
ROLE AND USE OF NANOTECHNOLOGY IN MEDICINE

T N V S S Satyadev, Srikakulapu Kanthi Priya, Maddirala Sai Lakshmi Sravani, Nanduri Kamala Rukmini, Y.K.N. Nisitha, Komati Naga Sudha
P B Siddhartha College of Arts & Science, Vijayawada-10

ABSTRACT

In the last decade are so the widely explored subject for research studies is nanotechnology and it finds application in almost all fields of science including medicine this technology is useful in every part of the medicine i.e., from the stage of diagnosis to the stage of ultimate cure. The future possible diseases to a human can also be detected using this technique, which were imagined a few years ago are making remarkable progress towards becoming realities. Nanotubes, nanoparticles, nanorods, nanocrystalline substances are useful in number ways in the field of medicine. The level of nitric oxide in bloodstream indicates the extent of inflammation caused. To monitor the level of nitric oxide in the blood stream, carbon nanotubes embedded in a gel are injected under the skin. The other most important Nanotechnology has been recently developed to deliver drugs, light, or substances to specific cells, such as cancer cells. These nanoparticles are utilized in this process. in such a way that they are attracted to diseased cells, which allows direct treatment of those cells. This technique reduces damage to healthy cells in the body and allows for earlier detection of disease. Nanocrystalline silver. The treatment of wounds and tests involves the use of an antimicrobial agent. For early detection of kidney damage is being developed. The method uses gold nanorods

functionalized to attach to the type of protein generated by damaged kidneys. When protein accumulates on the nanorod the color of the nanorod shifts. This test is designed to be fast and inexpensive so that problems can be detected early. Cancer is one of the most dangerous diseases that is spreading at an alarming rate around the world and a better way to treat cancer needs to be developed by making better use of the field of nanotechnology.

INTRODUCTION:

Some nanoparticles even have some applications in pharmaceuticals and biomedical implants. Nanoparticles are also used in tissue engineering. The highly toxic treatments of today's world can be administered with improved safety with the use of nano- technology. With all these wearable gadgets which can detect the crucial changes in the human system, we can also provide the doctors with the extensive and critical data on the changes in the signs of life and illness because of the technology available at the source of the problem.

Benefits of Using Nanomaterials

- Smaller equipment has less impact.
- They can be placed on the body.
- Biochemical reaction time is shorter.
- Technology is faster and more intuitive than drug delivery.
- Even tissue regeneration

In this paper, we have discussed about the applications of nanotechnology in the treatment of various diseases which were bothering our human life. With this paper

we want to gather and provide information regarding the use of nanotechnology in the treatment of below mentioned diseases so it can help and move everyone one step further in the journey of fighting against these diseases.

Role of Nanotechnology in Treatment

Hemophilia:

The first disease which we want to cover in this paper is Hemophilia. Hemophilia is one of the most dangerous diseases of human kind. It is a disease related to blood which is inherited. In the people with hemophilia, the blood doesn't clot properly. This can even lead to spontaneous bleeding. This disease is caused due to mutation or change in one of the genes which provide instruction to clotting factor proteins to make a blood clot.

Role of Nanotechnology in treatment and diagnosis of Hemophilia:

With the help of nanotechnology, we can revolutionize the process of diagnostics and treatment of Hemophilia. Nanoparticles can be engineered to detect specific biomarkers which help in the early detection of Hemophilia. This process even helps in the monitoring of the condition of the Hemophilia. After the diagnosis stage, nanotechnology can be used in drug manufacturing stage also. We can make more effective drugs using nanotechnology which can deliver essential clotting factors which help in reducing the frequency of treatment which further increases the quality of the patient's life.

There is another method in which clotting particles will be encapsulated within the nanoparticles making them more reluctant against degradation thereby increasing their

circulation time in the body. This process is one of the most sustainable ways to deliver the clotting factors thereby decreasing the frequency of bleeding episodes among the patients. Apart from this process we can also use nanoparticles in the process of delivering the gene the Hemophilia. With all these processes researchers are aiming to create a long-term solution in managing Hemophilia. Apart from these, Engineered Nanoparticles also can be used in reducing the immune reactions that are developed in some individuals against the conventional clotting factor therapies.

