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Brief Review on Future of Medicine: Nanorobots

Shravani Girigosavi[1*] and Payal Oak[2]

[1]Department of Pharmacology, Gourishankar Institute of Pharmaceutical Education and Research, Limb Satara, Maharashtra, India.
[2]Gourishankar Institute of Pharmaceutical Education and Research, Limb Satara, India.

Authors' contributions

This work was carried out in collaboration between both authors. Author SG designed the study, perform the statistical analysis, wrote the protocol and wrote the draft of the manuscript. Author PO managed the analysis of study. Both authors read and approved the final manuscript.

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Review Article

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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 nanometre (10-9meters). These devices range from 0.1 – 10 micrometres. Nano-robots are the advances in technology. The technology has expanded our capability and potential to operate the world around us on above removing scale. Nano robots can be used in various application such as space and medicine technology. Nanos robots are device is used for motive of nourishing, keeping and protecting the human body opposing antibody, microorganisms, pathogens. Nano robots are instrumental by using various components such as actuators, sensors, control, power, conveying and by affiliating cross – marked scales between organic and inorganic systems. Nanotechnologies are quickly arising within the nation of medicine, and this subdivision has been termed Nano medicine. Application for nanorobotics in medicine including diagnosis and drug delivery for cancer, tissue engineering, pharmacokinetics, dental surgery, ophthalmology and others. This region of work is fulfilled with prospective and possible applications, many of like that recently animating researched and evolution. The objective of this paper is to introduce the expanding sector of nanorobotics inside in medicine and advancement in medical application.

**Corresponding author: E-mail: Shravanigiri10@gmail.com, shravani10@gmail.com;*

Keywords: Nanotechnology; nano robot; diagnosis; medical application; nano medicine.

1. INTRODUCTION

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. 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 or 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. In 1986, K. Eric Drexler first launch the project and design of using Nano robots for therapy in a human body and this idea exist further deliberate and planed by Robert A. Freitas. The names Nano robots, ganoids, nannies or nan omits. Succession in medicine has been marked by the capability of analyst to study and recognize the globe around us on developing minor scale. These developments containing the germ theory and microbiology.

2. WHAT ARE NANO ROBOTS

A nabob is microscopic robot built with nanotechnology. It performs tasks at nanoscale level. The size of Nano robot is 10-9. 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].

2.1 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.
- The major advantage of Nano robot is thought to be their durability, in theory, 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].

2.2 Disadvantages of Nano Robots

- The Nano robot should be very accurate otherwise harmful events may occur.
- 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].

2.3 Different Approaches to Nanorobotics

1. Biochip
2. Unboots
3. Positional Nano Assembly
4. Bacteria Based

3. BIOCHIP

The joint use of Nano electronics, photolithography, and new biomaterials provides

a possible approach to manufacturing Nano robots for common medical applications. Such as for surgical instrumentation, diagnosis and drug delivery [6].

4. 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].

5. 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].

6. BACTERIA BASED

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

7. 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].

8. 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].

9. 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].

10. 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].

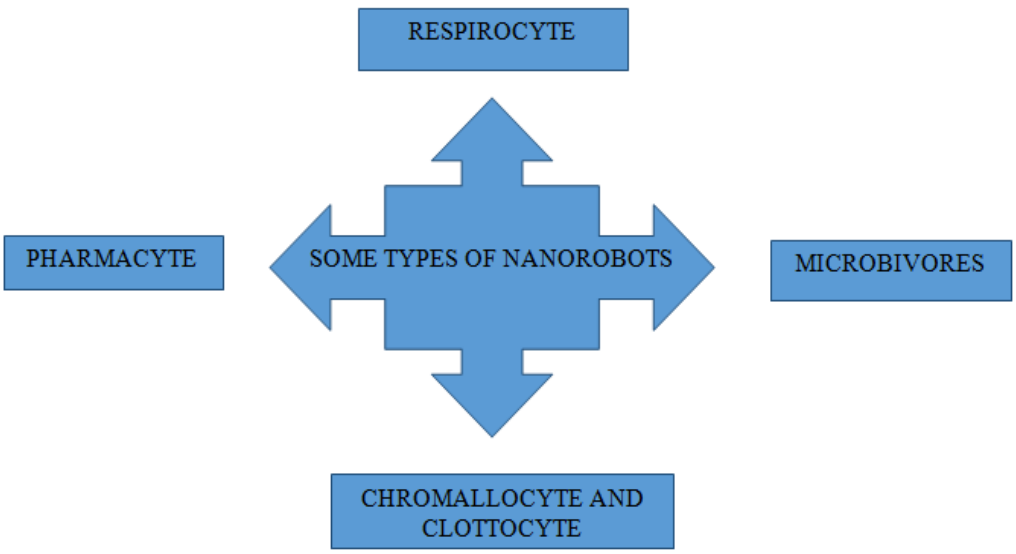

Fig. 1. Types of nano robots

11. 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].

