaded. [4]



4. Clottocytes:

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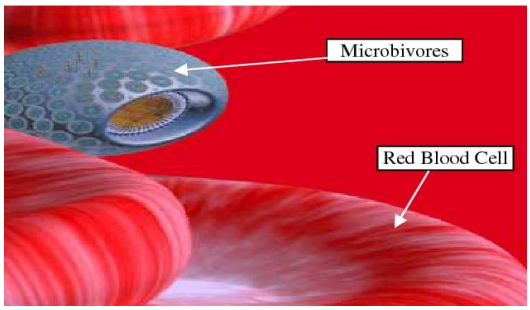


Clottocytes

This kind of Nano robot has a special biological ability called "instant" hemostasis, which it achieves by employing clottocytes, or synthetic mechanical platelets. It is known that platelets are roughly spheroidal blood cells with no nucleus that have a diameter of about 2μm. Platelets converge near the site of injury.

They become tacky and lump together to create a tampon there, where they are triggered to help stamp the blood vessel and halt the bleeding. Additionally, they distribute materials that aid in coagulation.

A complete functional design of an artificial platelet is beyond the scope of this paper. Here, I want to focus on the purely mechanical aspects of the hemostatic function of platelets, the artificial mechanical platelet or clotto cyte may allow complete hemostasis in as little as ~1 second, even in moderately large wounds. This response time is on the order of 100-1000 times faster than the natural system. [4]

5. Chromallocyte:

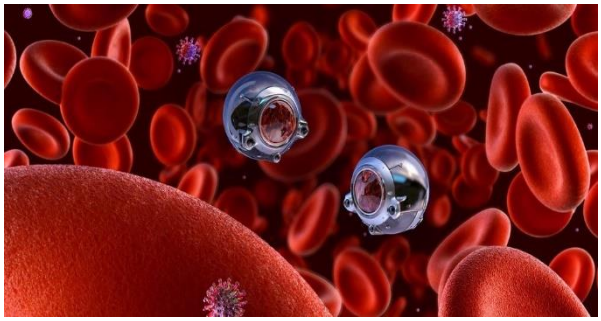
Chromallocyte

To reverse the effects of hereditary diseases and other cumulative harm to our DNA, the Chromallocyte would replace complete chromosomes in individual cells, avoiding aging. A repair machine can fix a cell by first assessing its contents and activity, then moving forward

molecule by molecule and structure by structure.[15]

Eventually, the machine will be able to fix the entire cell. A chromallocyte is a lozenge-shaped mobile Nano robot, consisting of about four trillion atoms. Its purpose is to be a gene delivery vector superior to viruses (typically used today), offering a much greater degree of precision and control for the experimenter. Although the chromallocyte, designed by Robert Freitas, a pioneer in nanotechnology, has not yet been fabricated, it does seem feasible in the next few decades. Scientists have already designed MEMS (microelectromechanical systems) that can maneuver through the human bloodstream. NEMS (nanoelectromechanical systems) are only a matter of time. Capable of limited vascular surface travel within capillary tissue, a swarm of Chromallocyte heads towards its destination of target tissue cells. Each Nano robot carries a complete set of chromosomes that makes it an ideal platform for dealing with many genetic or age-related diseases. [4]

6. Diagnosis and Imaging:



Nanorobots in blood vessel for Diagnosis and Imaging

They have microchips that are layered with human molecules. When the molecules identify an illness, the chip is expected to send an electrical signal provides an illustration of a unique type of sensor nanobots that may be injected into the blood beneath the skin to check blood contents and alert the user to potential illnesses. They can also be used to keep an eye on blood sugar levels. The low cost of production and ease of manipulation are advantages. [4]

COMPONENT:

Component of Nano robots are below:

