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NANOMEDICINE

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Abstract

The Nanotechnology is being used in developing countries to help and treat disease conditions and prevent health care issues. The common term of nanotechnology is Nanomedicine. The Nanomedicine is a branch of medicine which applies the knowledge and tools of nanotechnology to the prevention and treatment of disease conditions. The Nanomedicine involves the use of nanoscale materials, such as biocompatible nanoparticles and nanorobots, for the diagnosis of the disease, delivery of the drug, for sensing or actuation purposes in a living organisms. The Nanomedicine is the application of nanotechnology, which often described as technologies under 1000 nm, in the health care sciences. Well the researchers have been using nanomedicine to the target microbes, with a appropriate result in vitro and as a potential innovation to the field of antimicrobials. In this studies followed, as clinical trials started to appear, and a movement of clinical translation is initiating in the field of antimicrobial nanomedicine. An important achievement for this field, is stimulating further clinical research and basic sciences, and generating research questions and scientific enquiries. The Trials addressing nanoparticles on catheters, hand gels, therapeutic vaccines, safety, and other issues have been conducted. As per their financial and bureaucratic restrictions, the presence of clinical trials is a great indicator of the potential in the field and is a necessary step to fight against microbes by nanomedicine.

Key Words: Nanotechnology, nanomedicine, microbes, nanoparticles, nanorobots.

Introduction

The *Nanomedicine* is a medical application of nanotechnology. The Nano medicine comes from the medical applications of the nano materials and biological devices, the nano electronic biosensors, and even possible future applications of molecular nanotechnology as biological machines.

The Advancement in the field of nanotechnology and its applications to the field of medicines and pharmaceuticals has revolutionized the twentieth century. The Nanotechnology is the study of extremely small structures. The word “nano” means very small. The Nanotechnology is the treatment of individual atoms, molecules, or compounds into structures to produce materials and devices with a special property. The Nanotechnology involve work from the top down i.e. In reducing the size of large structures to the smallest structures. e.g. The photonics applications in nano electronics and nano engineering, top-down or the bottom up, which involves changing individual atoms and molecules into nanostructures and more closely resembles the chemistry biology[1].

History of Nanomedicine

The Nanomedicine is a young science. The nanotechnology can be use in medicine, medical technology and pharmacology has only been researched since the 1990s.

The Nanotechnology itself has only existed for a few decades. After the invention of high resolution microscopy it evolved simultaneously in the field of biology, physics and chemistry as in the course of the 20th century and spawned new disciplines such as microelectronics, biochemistry and molecular biology.

The nanomedicine, nanobiotechnology knowledge which investigates the structure and function of cells as well as intra- and intercellular processes[2].

This research study only became possible at the beginning of the 20th century when the door to the nanocosmos was burst open with the invention of innovative microscopes as needed in all the fields.

Definition: Nanomedicine is defined as the monitoring, and repairing, construction and controling of human biological systems at the molecular level, by using engineered nanodevices and nanostructures.

The ***Current problems*** for nanomedicine involve as understanding the issues in relation to the toxicity and environmental impact of nanoscale

materials (materials whose structure is on the scale of nanometers, i.e. billionths of a meter)[3].

The ***Functionalities*** can be added to the nanomaterials by interfacing them with in biological molecules or structures. The size of nanomaterials is similar to that of most biological molecules and structures; therefore, nanomaterials can be useful for both in vivo and in vitro biomedical research and applications.

The nanomaterials have the development of diagnostic devices as to use contrast agents, analytical tools, physical therapy applications, and drug delivery vehicles or channels.

The Nanomedicine seeks to deliver a valuable set of research tools and the clinically useful devices in the near future days. The Nanotechnology Initiative in new applications in the pharmaceuticals that may include advanced drug delivery system, application of new therapies, and in the vivo imaging processes. The Nanotechnology has provided the possibility of delivering of drugs to the specific body cells by using nanoparticles[4].

As the benefit of using nanoscale for medical technologies is that smaller devices are less invasive and can possibly be implanted inside the body, plus biochemical reaction times are much shorter. These devices are faster and more sensitive than typical drug delivery system.

The efficacy of drug delivery through nanomedicine is a largely based upon the followings as :

- The Efficient encapsulation of the drugs,
- The Successful delivery of the drugs to the targeted region of the body, and
- The Successful release of the drugs in to the body.

Current Advances In Nanomedicine

The Drug delivery systems may also be able to prevent tissue damages through proper regulated drug release methods; in reduceing drug clearances rates; or lower the volume of distribution and reduce the effect on non-target tissues.

The ***Nanoparticles*** used in combination therapy for decreasing antibiotic resistance or for their antimicrobial properties. The Nanoparticles might also used to the circumvent multidrug resistance (MDR) mechanisms.

As ***Some potentially important applications*** include cancer treatment with iron nanoparticles or gold shells. The Nanotechnology is helps in identifying new opportunities in drug delivery systems, This rapid rise may cause difficulties with toxicity, and drug efficacy can diminish as the drug concentration falls below the targeted ranges[5].

The Uses of Nanomedicine

The possible uses of nanotechnology in medicine are based on three basics as :

1. The Nanomaterials and nanoinstruments which can be used as biosensors, as aids in treatment and as transporters of active substances.

2. The knowledge of molecular medicine in the fields of genetics, proteomics and synthetically produced or modified microorganisms.

3. The nanotechnologies which can be used for the rapid diagnosis and for therapy, for repair of genetic materials and for the cell surgery, as well as for the improving of natural physiological functions.

The Applications Of Nano Medicine

1. ***Application of Contrast agents for cancer cell imaginsg:***

The Nanoparticles of cadmium selenide (quantum dots) glow when exposed to ultraviolet lights. These When injected, as they seep into cancer tumors. The surgeon can see the glowing tumor, and use it as a guide for more accurate tumor removal procedures[6].