12. COMPONENTS OF NANO ROBOTS

12.1 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 [15].

12.2 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 [16].

12.3 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.

12.4 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 modelling. Development platform for medical Nano robot's investigations. 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 [17].

12.5 Manner of Treatment

The operation can be done various ways. The cluster of substance can be burst to exert its action, and it remove subsequently. They can be used to enhance other efforts.

12.6 Removal of Nano Robots after Treatment

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 [18].

12.7 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, another option would be 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 [19].

12.8 Medical Applications of Nano Robots

Nano robots are anticipate authorizing new treatments for patients suffering from different disease. Medical technology where they might be used 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 [20].

13. NANO ROBOTSIN DRUG DELIVERY

Nano robots can be useful tool in drug delivery applications. A study, by researchers at the Interdisciplinary Centre, in Herzliya, and Bar Ian University, in Ramat Gann, Israel, solved those problems by building a Nano robot that could be switched on and off to release drug within the body when needed. The team built the Nano robot out of DNA folded in such a way that drugs could be tethered inside. The Nano robot also

has a gate, controlled by exposure to electromagnetic energy that opens and closes to release the drug into the surrounding environment in this case the body of a West Indian leaf cockroach. Nanoparticles drug delivery systems come in many shapes and sizes [21].

For example, researchers have found that *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. If successful, the result of the targeting would be a significant reduction in drug toxicity, reduction of the drug dose, and increased treatment efficacy [22]. They are not dependent on size or geometry. 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 [23]. Targeted drug delivery is the most important goal of pharmaceutical research and development. 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 non-target 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. Drug delivery refers to approaches, formulations, technologies, and system for transporting pharmaceutical body as needed to safety achieve its desired therapeutic effect. For example, protein and peptide drugs must be delivered by injection or a Nano needle. Diagnosis is the identification of the nature and cause of a certain phenomenon [24].

