Available online on 25.06.2014 at http://jddtonline.info
Journal of Drug Delivery and Therapeutics
Open access to Pharmaceutical and Medical research

REVIEW ARTICLE

NANOMEDICINE: A NEW BRANCH FOR FUTURE MEDICAL RESEARCH, APPLICATION AND TREATMENT FOR DISEASES

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ABSTRACT

Nanomedicine is the subfield of nanotechnology which deliver a promising diagnostic as well as treatment of lethal diseases like cancer. By interacting with biological molecules, therefore at nanoscale, nanotechnology opens up a vast field of research and application. These are the medicine which have very small in size or present in molecular level. There are more than one component of a nanomedicine which range from advance diagnostic devices, advance drug delivery vehicle including nanobots which are able to perform specific artificial surgeries with the ultimate degree of precision, which is never achieved in past .Future nanomedicine will be capable to detect the lethal diseases like cancer in very early stage. There will be also a possibility in future that with the help Nanomedicine are able to treat the genetic diseases or genetic disorder by targeting or repairing specific genes, tissue and cells which are responsible for these type of disorder with the help of nanomedicines.

Key words- ***Nanobots, Nanomedicine, Nanoscale***

INTRODUCTION

Nanotechnology is an emerging scientific field creating materials, devices and systems at the molecular level. By being able to work at the ultra-small scale, given a nano is one billionth of a metre, nanotechnology is being used to deliver innovations in sectors including health. Nanomedicine ranges from the medical applications of nonmaterial, to nanoelectronic biosensors, and even possible future applications of molecular nanotechnology. The nanoparticles have the great capability to treat lethal diseases like cancer and HIV if used as nanomedicines. nanomedicine aims at ensuring the comprehensive monitoring, control, construction, repair, defense and improvement of all human biological systems, working from the molecular level using engineered devices. [1]

Early vision in nanomedicine

The early genesis of the concept of nanomedicine sprang from the visionary idea that tiny nanorobots and related machines could be designed, manufactured and introduced into the human body to perform cellular repairs at the molecular level. Nanomedicine is a branch of nanotechnology a specific medical intervention curing disease or repairing damaged organs. Nanometer is a small unit of meter or too small so it will only observe by the high power microscope. This is the size in which biological molecules and structure found in a living cell.[2]

Use of nanosensors in naomedicine

Nanosensor mainly revolves around the potential of nanosensors to accurately identify a cell in the body in need. Change in the temperature, concentration and pH of the cell allow the nanosensors to detect them. This monitoring or detection allow to deliver or develop the medicine according to that specific cell or specific place.[3]

Different types of nanocarriers for drug delivery

A. Lipid-based systems: composed of amphiphiles that self-assemble into lyotropic liquid crystalline.[4] Phases that can be dispersed into man-sized particles. Hydrophobic drugs can be encapsulated into hydrophobic regions.

B. Metallic nanoparticles (NPs): commonly gold or iron oxide based systems that can be surface modified and encapsulate drugs.[5]

C. Nanotubes: carbon cylinders composed of benzene rings capable of drug encapsulation.

D. Polymeric nanocarriers: drugs can be encapsulated in or conjugated to random coil polymers.[6]

E. Polymeric micelles: amphiphilic block co-polymers that self-assemble in aqueous solution into a core shell structure. The hydrophobic core can be loaded with hydrophobic drugs while the hydrophilic shell makes the system water soluble and stabilizes the core.[7]

NANOMEDICINE APPLICATIONS

Nanomedicine as future medicine

Nanomedicine have a capability to treat the diseases like cancer and aids in future. With the help of its sub components like nanosensors it will be capable to detect

the defective cells in the early stage or the cells or tissue which show different character in the molecular level. Later on nanomedicine also used to treat or destroy these specific cells. In future naomedicine have both capability detection and treatment. Molecular nanotechnology is highly theoretical, seeking to anticipate what inventions nanotechnology might yield and to propose an agenda for future inquiry. The proposed elements of molecular nanotechnology, such as molecular assemblers and nanorobots are far beyond current capabilities.[8]

Nanomedicine as artificial surgeon

The concept of future surgeons arises when robots perform a surgery inside patient with a precision never before achieved. Nanobots fixing mutations in DNA or repairing neurons in your brain. Such are the possibilities as medicine enters the nanoera and join leading researchers who are pushing this frontiers.[9]

Nanomedicine as Diagnostic Purpose

The impact of non-invasive imaging on assessing and improving the potential of nanomedicine based therapeutic interventions has greatly expanded in the last couple of years. In addition, a number of nanomedicine formulations have been designed solely for diagnostic purposes. One of the first applications of nanomedicine will be improved fluorescent markers for diagnostic and screening purposes. Conventional fluorescent markers require complex color.[10]

Nanoparticles for Gene Delivery

Today in gene therapy clinical trials viruses are used as the gene vector. There are several drawbacks with this technology like toxicity, contamination. Sometime human body generates strong immune response against them. A gene delivery system where virus based vectors not used will be possible to decrease or bypass these drawbacks.DNA polymer complexes and liposomal delivery systems are used as nanotechnology based non-viral gene vectors.[11]

Nanomedicine in cancer therapy

Nanomedicine radically changes cancer therapy by using and increasing the number of highly effective therapeutic agent. Nanoparticles can serve as customizable, targeted drug delivery vehicles capable of ferrying chemotherapeutic agents or therapeutic genes into malignant cells while sparing healthy cells.[12] Several other drug-antibody conjugates have been developed. Some of them are already approved while others are in different phases of clinical trials.

Impact of nanomedicines in life

The positive impact of nanomedicines on the quality of life in life-threatening diseases like cancer is evident in clinical trials. However, applying these initial outcomes to clinical practice still needs to be rationalized and carefully controlled in terms of risk to benefit ratio, and is carefully overseen by regulatory authorities such as FDA.[13]

Limitations of nanotechnology

As nanomedicine, and nanotechnology in general, is relatively new, very little data concerning its possible risks exists – it's more experimental at this stage. The ways in which these particles are capable of interfering with the human body and its biochemical pathways are troublesome and worrying. The medical issues are still unknown to a great level, but possibilities and theories are being formed by scientists. On the other hand, the moral issues are known and finding a way around them seems next to impossible.[14]

CONCLUSION

Nanomedicine, one of the important applications of the nanotechnology has made a revolutionary development in the medical field. This evolution will possibly be the end of cancer and aids which will greatly increase our chances for survival as well as our children. Over the next 10–20 years, new nanotechnologies may revolutionize science, technology and society. However, if medical nanotechnology wants to realize its full potential, major impediments blocking serious steps forward have to be removed.

ACKNOWLEDGMENT

This research paper is made possible through the help and support from everyone, including: parents, teachers, family, friends, and in essence, all sentient beings.I would like to thank Vaibhav pandey for his most support and encouragement.

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