

Measuring landscape of nanomedicine



Physics

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ABSTRACT

In this paper we have enlighten the developing and innovative hands of the nanotechnology in the circle of medicine. It pertains the winning approach and growth of nanotechnology not only for being lucrative but also comprehensive. Nanotechnology is an approach to solve so many problems related to medical field. The thousands of research papers have been published for nanomedicine as Drug delivery, Cancer treatment, heart disease, life extension and many more. Nanomedicine is an amazing development for human health. Nanotechnology has given huge amount of innovations in the field of medical science from beginning to till now. It has made human life so easy and smooth which indicates that its future will be more dazzling than today. We have discussed here the growing steps of nanomedicine in minor to major diseases, and what can be the possibilities in future.

INTRODUCTION

Nanomedicine, as we know, is the application which has diverse dimensions. Nanomedicine is one of the most valuable medical applications of nanotechnology. Many diseases originate from alterations in biologic processes at the molecular or nanoscale level. Mutated genes, misfolded proteins, and infections caused by viruses or bacteria can lead to cell failure or miscommunication, sometimes leading to life-intimidating diseases. These molecules and infectious agents are nanometers in size and may be located in biologic system that is protected by nanometer-size barriers. As the name specifies nanomedicine involves the use of nanoparticles in the surgical and medical treatment of patients, as quantum dots used for locating cancer tumors in patients, nanogold particles that have antibodies attached can provide quick diagnosis of flu virus and nanosilver particles are best suited for antibacterial point. In other words we can say nanomedicine is the nanotechnology application which is used for engineering, binding molecular or atomic machines for the treatment of diseases in living organisms. Two forms of nanomedicine that have already been tested in mice and are in anticipation of human trials are using gold nanoshells to help diagnose and treat cancer, and using liposome as vaccine adjuvant and as vehicles for drug transportation. Nanomedicine may be defined as the monitoring, repair, construction and control of human biological systems at the molecular level. Nanoparticle research is currently an area of intense scientific interest due to a wide variety of potential applications in biomedical, nanomedicine as drug delivery, bone repairing, heart disease, cancer treatment, cell repair, aging, gene therapy, stem cells, imaging, diabetes, surgery, limb control, medical monitoring, disease prevention, prenatal and in the hundreds of operations of medical world.

NANOROBOTS FOR DRUG DELIVERY

There is one factual bonus to **Nanorobots**; they are able to treat cancer. With these nanorobots would search out cancer affected cells using certain molecular markers. Nanorobots are theoretical microscopic devices measured on nanometer scale. The traditional treatment of radiation that kills not just cancer cells but healthy human cells as well, causing hair loss, fatigue, nausea, depression, and a host of other symptoms. The chemotherapy can often end up destroying more healthy cells than cancerous ones. A doctor put the nanomedicine in patient's body by an injection of a special type of nanorobot that would try to find cancer cells and destroy them, dispelling the disease at the source, leaving healthy cells without touch. These nanorobots are so tiny that they can easily traverse the human body. Scientists have described that the exterior of these nanorobots constructed of carbon atoms in a diamondoid structure because of its inert properties and strength. It is valuable in some other diseases like skin disease where cream containing nanorobots may be used. It would remove the right amount of dead skin, remove excess oils, add missing oils, and apply the right amount of natural moisturizing compounds. System that mechanizes drug

delivery can help increase the reliability associated with providing medication to those who need it. Drug delivery system can be regulated using nanotechnology to ensure that certain types of medications are released at the proper time, and without the human fault that comes with forgetting to take something. Actually "the delivery of drug in human body by the help of some instruments or machines or supporting things in a controlled manner, called the drug delivery". It is also termed as controlled release technology which began in the 1970's and has continued to expand rapidly. It is essential to explain that there are various drug delivery systems, such as liposomes, micelles, emulsions; polymeric micro/nanoparticles have been showing great promise in controlled and targeted drug delivery. Targeted drug delivery can be used to treat various diseases, such as cardiovascular diseases and diabetes and it is more significant to treat cancer disease.



Fig. 1 Functioning of nanorobots in blood

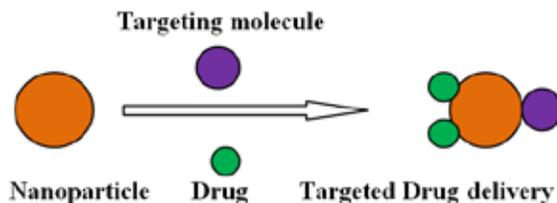


Fig. 2 Targeted Drug Delivery system

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 a tartar, and lift them from teeth to be rinsed away.