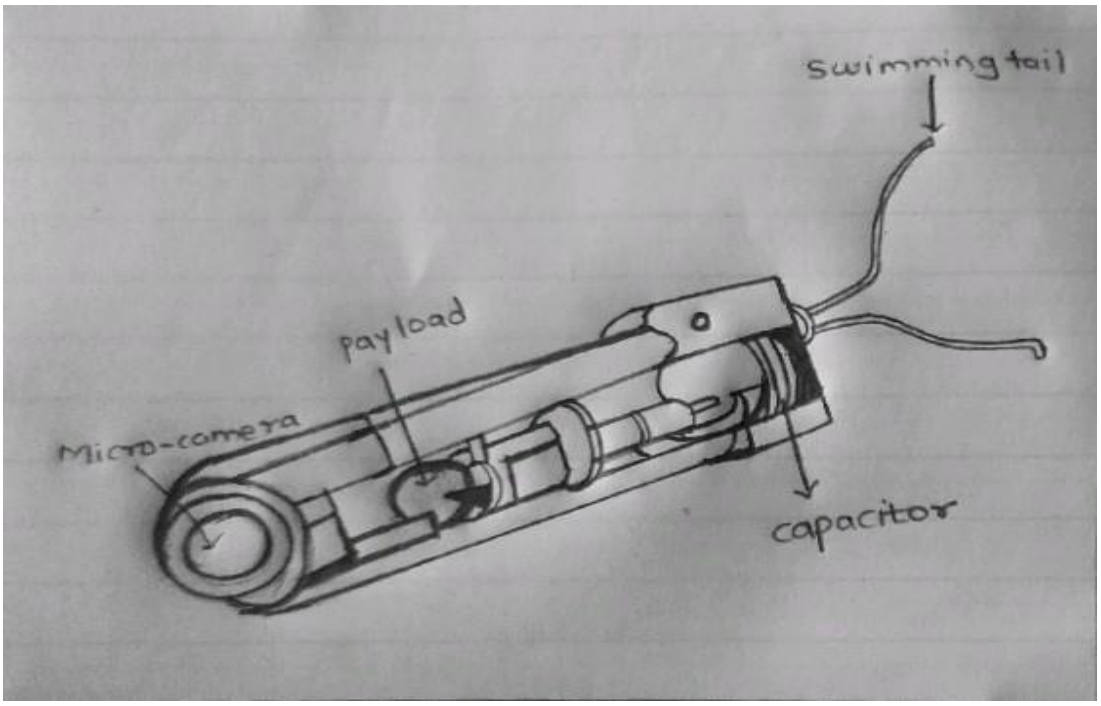

Fig. 2. Nano robots in drug delivery

Table 1. Information related to the components of nano robots

Component		Information
1.	Payload	The void section holds small dose of drug or medicine. The Nano robots could transverse in the blood and release the drug to the site of infection or injury.
2.	Micro camera	The Nano robot may include a miniature camera. The operator can steer the Nano robot when navigating through the body manually.
3.	Electrodes	Two electrodes protruding from the Nano robot could kill cancer cells by generating an electric current, heating the cell up until it dies. The electrodes mounted on Nano robot could form the battery using the electrolytes in the blood.
4.	Lasers	These lasers could burn the harmful material like arterial plaque, blood clots or cancer cells. The lasers would literally vaporize the tissue.
5.	Ultrasonic signal Generators	Microwave emitters and ultrasonic signal generators, these are used for destroying cells like cancerous cells without rupturing it. By using fine-tuned microwaves or ultrasonic signals, a Nano robot could break the chemical bonds in the cancerous cell, killing it without breaking the cell wall.
6.	Swimming Tail	The Nano robot will require a means of propulsion to get into the body as they travel against flow of blood in to the body.
7.	Bionanorob -opts	Nano robots designed by harnessing properties biological materials (peptides, DNA) their designs and functionalities.

14. NANOROBOTICS IN SURGERY

Surgical nabob, planned by a human surgeon, could 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 performs various functions like searching for pathogens, and then diagnosis [25].

15. 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 of the record, and report some vital signs such as Temperature, pressure, immune system different part of human body continue. The Nano robots have the ability to observing down the record, and report some essential signs such as temperature, pressure and immune system parameters of different parts of the human body continuously. Medical Nano robots can perform a vast array of diagnostic, testing and monitoring functions, both in tissues and in the blood stream. This device could continuously record all signs [26].

16. 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 [27].

17. NANOPARTICLES USED IN GENE DELIVERY

17.1 Polymer Nanoparticles

Polymer nanoparticles (PNPs) transport genes or medicinal proteins containing drugs have existence each and every be dissolved or summarized 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. Polymeric NPs have shown great potential for targeted delivery of drugs for the treatment of several diseases [28].