1. Payload

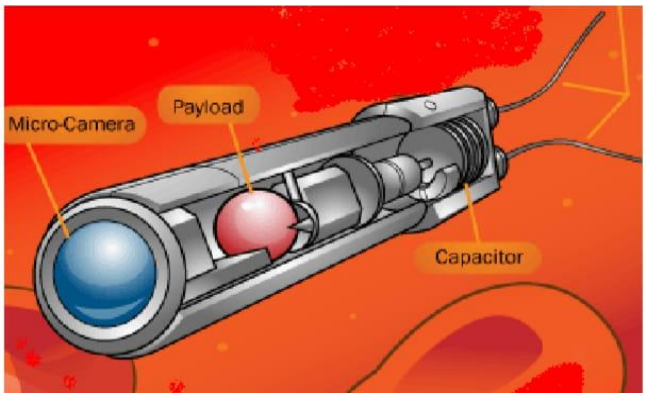
2. Micro Camera

3. Electrodes

4. Lasers

5. Ultrasonic Signal Generators

6. Swimming Tail:



1. Payload:

This is a period of voiding that contains a tiny amount of medication. It has the ability to move across blood vessels and deliver the medication to the location of injury or infection. [9]

2. Micro Camera:

In addition, the Nano robot might have a tiny camera that it uses to manually move across the frame. [9]

3. Electrodes:

By using the electrolytes in the blood, the electrode configuration on the Nano robot should form the battery. By creating an electric current and heating the cancer cells to death, these protruding electrodes have the ability to eradicate the majority of cancer cells. [9]

4. Lasers:

Lasers are used to burn the harmful materials like cancerous cells, blood clots and plaques i.e. these lasers vaporize tissues. With the help of powerful laser vaporizing cancerous cells is the challenging work, but this laser does not harm to surrounding tissues. [9]

5. Ultrasonic Signal Generators:

These turbines are used while the nanobots are used to goal and damage kidney stones. [9]

6. Swimming Tail:

Nano robots are propelled into the frame. Motion is provided by the motor, while mobility is provided by manipulator palms or mechanical legs. The most sophisticated software for simulating nanobots in a fluid-filled environment under Brownian motion control is called the manipulative layout. [14] The goal molecules are detected by the chemical sensors on the nanobots. Particle swarm optimization (PSO), artificial bee colonies (ABC), and ant colony optimization (ACO) are the three main types of swarm intelligence strategies that have been developed. Its structural components have included fins, propellers, Nanosensors, and a molecular sorting rotor. [9]

MECHANISM OF ACTION:

Since the manipulation processes in microscopic environments differ from those in standard manipulation strategies, techniques utilizing event-based fully feed-forward control are being explored as a means of accurately advancing new scientific innovations. The application of tiny devices in reality has brought about the many scientific and surgical procedures improvements made to medical practices in recent years. Regarding the cerebral and myocardial hearts surgical intervention Catheterization has proven to be an effective crucial methodology. The development of bimolecular science and novel production techniques is now helping us to accelerate the downsizing of devices from micro to Nano electronics. The. Modern technology powers biological sensors, providing the foundation for the creating bimolecular switches.[30]

It is anticipated that the metabolism of local glucose, oxygen, and externally supplied acoustic energy will power Nano robots. Navigational acoustic signaling can be used to establish communication with the device. Network that was created inside the body. Once the Nano robots' mission is accomplished, they can be recovered by allowing them to expel themselves via the same old human excretory routes. To move slowly or swim through human tissues, Nano robots may employ precise motility processes, such as:

1. Navigational recession

2. Cytopenetration

3. Use any of multitudes of techniques to monitor, interrupt, or regulate nerve impulse site visitors in individual nerve cells. [9]

THE DESIGN OF NANOROBOT:

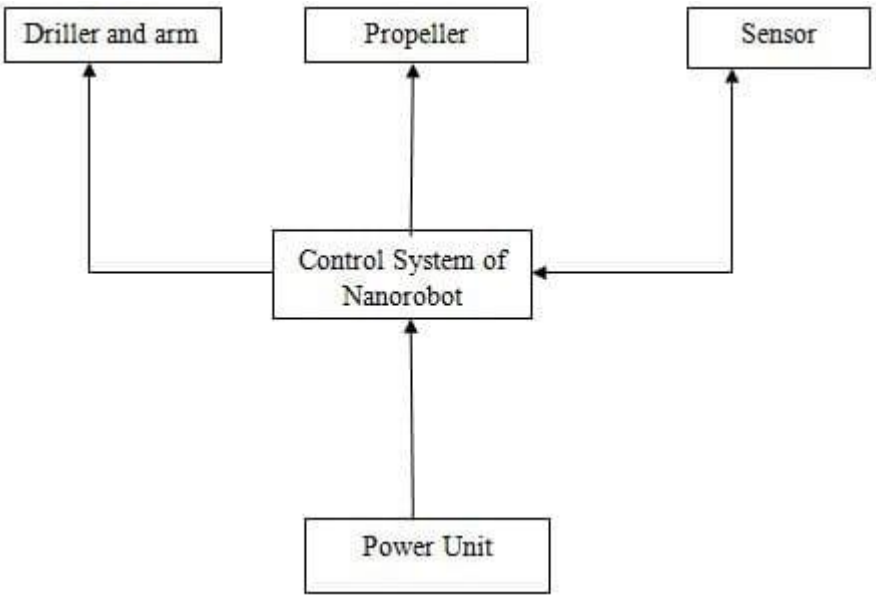
- The primary criteria used in the creation of a Nanorobot are its navigation system and the manner in which it binds to tumour cells.

- When building a Nano robot, its ability to move in a liquid environment is the primary consideration. The device must have a smooth trajectory and not harm normal cells in order to navigate through the bloodstream.[9]

- In order to prevent collisions, ultrasonic sensors are affixed to the Nano robots' bodies. This can stop the Nano robots from crashing into one another.

- A series of rotary motor (known as flagella motor) provides the power for the generation of remarkable force, which can drive the thin helical filament (flagella).

- The assembled nanobots size ranges from roughly 0.5 to 0.8 µ, while the capillary's diameter was discovered to be between 5 and 10 µm. The size of the Nanorobot must fall within the range of capillary size in order for it to pass through blood vessels.[10]



Block Diagram of Nano robots

1. Manufacturing Technology:

➢ Robots that are smaller in size are more difficult to design. First of all, because the components are in the Nano scale size range, it is challenging to apply mechanical engineering to design e.g. Rods, nuts.

➢ Bolts cannot be used to keep things together and real time imaging to receive immediate feedback on the system status is very rare.

➢ New approaches in construction, computation, transducers, and manipulation aids in the ability to manufacture Nanorobots.

➢ For the diagnostic purposes, different temperature gradients, chemicals concentration in the blood and electromagnetic signals are some of the important parameters.[29]

➢ For the production of basic Nano devices and Nano electronics systems, deep UV lithography, a technique used in complementary metal oxide semiconductor (CMOS) design, offers excellent precision and reproducibility.

➢ Joint use of Nano photonic and nanotubes with CMOS can effectively lead to find a pathway for assembly process which essential for Nanorobot manufacturing, which also accelerate the actual levels of resolution ranging from 248 nm to 157 nm devices.[10]

2. Propulsion:

➢ A variety of innovative approaches are developed by natural system for movement in its environment. The direct movement of mammalian cells in blood vessels is not possible because of the high flow rate (2-14 ml/s) of blood.

➢ Previous studies have indicated that the inefficiency of chemotherapy drugs lowers their delivery efficiency.

➢ Approaches typically employed by swimming microorganisms were explored for the determination of how a better propulsion system can be developed.

➢ Robots equipped with artificial bacteria (ABF) have been produced in experiments to move in three dimensions. ABFs are constructed from helical Nano belts with soft magnetic heads composed of nickel, chromium, and gold. This allows the Nano belts to rotate in the presence of an external magnetic field.

