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NANOBOTS: A REVIEW

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ABSTRACT

Nanorobots being a promising research and development era has gained acute attention and response from Govt. as well as industries. For long term future application the characterization and manufacturing techniques of nanorobots is yet but much more developed. Apart from biomedical application its potential use in defence automotive and aerospace accessibility and efficiency. Nanomedicine offers the prospect of powerful new tools for the treatment of human diseases and the improvement of human biological systems. Nanomedicine is the process of diagnosing, treating, and preventing disease and traumatic injury, of relieving pain, and of preserving and improving human health, using molecular tools and molecular knowledge of the human body. Ongoing intensity of research and development work tend to a brighter future. This review work expects positive attention from future regards towards nanorobotics. Nanorobots can offer a number of advantages in drug delivery over present methods. These include more bioavailability, targeted therapy, fewer surgeon mistakes; reach remote areas in human anatomy, large interfacial area for mass transfer, non-invasive technique, this review focuses on the properties, method of preparations, mechanism of action, elements and applications of nanorobots. In addition, current study also involves the future aspects of nanorobots.

KEYWORDS: Nanobots, Nanotechnology, Nanoscale Machine, Nano medicine, NEMS (Nano Electro Mechanical System).

INTRODUCTION

Nanorobots is an abbrivation used for Nanorobots. These are nothing but nanoscale machines the first scientist who mention the term “Nanorobots” was the physicist “Richard Feynman” in 1959. [1]

Nanobots can be produced using organic material such as protein & polynucleotide or organic material such as metal or diamond. Nanorobotics is an emerging technology field creating machines or robots whose compounds are at or near the scale of a nanometre (10^{-9} meters).[1]

Nanorobotics refers to the nanotechnology engineering discipline of designing & building. Nanorobots, with devices ranging in size. From 0.1 to 10 micrometre. And constructed of nanoscale or molecular component.[2]

The term nanobot, nanoid, nanite, nanomachine or nanomite have also been used to describe such device currently under research & development. Since, nano-robots would be microscopic in size it would probably be necessary for very large number of them to work together to perform microscopic & macroscopic task.[2]

The first useful applications of nanomachines may be in nanomedicine. Nanorobots can diagnose, monitor & treat disease.[3]

Three kind of Nanobots such as,

1) 3D- DNA Nanomachines.
2) Nano-swimmers.
3) Bacteria-nanobots.

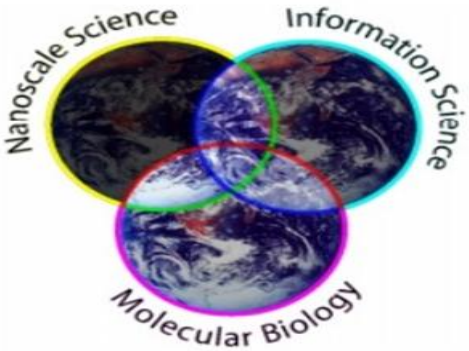

Fig. 1: At the beginning of this millennium, we are watching the birth of three great new technologies: biotechnology, information technology and nanotechnology.

What is nanorobotics?

Nanobotics is the emerging technology field creating machines or robots whose component are at or close to scale of a nanometer.[2]

More specifically, nanorobotics refers to the nanotechnology, engineering, discipline of designing & building nanorobots with device ranging in size from 0.1 to 10 micometer & constructed of nano scale or molecular component. Also, carry out a very specific function & are approx. 50 to 100 nanometer wide.[4]

Another definition sometimes used is a robot which allows precision interaction with nanoscale objects, or can manipulate with nanoscale revolution.[4]

Also, microscale robots or microrobots which can move with nanoscale precision can also be considered nanorobots.[4]

Nanorobots might also produce copies of themselves to replace warm-out units, a process called self-replication.[4]

It has been suggested that a fleet of nanorobots might serve as antibodies or antiviral agent in patient with compromised immune system, or in disease that to do respond to more conventional measure.[2]

Applications & Uses

Drug delivery is very important aspect of medical treatment. As consequence of nanotechnology, new technique consisting of device coming into market among these nanorobots finds opportunity in cure of human illness.[5]

Most recent application of nanobots in drug delivery are in brain targeting, glucose monitoring in in diabetes patient, bone reconstruction, cancer treatment, blood clot, nerve regeneration, protein and peptide drug delivery system.[5]

Nanotechnology based nanomedicine tools & device are technically designed in such a way which can interact at molecular level & enhance therapeutic index of drug with no side effect.[6]

Nanorobotics may also reduce contamination and provide successful screening for quarantine. Also, have useful application for biohazard defence, including improving the response to epidemic disease.[7]

Nanobots will find their first application in medical science. They may be used to attach themselves to specific cells, such as cancer cells, and report the position & structure of these tissue.[8]