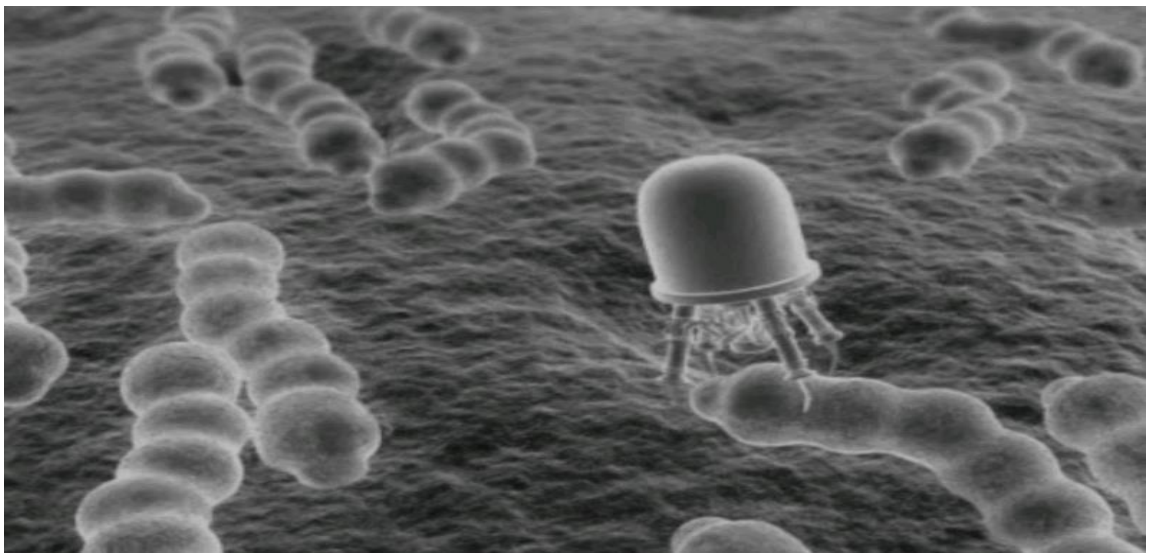

Fig. 3. Nano robots in surgery

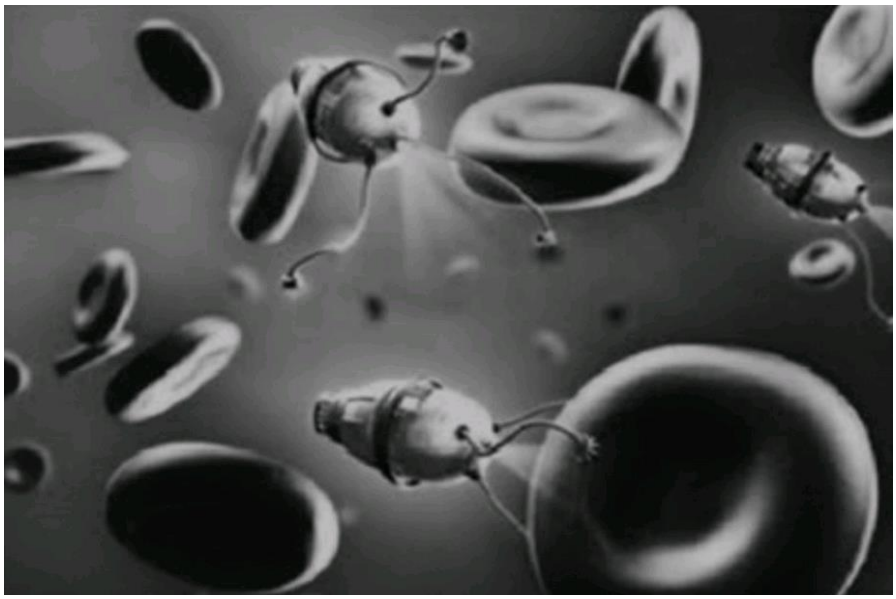

Fig. 4. Diagnosis and testing

Fig. 5. Nano robots in gene therapy

17.2 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 [29].

17.3 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 [30].

18. 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. These

invisibly small dentifrobots, crawling would be inexpensive, purely manufactured non agglomerated discrete nanoparticles mechanical devices that would be programmed with strict avoidance protocol. Dentifrobots also would provide a continuous barrier to halitosis since bacterial putrefaction is the central metabolic process involved in oral malodour. With this kind of daily dental care available from an early age, conventional tooth decay and gingival disease will disappear. Properly configured dentifrobots could identify and destroy pathogenic bacteria residing in the plaque and elsewhere, while allowing the 500 species of harmless oral microflora to flourish in a healthy ecosystem. Nano dentistry as the top down approaches are the including Nanocomposites, Nano Light Curing Glass Ionomer Restorative materials, Nano Impression Materials, Nano Composite Denture Teeth, Nano solutions, Prosthetic Implants, Bone replacement 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. possibilities might include 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 [31].

19. PREVENTIVE DENTISTRY

Preventive dentistry is the practice of caring for your teeth to keep them healthy. This helps 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 remineralisation is governed by the local concentration of apatite minerals. Nano sized calcium carbonate particles or hydroxyapatite 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 p H. Apart from regular dental care, there has been nanotechnology research into implant care and the prevention of peril-implant diseases. Mouthwashes containing biomimetic carbonate hydroxyapatite nanocrystals have been shown to preserve the implant titanium oxide layer by protecting it against surface oxidative processes [32].

19.1 Teeth Implant

A dental implant also known as endosseous implant or fixture is a surgical component 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 [33].

19.2 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. During this examination, your periodontics will also look for indications of jaw dysfunction, gum recession, loss of bone, and periodontal disease. To determine whether or not periodontal disease is present, they will use a periodontal probe to measure the depth of the pockets in your gums [34].

19.3 Restorative Dentistry

Restorative dentistry is the term dental professional use to explain how they replace

missing or damaged teeth. Fillings, crowns (caps), bridges and implants are common restorative options. The goal is to bring back your natural smile and prevent future oral health issues.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 [35].