GENE THERAPY

Nanotechnology would be small enough to enter the body and even redesign the genome. This would be a way to modify a number of conditions and diseases. However, the human genome would need to be understood a little better for truly advanced **gene therapy**. However nanobots would be qualified for swapping abnormal genes with normal genes and performing other functions. Gene therapy holds guarantee in the treatment of numerous of diseases, such as cancer, heart disease, diabetes and some more. The first approved gene therapy procedure introduced in 1990 on a very young patient, the patient has disease as severe combined immunodeficiency. In this procedure, the missing gene was inserted into white blood cells which were then infused into the **patient's** bloodstream.

TREATMENT OF CANCER

The nanotechnology has a great establishment in the field of cancer treatment. Nanotechnology offers some exciting possibilities in cancer treatment through the nanomeicine. It includes the possibility of destroying cancer tumors with minimal damage of healthy tissues and organs as well as the detection and elimination of cancer cells before they form tumors. Most valuable efforts are going on the improvement of cancer treatment through the nanotechnology at the research. A treatment involves targeted chemotherapy that delivers a tumor-killing agent called tumor necrosis factor alpha (TNF) to cancer tumors. TNF is attached to a gold nanoparticle along with Thiol-derivatized polyethylene glycol (PEG-THIOL), which hides the TNF bearing nanoparticle from the immune system. It allows the nanoparticle to flow through the blood stream without being attacked. **One heat therapy** to wipe out cancer tumor with nanoparticles is called **Auro-shell**. The Auro-shell nanoparticles circulate through a patient's bloodstream, exiting where the blood vessels are leaking at the site of cancer tumors. Once the nanoparticles mix together at the tumor the Auroshell nanoparticles are used to concentrate the heat from infrared light to destroy cancer cells with minor damage of nearby healthy cells. Targeted heat therapy is being developed to treat breast cancer cells. Quantum dots may be applicable to locate cancer tumor in patient because it has unique optical and electronic properties such as its size and composition, tunable fluorescence emission from visible to infrared wavelengths, large absorption coefficients across a wide spectral, range and very high levels of brightness and photostability.

Gold nanoparticles may be used for cancer treatment so they may be deal as anti-cancer drugs by delivering. Nanogold particles have a large surface area and strong bonding properties. Gold's bonding properties also help the drugs stay on site rather than dissociate into the bloodstream. These nanogold particles would be particularly significant for pancreatic cancer. Besides pancreatic cancer gold nanoparticles confirm for treating leukemia, multiple myeloma and ovarian cancer.

FORTHCOMING PROSPECTS

In competitive scenario for stepping future, the path will be so easy to keep in hands for its practices for surgical purpose of molecular. The way can be counted as a helpful in support of immune system, which selectively attack assailant outside tissues

and for vast application it raised the needs of nano-machines in the interacting of tissue cells.

The complete information about the human molecular structure so carefully obtain during the previous century will be extended and employed in this century to design medically active microscopic machines. These machines, rather than being tasked primarily with flights of pure discovery, will instead most often be sent on missions of cellular inspection, repair and reconstruction. The current developments in the field of nanomedicine are demographic change, population growth and increasing health care costs. The future of nanomedicine is somewhere associated with magnetic nanoparticles consisting of elements nickel, cobalt and iron. These elements can make a significant role for the contribution in nanomedicine. Magnetic nanoparticles may be applicable in defeating cancer drug resistance. These magnetic nanoparticles can play a major role in diagnostic investigation and therapy in the field of **theranostics**.

The principal focus modify from medical science to medical engineering. Nanomedicine will involve designing and building a vast propagation of unbelievably effective molecular devices. Nanotechnology will radically change the way to diagnose, treat and prevent cancer and it will eliminate suffering and death from cancer. Nanomedicine has the potential to increase the life extension of human beings. It will create population with a large percentage of aged people- an aging society. There waits to see if the costs of health care would rise or fall. However there is always problem to charge more expensive prices for this new technology and cause health care to rocket up sky high. Nanotechnology may play an important role for the development of gene therapy in future. It will help to design new types of vector like dendrimers. These dendrimers can be made to bring DNA or RNA and targeted to cells with an advancement of specificity and low toxicity.

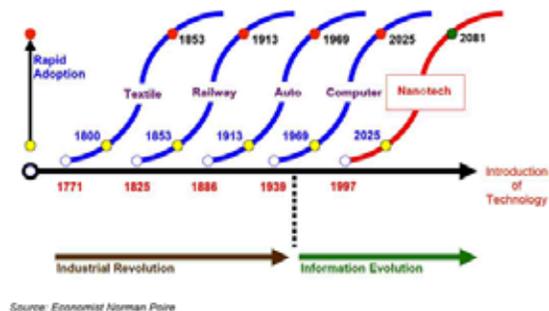


Fig. 3 The growth of nanotechnology in future

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