With all these processes being still in the research stage, Nanoparticles are showing us a great hope in fighting against these diseases. By all these studies, we can understand the potential of nanotechnology in the treatment of hemophilia there by improving the quality and efficiency of the processes against this blood disorder. However, while promising all these processes are still in research stage and may take time before getting available in open market.

Lung Cancer:

The next important and dangerous disease where the use of nanotechnology can bring a lot of revolution is Lung Cancer. Lung Cancer is the most common type of cancer which mostly causes due to smoking, however nonsmokers may also develop it. Lung Cancer starts in the lungs. It has two types i.e.; Non-Small Lung Cancer and Small Cell Lung Cancer. This disease can show various symptoms like blood coughs, chest pain, persistent cough breathing shortness, fatigue, weight loss etc.. There are various treatment options already available for lung cancer based on the stage and type of the cancer. Anyway,

early detection is the key to get better results in all these treatments.

Role of Nanotechnology in treatment and diagnosis of Lung Cancer:

Nanotechnology showed us a great promise in the diagnosis and treatment of Lung Cancer. We can use nanoparticles to identify the specific biomarkers associated with the disease which helps in early diagnosis which is the key in these types of diseases. There are more enhanced nanotechnology-based imaging techniques available which can provide more clear images of the tumors leading to the better treatment planning. In this treatment we can directly deliver the chemotherapy drugs to cancerous cells thereby minimizing the damage to the tissues which are healthy. This is a very effective process and has lesser side effects. Nano technology helps in precise tumor location and extent of the spread making the treatment process more effective. Even though the count of the clinically approved nanomedicines/ Nano formulations is more than 50, there are only two therapies available clinically i.e., Abraxane and Nano Particle Albumin. However, the former is only used in the patients who are not eligible for radiotherapy or surgery.

However, there are many processes available against this disease, use of nanotechnology offers a much more effective and a better way in both diagnosis and treatment. And these approaches offer much more personalized and effective treatments in future.

Alzheimer:

The next disease where we can discuss the scope of nanotechnology in its treatment is Alzheimer. Alzheimer's is

one of the most prevalent types of dementia which affects the memory, thinking and even the behavior of the individuals. It gradually causes a decline in cognitive abilities and functioning. Alzheimer's diseases affect close to 50 million people worldwide, with the rise of life expectancy this number may go to 150 million, making it a serious issue to think upon. Though there are four FDA approved treatments for Alzheimer there is no permanent remedy as these treatments are not be able to get absorbed by neuronal cell membranes, instability. Role of Nanotechnology in treatment and diagnosis of Alzheimer's:

We can create a more effective way of fighting Alzheimer's with the help of Nanotechnology. We can use nanoparticles to enable more specific and sensitive imaging of biomarkers associated with this disease. This process helps in early detection and accurate diagnosis. Being the disease related to brain which has three barriers physical, chemical and electrical protecting the brain from entrance of unwanted particles, Nano particles will be more effective. Nano particles being small in size having less toxicity and solubility make them a very good substitute. There is a great potential for nanomaterials to manage the pathologies of Alzheimer's making the researchers investigate lot about it. Researches are also going on various types of nanomedicines which offer a great reluctance to this disease.

Biotechnology and proteomics advancements are one of the main features of nanotechnology in the war against the Alzheimer. The future of nanomedicines in the treatment of Alzheimer's disease looks bright giving lot of hopes. Many

researchers in their recent studies are recommending revising the existing procedures that are ignored at the Nano-bio interface in order to decrease the amount of misinterpretations in future.

Conclusion:

Thus, we can understand how the use of nanotechnology will help and create effective methods in both diagnosis and treatment of the diseases. Apart from the diseases mentioned above the use of Nanotechnology will bring the change in many other diseases related to heart and brain that are bothering humankind for a long time now. Many researches were going on in this topic. Even Governments from various countries are playing an active role in encouraging the researchers. They are keen to introduce the nanotechnologies in health to make the human life better.