- A fluid motion similar to it can be generated by fabricating ABF with biological flagella.

- But metals used in their construction can lead to severe toxicities and reduce Nano robot's biocompatibility.

- By developing of an effective propulsion system, the retention time of Nanorobots in the body can be increased and also slower the renal clearance rate. This will improve the bioavailability of drug for extended traditional therapy.[10]

3. Chemical Sensing:

- To monitor E-cadherin gradients, chemical sensor is embedded in Nano robots.

- Mobile phones are applied to retrieve information about patient conditions in various medical Nano robotics architecture. For commanding and detection of location of Nano robots within the patient can be accessed by the help of electromagnetic waves.

- An important aspect to describe the Nanorobot application in cancer therapy is the interaction of chemical signals within the body with the blood. [12]

- After a tumor is diagnosed, nanorobots are designed to attach themselves to it. In addition to their ability to draw a specific number of additional nanobots to the site of chemotherapeutic action, nanorobots are designed to enable wireless connection, which enables clinicians to receive accurate tumor location information.[10]

4. Energy Supply.

- The energy needed for the nanorobot to operate as long as it is needed for operation can be secured by using CMOS for the supply of power and telemetry.

- Digital bit encoded data can be sent from within the body using the same way. Several processes involving several jobs can be used with little to no energy waste carried out via resonant nanocircuit's electric properties.

- Nano circuits can supply 1.7 mA at 3.3 V for power through electromagnetic energy.

- Telemetry (based on radiofrequency) method have shown very good results in monitoring of patient and transmission of power by using inductive coupling.[10]

5. Data Transmission:

- The continuous medical monitoring can be greatly benefited by the application of sensors and devices implanted within the body to transmit health related data of patients.
- Chemical signaling can be used to facilitate cooperation amongst nearby Nano robots.
- Integrated sensors, or data transfer, provide for a better understanding of read and written data from implanted devices.[13]
- In liquid workspaces, radiofrequency, chemical, optical, and sound signals can all be considered the best options for data transfer and communication, depending on the application.
- In liquid workspaces, radiofrequency, chemical, optical, and sound signals can all be considered the best options for data transfer and communication, depending on the application. [10]

6. System Implementation:

- The design of Nanorobots comprise of integrated Nanoelectronics.
- One use for Nanorobotics is with cell phones. For instance, early identification of E-cadherin levels for chemotherapy drug delivery and novel tumor identification for cancer therapy.
- This information obtained can help in the early detection of malignant tissues.
- Chemical sensing which can be highly specific, can be used to identify various cell types using markers. Acoustic sensors are an additional option that employ a range of frequencies to determine a wavelength that corresponds to the size of the object of interest. [10]

7. Controlling of Nanorobots:

- The controller connects the motors and sensor.
- Control, actuation, and sensing are tightly interwoven. Research is now being done on techniques that have developed to provide biological systems with high performance, adaptability, and robot. [10]

8. Nanorobot Simulation:

➢ Because of the development of nanoelectronics, nanorobots are also seen as a new and useful technology to support novel drug approaches.

➢ Real-time three-dimensional visualization of the red corpuscle can be achieved by nanorobots located within the vessels. [10]

APPLICATION OF NANOROBOT:

Nano robots are predicted to allow new remedies for sufferers affected by unique diseases, and cold bring about wonderful boost withinside the records of medicine. Nanotechnology has furnished the opportunity of handing over drugs to precise cells the usage of nanoparticles.[9] potential uses for nanorobotics in medicine include early diagnosis and the targeted drug delivery for any disease, biomedical instrumentation, surgery, pharmacokinetics, monitoring of any disease and health care.