2. ***The application of Therapeutics for treating the cancer diseases :***

The Gold nano shells can be targeted to bond to the cancerous cells. By causing irradiating the area of the tumor with infrared lasers, as which passes through the flesh without heating it, and the gold is heated sufficiently to cause death to the cancer cells.

3. ***The Medical applications of nanomaterials***

This could solve the difficulties and blood leaks caused when the surgeon tries to re stitch the arteries that have been cut during a kidney or heart transplantation[7].

4. The Nano electronic biosensors

Diagnostic devices

The Nanotechnology is advancement in the use of arthroscopes that are used in surgeries with lights and cameras, so surgeons can do the surgeries with smaller incisions.

The physical therapy applications

Drug delivery vehicles

It is used in photodynamic therapy, a small particle is placed within the body and is identified with light from the outside. The light gets absorbed by the particle and if the particle is metal, energy from the light will heat the particle and surrounding tissues[8].

The application of Neuro-electronic interfaces

The application of the Neuro-electronic interfacing is a visionary goal dealing with the construction of nanodevices that will permit computers to be joined and linked to the nervous system.

The application in Tissue repair

The Nanotechnology may be able to help reproduce or repair damaged tissue. The "Tissue engineering" makes use of artificially stimulated cell proliferation by using suitable nano material-based on scaffolds and growth factors. For example, bones could be re grown on carbon nano tube scaffolds. The Tissue engineering might replace today's conventional treatments like organ transplants or artificial implants[9].

5. *The Molecular nanotechnology*

The Nanomedicine would make use of nanorobots, will introduced into the body, to repair or detect damages and infections. The Carbon could be the primary element used to build these nano robots due to the inherent strength and other characteristics of some forms of carbon (diamond/fullerene composites), and nano robots would be fabricated in desktop nano factories specialized for this purpose only.

The nanomedicine applications as include activity monitors, chemotherapy, pacemakers, biochips, OTC tests, insulin pumps, nebulizers, needleless injectors, hearthing aids, medical flow sensors and blood pressure, glucose monitoring and drug delivery systems.

The nanomedicine involves the use of nano robots as mini surgeons. Such as machines might repair damaged cells, or get inside cells and replace or assist the damaged intracellular structures. The nano machines might replicate themselves, or correct the genetic deficiencies by altering or replacing DNA (deoxyribonucleic acid) molecules[10].

The Advantages Of Nano Medicine

- The Drug delivery to the exact location.
- To reduce Lesser side effects.
- The Molecular targeting by nano engineered devices.
- The disease Detection is relatively easy.
- No surgery required.
- The Diseases can be easily cured.
- Identify optimal drug agents, to treat the exsisting condition, or targeted pathogens.
- Diagnose conditions and disclose pathogens.
- Fuel high-yield production of matched pharmaceuticals.
- Locate, embed, or attach integrated or enter target tissue; configurations or pathogens.
- Dispense the ideal mass dosage of matched biological compound to the specific target locations.

Conclusion

The Nanomedicine is a new nanotechnology that has a huge impact on the human lives. As with many studies and researchers, the human has used to the nano medicine to operate many various medical functions such as drug delivery system, the cancer therapeutics, in tissue engineering, etc. The opportunities for nano medicine to improve health are limitless. To maximize gains in individual and population health, inclusion of public health expertise is essential. This influence in the development of nano medicine will help to identify the greatest areas of need for technological innovations, to determine how to best allocate funding, and shape polices to protect humans and the environment for better maintenance of health.

References

1. Nanomedicine, Volume I: Basic Capabilities, by Robert A. Freitas Jr. 1999, ISBN 1-57059-645-X.
2. Wagner V; Dullaart A; Bock AK; Zweck A. (2006). "The emerging nanomedicine landscape". *Nat Biotechnol.* **24** (10): 1211–1217. doi:10.1038/nbt1006-1211.PMID 17033654.
3. Freitas RA Jr. (2005). "What is Nanomedicine?" (PDF). *Nanomedicine: Nanotech. Biol. Med.* **1** (1): 2–9. doi:10.1016/j.nano.2004.11.003. PMID 17292052.
4. Nanotechnology in Medicine and the Biosciences, by Coombs RRH, Robinson DW. 1996, ISBN 2-88449-080-9.
5. Nanotechnology: A Gentle Introduction to the Next Big Idea, by MA Ratner, D Ratner. 2002, ISBN 0-13-101400-5Editorial. (2006).
6. "Nanomedicine: A matter of rhetoric?". *Nat Materials.* **5** (4): 243.Bibcode:2006NatMa...5..243.. doi:10.1038/nmat1625. PMID 16582920.
7. LaVan DA; McGuire T; Langer R. (2003). "Small-scale systems for in vivo drug delivery". *Nat Biotechnol.* **21** (10): 1184–1191. doi:10.1038/nbt876.PMID 14520404.
8. Cavalcanti A; Shirinzadeh B; Freitas RA Jr.; Hogg T. (2008). "Nanorobot architecture for medical target identification". *Nanotechnology* **19** (1): 015103(15pp).Bibcode:2008Nanot..19a5103C. doi:10.1088/0957-4484/19/01/015103.
9. Boisseau, P.; Loubaton, B. (2011). "Nanomedicine, nanotechnology in medicine".*Comptes Rendus Physique* **12** (7): 620. doi:10.1016/j.crhy.2011.06.001. edit
10. Rao, Shasha; Tan, Angel; Thomas, Nicky; Prestidge, Clive. "Perspective and potential of oral lipid-based delivery to optimize pharmacological therapies against cardiovascular diseases". *Journal of Controlled Release* **193**: 174187.doi:10.1016/j.jconrel.2014.05.013.