However, as every coin has two sides, nanotechnology with all these benefits and revolutions also brings greater challenges. The greatest of all these challenges which is bothering many scientists and governments is how to scale up the production of the materials and tools. Other major concern would be the costs associated with all these practices and processes. We cannot increase the exposure of the nanotechnology with these huge prices because most of the people around the world are not in a position to get this costly treatment done. So, cutting the costs is one of the major challenges associated with nanotechnology. Securing the public confidence over this rapidly increasing technology is also the bigger challenge. Governments across the nations are ready to take the steps regarding this issue. In a study to address all the misbeliefs on size of the nanoparticles The National

Cancer Institute, United States declared that there are bigger sized nanoparticles available in our daily environment than the engineered nanoparticles which were being used in various treatments and diagnosis. This study also clarified a major concern regarding the toxicity of the nanoparticles. They have declared that the nanoparticles are less toxic than most of the household cleaning products, insecticides, antidandruff products. There is a greater use of nanotechnology in food sector already. These nanomaterials in food sector are used to decrease the amount of fat and sugar without the alteration in taste.

However, there is still much more scope for research in this field before making it available in open market. Even though most of nanomaterials are harmless as per NCI suggestions there is still some potential of some risk in some nanomaterials which needs to be investigated.

Thereby we conclude that when a technology advances rapidly, the information regarding all the if's and but's of that technology also had to keep up the pace in order to maintain the cause.

References:

1. Abid Haleem, Javaid Mohd, Ravi Pratap Singh, Shanay Rab, Rajiv Suman. Application of nanotechnology in medical field: a brief review
2. Mihail C Roco, Nanotechnology: convergence with modern biology and medicine, S0958-1669(03)00068-5

3. Catharine Paddock, nanotechnology in medicine: huge potential, but what are the risks Major Nanomaterials use cases in medicine, article from UC Riverside.
4. Anna Pratima G. Nikalje, Wilson college Mumbai, Nanotechnology and its applications in Medicine, March 2015 Medicinal chemistry, 5(2):5:081-089
5. Yanyan Cao, Run Zhang, the application of nanotechnology in treatment of Alzheimer's disease,10.3389, fbioe.2022.1042986
6. Tan Sook Ling, Shanthini Chandrasegaran, Low Zhi Xuan, Tong Li Suan, Elaine Elaine, Durrghashini Visva Nathan, Yam Hok Chai, Baskaran Gunasekaran and Shamala Salvamani, The Potential Benefits of Nanotechnology on Treating Alzheimer's disease, 2021 July 4 10.1155/2021/5550938
7. Rupak Nagraik, Avinash Sharma, Deepak Kumar, Soham Mukherjee, Fatih Sen, Avvaru Praveen Kumar, Amalgamation of Biosensors and Nanotechnology in disease diagnosis, 10.1016
8. Qureshi, SR Nanotechnology based drug delivery system. Journal of pharmaceutical research and opinion, 1(6),2014, 161-165
9. Zaitchuk R. New technologies in medicine: biotechnology and Nanotechnology, Disease-a- month, 45(11),1999,453 95.
10. Alexander M. Cryer, Andrew Thorley, nanotechnology in the diagnosis and treatment of lung cancer,10.1016

11. Savliya, Reema Shah, Darshini Singh, Rajini Kumar, Ashutosh, Rishi Dhawan, Alok Singh, Sanjay, nanotechnology in disease diagnostic techniques, 2015,645 661(17)
12. Tenderwealth Clement Jackson, Bernard Opatimidi Patani, Daniel Effiong Ekpa, Nanotechnology in diagnosis: A Review, 10.4236/anp.2017.63008
13. Majid Saedi, Massoumeh Eslamifar, Khadij Khezri, Solmaz Maleki Dizaj, Nanotechnology in drug delivery to the central nervous system.10.106/ 2018.12.133