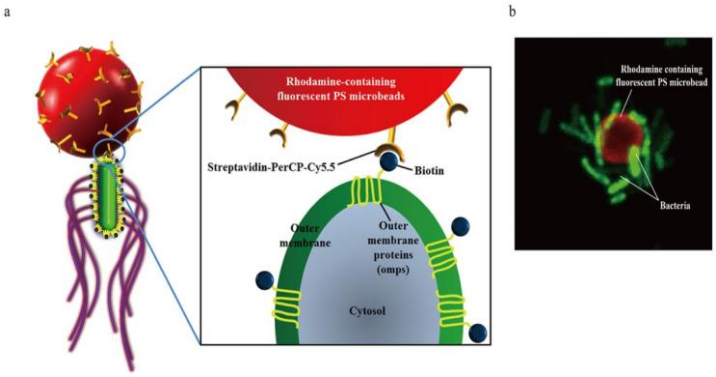
1. Application in cancer:

Most cancer treatments use nanorobots equipped with chemical biosensors (nanosensors) to identify tumor cells early on. When cancerous cells are present in the body, this Nano sensor will detect them.

The body of an affected individual may be examined for tumor cells in the early phases of recovery using nanorobots that have chemical biosensors installed in them. For this kind of project, integrated Nano sensors may be used to determine the depth of E cadherin signals.

A hardware architecture that is primarily based on nano bioelectronics has been defined for the use of nanorobots in cancer therapy. [23]

Salmonella bacteria that are interested in tumors through chemical substances released by cancer cells have been genetically altered by scientists. When the bacteria get to the tumor, they release capsule-filled pills automatically thanks to minuscule robots they carry. These robots are only a few micrometers in size. The scientists termed the nanorobot "bacteriobot," which delivers medications directly to the tumor, attacking the tumor while preserving healthy cells, so avoiding adverse effects associated with chemotherapy. The DNA nanorobot's conformation changes structurally when it binds to the intended target, going from a closed to an open state and releasing the stored treatment. [21]



Bacteiobot

Applications of DNA Nano robot in Treatment of Cancer:

A targeted drug delivery system utilizing DNA Nano robots could improve medical interventions. Numerous chemotherapy medications can be made specifically to destroy cells that divide quickly. However, the truth is that rapidly dividing cells now comprise blood cells, stomach lining, hair follicles, and other tissues instead of cancer cells. Chemotherapy medications typically cause a wide range of side effects, including nausea and vomiting, hair loss, low blood cell counts, etc., as they assault all of these rapidly dividing cells. Thus, this represents the main drawback of chemotherapy medications. [22]

By stimulation of dying receptors causing apoptosis.

- Destruction of cancer cells by focused transport of anti-cancer drugs.
- By direct harm to the cancerous cells.
- The target is only reached by passively moving Nanorobots in the fluid if they happen to bump into it owing to Brownian motion.
- Pharmacies will be used in Nano medicine for a wide range of purposes, including direct control over cell signaling pathways and the induction of death in cancer cells.[9]

The payload can be injected directly into the cytosol via Tran's membrane injector mechanism or discharged into the adjacent extracellular fluid, depending on the needs of the mission. [11]

DNA Nanobots

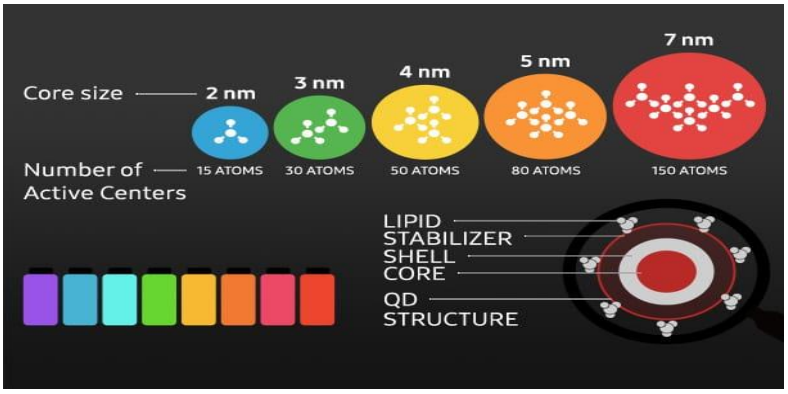
Quantum Dots:

These are tiny crystals that, when exposed to ultraviolet light, glow.