Medical & Biomedical nanobots

Researchers working in medical nanobotics are creating technologies that could lead to novel healthcare applications, such as new ways of accessing areas of human body that would otherwise be unreachable without invasive surgery.[9]

"Nanorobotics can play a major role in medical application, especially for target intervention into the human body through the vascular network."[9]

Education & Fear of nanobots

An area that promises new understanding of nature, and use of that understanding to build technologies that will change the world. It has captured the attention of public and of Govt. and is beginning to attract the attention of corporation.[10]

It is clear that there are both major scientific opportunities in nanoscience, and measure requirement for nanostructure and device from nanotechnology.[10]

Nanoscience is "intermediate" science. It does require sophisticated physical measurement, and access to specialised device for fabrication, but generally does not require very large facilities of the type represented by synchrotrons.[10]

Risk

The main risk to human are in adsorption of biomolecule or material, causing DNA damage.[1]

Nanobots in today's world

Nanobots have in the past been a fixture of science fiction writing and illustration and such ideas are now also appearing in scientific research.[11]

"An autonomous DNA robot capable of transporting molecular payloads to cell." Nanobots are the recent and may be the future technology for many fields. The healthcare industry of today is functioning on development minimally invasive technique for diagnosis, as well as treatment of ailnments. Some nanobots are used as a microscopic in surgical fields.[11]

Development & Communication

Nanobots can be produced using organic material such as protein and polynucleotide or organic material as metal or diamond.[1]

The surface properties of the nanobots are a key factor to define solubility and interaction with other macromolecule or cell surface.[1]

Sensors are one of the most important parts in nanobots. Machanical, thermal, optical, magnetic, chemical & biological sensors have been tested in nanobots application.[1]

A clear example of this type of sensor is the utilization of nano cantilevers as a Nano Electro Mechanical System (NEMS). This system utilise biological material that will be attached by itself to a coated cantilever, causing fundamental changes in mass or its surface tension.[1]

Future nanobots

The healthcare industry of today is focusing on developing minimally invasive techniques for diagnosis, as well as treatment of aliments.[12]

Nanobots are also being considered as a way of delivering differentiated stem cells to various locations in the body.[8]

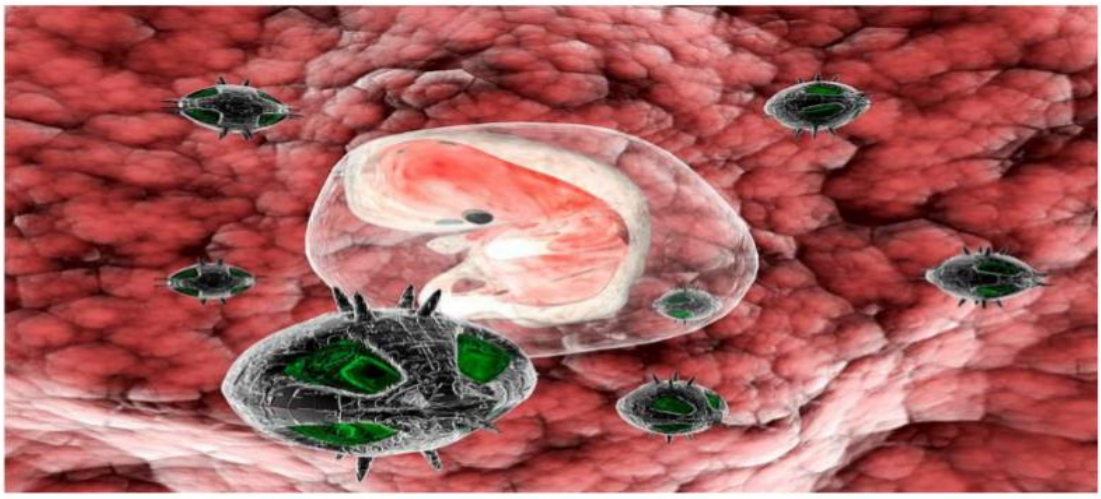

Fig. 2: Nanobots being used in foetal surgery (concept).

Source: Image courtesy: http://fineartamerica.com/featured/nanorobots-with-human-embryo-christian-darkin.html

Foetal surgery, risky even today due to high mortality rate of either the body or mother, could soon have a 100% success rate, due to fact that nanobots can provide better access to require area including minimal trauma.[8]

CONCLUSION

From above we conclude that nanobots are helpful in various medical purpose. We have seen wide range of application of nanobots in various field. E.g. cardio, aging, cancer, medicine etc. The advent of molecular nanotechnology will again expand enormously the effectiveness comfort and speed of future medical treatment while at the sometime significantly reducing their risk, cost and invasiveness.

Use of nanobotics in the field of medicine has a wider scope than any other sub-field that has emerged to date.

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