19.4 Oral and Maxillofacial Surgery

Oral and maxillofacial surgery is surgical specialty focusing on reconstructive surgery of the face, facial trauma surgery, the oral cavity, head and neck, mouth, and jaws, as well as facial cosmetic surgery. Maxillofacial surgery is a specialty that combines surgical training with dental expertise to correct a wide spectrum of diseases, injuries, tumours, defects and deformities in the mouth, head, neck, face, jaws, and the hard and soft tissues of the oral and maxillofacial region. Procedures undertaken by oral and maxillofacial surgeons include: surgical treatment of facial injuries – complex craniofacial fractures, fractures of the lower jaw, upper jaw, cheekbone, nose, and orbit and soft tissue injuries of the mouth, face and neck. They also work with patients who need options for saving or replacing teeth, such as root canals and dental crowns [36].

19.5 Oral Medicine

Oral medicine is defined by the American Academy of oral medicine as the discipline of dentistry concerned with the oral health care of medically complex patients including the diagnosis and management of medical conditions that affect the oral and maxillofacial region. The field of oral medicine consist chiefly of the diagnosis and medical management of the patient with complex medical disorders involving the oral mucosa and salivary glands as well as orofacial pain and temporomandibular disorders. Specialist trained in oral medicine also provide dental and oral health care for patients with medical diseases that affect dental treatment, including patients receiving treatment for cancer, diabetes, cardiovascular diseases, and infectious diseases [37].

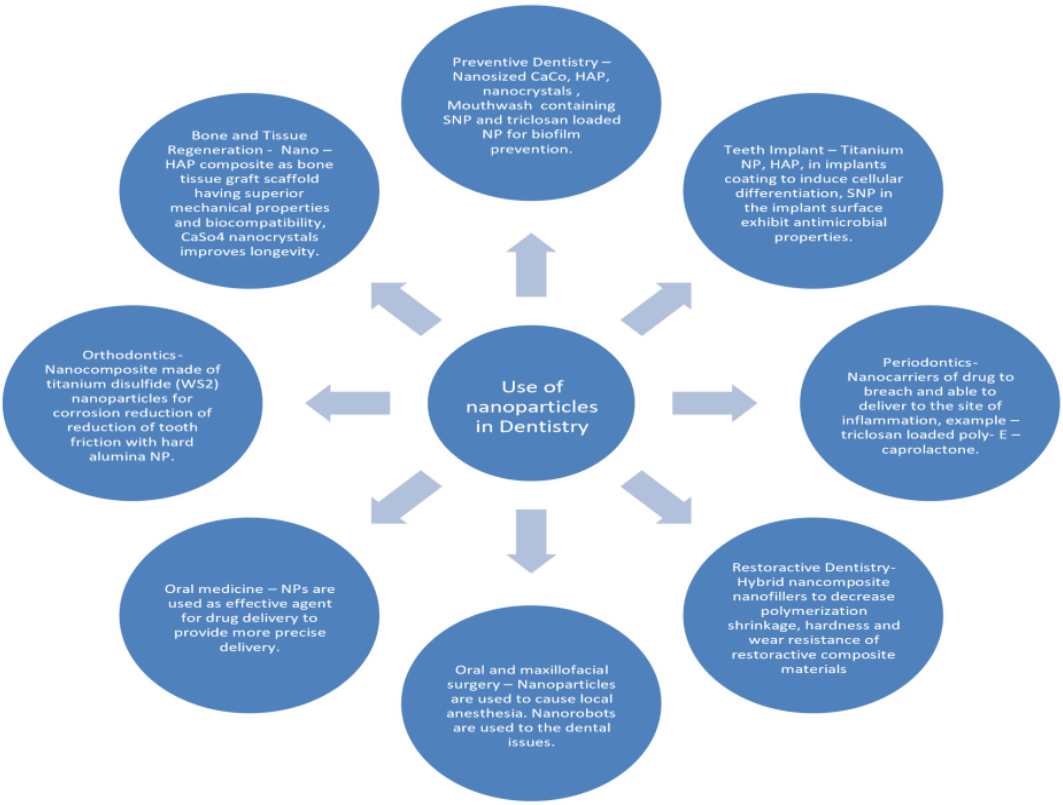

Fig. 6. Use of nanoparticles in dentistry

19.6 Orthodontics (according to british society of orthodontics)

Orthodontics includes the study of growth and development of the jaws and face particularly, and the body generally as the influencing the position of teeth; the study of action and reaction of internal and external influences on the development and correction of arrested and perverted development. Orthodontics is a speciality of dentistry that deals with the diagnosis, prevention, and correction of dentistry that deals with the diagnosis, prevention, and correction of malposition teeth and jaws, and misaligned bite patterns. It can also focus on modifying facial growth, known as dent facialorthopaedics [38].