When injected into the body, they may float around until they encounter malignant tissue. Deadly cells will adhere to the unique coating on the glowing dots.

Through the use of chemotactic sensors coupled to specific antigens on the surface of the cells, the nanorobots can distinguish malignant cells from normal ones. the cells that are being targeted. Using chemical sensors, these will be automated to identify the levels of β-catenin and E-cadherin in the primary and metastatic phases. Thus, nanorobots only eliminate malignant cell. [10]

The physical selectivity to the cancer lesion location can result from the phenomenon known as increased permeation retention.



Quantum Dot

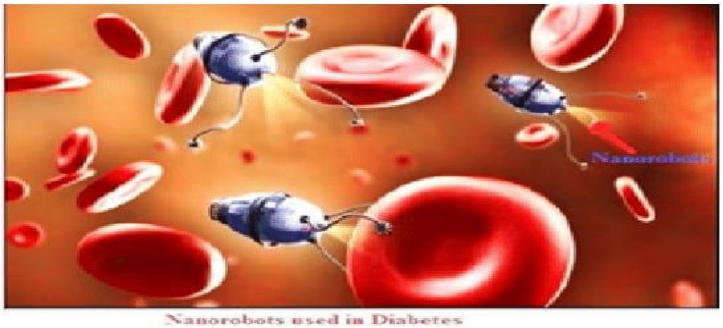
Polymeric NPs are good choice as carrier of cancer medications for treatment and, are made from biodegradable polymers. [10]

2. Application in Diabetes

Nanorobots are considered a new possibility for the health sector to improve medical instrumentation, diagnosis, and treatment of diabetes. 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. [19]

The simulated nanorobot prototype model has embedded Complementary Metal Oxide semi-conductor (CMOS) nanobioelectronics. It features a size of ~2 micronmeter, which permits it to operate freely inside the body. The nanorobot uses embedded chemo sensor that involves the modulation of hSGLT3 protein glucosensor activity. Through its onboard chemical sensor, the nanorobot can thus effectively determine if the patient needs to inject insulin or take any further action, such as any medication clinically prescribed. They flow with the RBCs through the bloodstream detecting the glucose levels. At a typical glucose concentration, the nanorobots try to keep the glucose levels ranging around 130 mg/dl as a target for the Blood Glucose Levels (BGLs). In the medical nanorobot architecture, the significant measured data can be then transferred automatically through the RF signals to the mobile phone carried by the patient. At any time, if the glucose achieves critical levels, the nanorobot emits an alarm through the mobile phone. [4]

The nanorobot can consequently correctly decide through it's on board chemical sensor, if a affected person desires to inject the insulin or to take any similarly motion which include any medicine that's clinically prescribed. The nanorobots try and preserve the extent of glucose ranging round a hundred thirty mg/dl because the goal for the Blood Glucose Levels, at the everyday glucose concentration.[6]



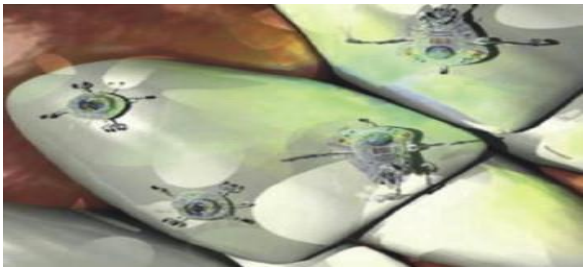
Nanorobots used in Diabetes

3. Application of nano robots in dentistry

The glucose that's carried through the blood movement is essential to keep a human metabolism running healthfully & its acstage is the important thing problem in the diagnosis & treatment of the diabetes. [18] The protein hSGLT3 has the essential have an impact on in retaining the right GI [Gastrointestinal] cholinergic nerve & skeletal muscle feature sports regulating the extracellular glucose awareness that's intrinsically associated with the glucose molecules. The hSGLT3 molecule can serve to outline the glucose ranges for the diabetes patients. [9]

These when delivered either by mouthwash or tooth paste, can cover all sub gingival surfaces, thereby metabolizing trapped organic matter into harmless and odorless vapors. Properly configured dentifrobots can identify and destroy pathogenic bacteria that exist in the plaque and elsewhere. These invisibly small dentifrobots are purely mechanical devices that safely deactivate themselves when swallowed. [4]

Nanotechnology has brought dentistry a miniature technology which has the ability to lessen the burden of dentist in near future. It is envisioned that Nanorobot will help dentists in managing complicated cases of microscopic level with easy and preciseness. It will be of prime help for dentists practicing both Conventional and four handed dentistry. [12]



Nanorobots used in dentistry

4. Nanorobots in Surgery

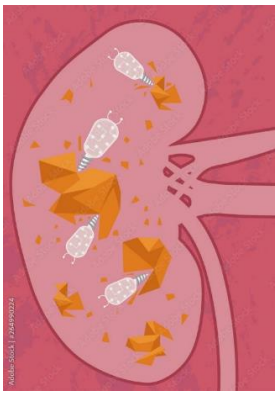
Surgical Nanorobots may be introduced into the body through the vascular system or at the ends of catheters into numerous vessels and alternative cavities within the body a surgical nanorobot, programmed or guided by an individual's surgeon, may act as a semi-autonomous on-the-spot surgeon within the body. Such a tool may perform numerous functions like checking out pathology so designation and correcting lesions by Nano manipulation, coordinated by associate degree on board computer whereas maintaining contact with the

management surgeon via coded ultrasound signals.[20]

Neurosurgery is unambiguously suited to profit from several of the innovations engineering science has got to provide. These invasive intracranial watching, and pharmaceutical delivery, amongst several others. [9]

5. Nanorobots in Kidney disease

Nanorobots are used to break the kidney stones with the help of ultrasonic shocks. Kidney stones are painful and a large stone does not pass out in urine.[28]. Sometimes doctor break this stones by ultrasonic frequency but, these are not effective in always. Nanorobots break up these kidney stones by using small laser and these smaller pieces are passing out in urine outside the body. [4

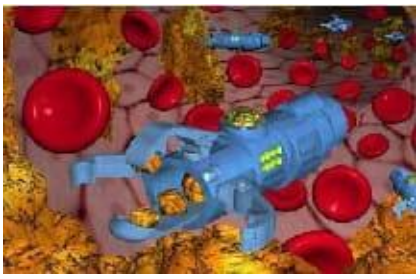


Nanorobots used in Kidney

6. Heart-attack prevention

Nanorobots can also be used to prevent heart-attacks. Heart-attacks are caused by fat deposits blocking the blood vessels. Nanorobots can be made for removing these fat deposits. The nanorobots remove the yellow fat deposits on the inner side of blood vessels. This will allow for both improving the flexibility of the walls of the arteries and improving the blood flow through them.[27]

From this hypothesis, such technology will help for delivery of drugs like lipid lowering substances such as lovastatin, simvastatin etc. These drug molecules will enter with nanorobots and give delivery at the site of action.[4]



Nanorobots used in Heart Disease

7. An Artificial Phagocyte (Microbivore)

Microbivore is an artificial mechanical phagocyte of microscopic size whose primary function is to destroy the microbiological pathogens found in the human bloodstream, using the “digest and discharge" protocol. The chief function of microbivore is to wipe out microbiological pathogens found in the human bloodstream, using the "digest and discharge" procedure. Microbivores upon given the intravenously (I.V) would achieve complete clearance of the most severe septicemic infections in hours or less, far better than the weeks or months .needed for antibiotic-assisted natural phagocytic defenses.[4]

8. An Artificial Oxygen Carrier Nanorobot

"Reciprocate" is the artificial mechanical red cell, an imaginary nanorobot which floats along in the blood stream. It is essentially a small pressure tank that can be pumped full of oxygen (O2) and carbon dioxide (CO2) molecules. Later on, these gases can be released from the small tank in a controlled manner. These atoms are mostly carbon atoms arranged as diamond in a porous lattice structure inside the spherical shell.