19.7 Local Anaesthesia

In the era of Nano dentistry, a colloidal suspension containing millions of active analgesic micron size dental robots will be instilled on the patients gingival. After contacting the surface of crown or mucosa, the ambulating Nano robots reach the pulp via the gingival, lamina, and dentinal tubules. Once installed in the pulp, the analgesic dental robots may be commanded by the dentist to shut down all sensitivity in any particular tooth that requires treatment [38].

19.8 Application of Nano Robot in Cancer Treatment

The targeted delivery of pharmaceutical agents to specific cellular and intracellular destinations within the human body, could be a very helpful and hopeful for the therapy of patients, since current treatments like radiation therapy and chemotherapy often end up destroying healthy cells than cancerous ones. It provides non-depressed therapy for cancer patients. Nano robots with embedded chemical biosensors are used for detecting the tumour cells in early stages of cancer development inside a patient body. A doctor offers the patient an injection of a Nano robot. Seeks out cancer cells and destroy them. The Nano robot, are made from flat, rectangular DNA sheets. The thrombin loaded DNA Nano robot, the Nano robot includes a special molecule, a DNA that target a protein found in high amounts only on the surface of tumour cells. This directs the nabob to the tumour cells, where the blood clotting enzyme is released, stopping the blood flow to the tumour. The patient has no awareness of device working inside them. The therapeutic index of most anticancer drugs is narrow, causing toxicity to normal stem cells, haematological adverse effects, gastrointestinal among other. Delivering drugs directly to the tumour, the Nano robot, attacks the tumour leaving healthy cells alone, sparing the patient from the side effects of chemotherapy [39].

19.9 Nano robots in the Diagnosis and Treatment of Diabetes

Nano robots are containing a probability for the health sector to progress medical influential, diagnosis and treatment of diabetes. Patients with diabetes must be small blood samples many times a day controls glucose level. Such procedures are uncomfortable and extremely inconvenient. To keep away this kind of problem the level of sugar in the body can be observed via constant glucose monitoring using medical nanorobotics. The Nano robots may use embedded Nano biosensors to monitor blood glucose levels, and transmit every two hours this information through RF signals for mobile phones carried with the patient. If the glucose is eventually not inside the desired levels, Nano robots activate a pre-programmed tune in the cellular phone, which may alert the patient to take any necessary action regarding the diabetes control with prescribed medicaments [40].

20. PARASITE REMOVAL

Nano robots can lead a micro-war with bacteria and small parasitic organisms in the patient body, to destroy all parasites. It might take several Nano robots working together to destroy all parasites [41].

20.1 Nano Robots in Kidney Disease

Nano robots may carry small ultrasonic signal generator to deliver frequencies directly to the kidney stone which in turn get crushed and pass out through urine. Nano robots can be used in the body to broke up blood clots into smaller pieces before they have a chance to break free and move on their own. Kidney stones can be internally painful the larger the stone the more difficult it is to pass. A Nano robot could break up kidney stones using a small laser [42].

20.2 Nano Robots in Gout

Gout is a condition where the kidney, 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 who suffer from gout experience intense pain at these joints. A Nano robot could break the crystalline structures at the joints, providing relief from symptoms, though it would not be able to reverse the condition permanently [43].

20.3 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 [44].

21. PROSPECTIVE

In the recent world most of the treatment which is required for curing problems inside the human body is done surgical operations, the use of Nano robots help us to cure all problems without surgery. Comparing with the surgical operations, using Nano robots provides more controlled medical treatment. Cancer cells helps in replacing chemotherapy. The medical Nano robots can be utilized in the area of eye surgery. The Nano robots will make surgical process and medical treatment safe for all patients and will be effective tool for targeting the source of frightful diseases. The proportions of Nano robots are made smaller to prevent the damages caused to tissue [45].

22. CONCLUSION

Nano robot's performance in heart surgery is found to be effective. As the construction of Nano robot is under progress, the ideas explained here could not be implemented at present. This will be implemented in future. All currents developments in nanotechnology directs human a step closer to Nano robot's production. Nano robots can theoretically destroy all common disease of the 20th century, thereby ending much of pain and suffering. Although research into Nano robots is in its preliminary stages, such technology is endless. Recent advancement in the field of nanorobotics gives the hope of the effective use of this technology in medical field. Thus in future Nano robots will play an important role. Nanotechnology gives the hope of the effective use of this technology in medical field. Nano robots are used in medicine are predicting to provide wealth. When the severe side effects of the existing therapies are considered, the Nano robots are found to be the more innovative and supportive to the treatment and diagnosis of vital disease.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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