When the nanorobot passes through the lung capillaries, O2 partial pressure is high and CO2 partial pressure is low, so the on board computer tells the sorting rotors to load the tanks with oxygen and to dump the CO2.[4]

Ideal Properties of Nanorobot:

- Nanorobots must have size in between 0.5 to 3 microns large with 1-100 nm parts.
- Nanorobots of larger size than the above will block capillary flow.
- It will prevent itself, from being attacked by the immune system by having a passive, diamond exterior.

- It might produce multiple copies of it to replace worn-out units, a process called self-replication.

- It will communicate with the doctor by encoding messages to acoustic signals at carrier wave frequencies of 1-100 MHz.

Advantages of nanorobots:

- Use of nanorobot drug delivery systems with increased bioavailability;

- Targeted therapy such as only malignant cells treated.

- Reach remote areas in human anatomy not operatable at the surgeon's operating table.

- Small size- The upper limit of the size of nanorobot is 3 micron so that it can easily flow in the body without blocking the capillary flow.

- Cost effective (if mass produced) - Manufacturing by batch processing reduces the cost even if the initial cost of development is high.

- Less post treatment care: As it is minimally invasive technique, therefore less post treatment care is required [24].

- Better accuracy

- Drug inactive in areas where therapy not needed minimizing undesired side effects.

- As drug molecules are carried by nanorobots and released where needed the advantages

of large interfacial area during mass transfer can be realize.

- Non-invasive technique.

- Computer controlled operation with nobs to fine tune the amount, frequency, time of release.

Disadvantage of Nanorobot:

- The initial design cost is high.

- Nanobots can cause a brutal risk in the field of terrorism.

- The design of the nanorobt is a very complicated one.

- Other possible threat associated with nanorobot is privacy issue. Because it is miniature form of device.
- The nanorobot should be very accurate otherwise harmful events may occur.
- Regulatory Issues
- May affect human health by introducing toxicity in blood.
- Nano implements could adjust human DNA structure.

CONCLUSION:

The nanorobots from the field of nanomedicine can be a new, supporting, and hopeful machine technology for patients in the treatment and diagnosis of life-threatening diseases, especially in light of the severe side effects of the current medicines like radiation and chemotherapy. Future medical research will focus more on medical engineering than medical science, with nanorobotic technologies driving this change. Nanorobots have several potential uses in medical, from curing sickness to slowing down the ageing process (problems like wrinkles, bone loss, and age-related illnesses can all be treated at the cellular level). Nanorobots are also candidates for use in industry. They will offer individuals treatments that are not now accessible, with increased efficacy and fewer adverse effects. They will offer combined activity, including surgery with immediate diagnostic feedback, imaging agents that act as medications, and drugs marketed with diagnostics. Nanorobotics has the potential to change healthcare and the way diseases are treated.

in the future, even if it now seems like science fiction. It creates new opportunities for extensive, prodigious study. Sensitive new diagnostics will be used in healthcare in the future to improve individual risk assessment. The greatest impact can be anticipated if the major illnesses that place the most burden on the ageing population are tackled first: diabetes, cancer, musculoskeletal disorders, neurological diseases, and cancer. In these project practice school we have reviewed nanorobotic technology, importance, benefits in prevention of life threatening diseases. In the future more advanced nanorobotic technology could be effective therapy than medicine or surgery to avoid the future complication.

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