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Nanomedicine: from Application reality to Anticipation

Asst. Prof. Dr. Chateen I. Ali Pambuk[1], Fatma Mustafa Muhammad[2], Nihad AbdulJabbar Jalal[3]

[1,2,3] College of Dentistry / University of Tikrit

ABSTRACT

Medical applications for nanotechnology are the most important applications of this modern technology among all applications because of its direct link to human life and health. Nanotechnology promising to innovate a lot of medical applications related to accurate diagnosis and treatment of high efficiency as well as many applications in the field of health care, facing the most deadly diseases in humans such as cancer. Nanomedicine is the application of medical nanotechnology that will lead to the development of research methods, advanced drug delivery systems, new ways to treat disease or repair damaged tissues and cells. Delivering drug in this era is the most advanced application of nanotechnology in the field of medicine. Nanoparticles are being developed to improve the biological availability of conduction, and a major constraint in the design of new lipid-based or polymer-based polymer molecules is due to their small size, rather than being discharged from the body. These nanoparticles can be used on shuttle drugs in cells that may not be drug-free on their own. Nanoparticles may be specifically capable of targeting certain cell types, reducing toxicity and improving efficacy. The aim of this descriptive minireview, generally, is to shed light on the main Applications of Nanoparticles in Medicine.

ARTICLE DETAILS

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INTRODUCTION

Nanotechnology has helped to change the medical rules for disease prevention, diagnosis and treatment, It is the age of nanotechnology. Nanotechnology, for example, introduces new ways of drug carriers within the human body (called nanoscale carriers of sizes up to nanometers)) enabling to target different cells in the body. By using this technique, the cells of the body can be easily photographed as a normal picture, and these cells can be controlled and formed in different forms (1).

Many types of nanoparticles are used in medical applications to act as drug carriers or imaging equipment. Currently, different types of manufactured nanoparticles are used as delivery systems for anti-cancer properties and vaccines, and nanoparticles are used in home test devices to detect pregnancy (2).

Nanowires are used as nanoscale sensors because of their high sensitivity and nanoscale size. These nanowires are painted with antibodies manufactured so that they adhere only to DNA, proteins, or other biological particles within the body, These nanoparticles can be used to detect a large number of diseases in their early stages, by inserting large numbers of nanshells inside the body that are coated with altered antibodies of different sensors represent (2,1).

Gold nanoshells are also used to destroy cancer cells. These nanoshells are about 120 nanometers long and are smaller than the size of the cancer cell by 170 times. When these nanoparticles are injected into the body, they are automatically attached to the cancer cells. Furthermore, by laser heating of the gold, leads to the burning of these cells and death. The advantage of this method the accuracy and position, because of the small nanoparticles focus only on diseased cells, making healthy cells away from the risk of side effects (3,2,1).

NANO-BIO-GENERATORES

Nano -Bio- generators are nanochemical devices that generate electrical energy from blood glucose in the body and are then used to operate other nanoparticles implanted in the human body, such as pacemakers or robot nanoparticles for regulation of blood sugar (4).

One of the most promising medical applications for nanotechnology is the use of polymer nanofibers to perform vascular surgery. Furthermore, prostheses made of protein nanofibers have recently been implanted in the central nervous system of humans. Polymer nanoparticles are also used in the treatment of burns and wounds and are used in the cosmetic industry (5,1).

When injecting the cadmium nanoparticles (quantitative dots) inside the body, they collect selectively within cancer cells. If the target area is exposed to ultraviolet light. The particles light up, helping to locate and remove the malignant cells.

Nanoparticles with mechanical and electrical properties that replace red blood cells are now thought to be effective andfunctional . Nanotechnology is now providing an alternative to human parts that are close to the original. Research is now replacing some of the organs that perform motor functions, such as muscle , skeletal muscles and joints of nanoscale properties perform the same task. Nanoparticles manufactured from rare earth elements are used to remove blood phosphate in patients with hyperphosphatemia (5,3) .

Nanotechnology plays a major role in improving tissue culture engineering and cell therapy, including the use of viable cells or natural or artificial compounds implanted within the organism. Some researchers are now experimenting with the use of selcone nanoparticles to stop the immune system from identifying foreign cells. These capsules block antibodies generated by the immune system (6,1).

Surgical instruments have now become a target for nanotechnology development and improvement. A nanometer-based surgical scalpel, which is finely cut through the eyeball, has been designed. In the near future, nanotechnology is expected to provide successful solutions to correct the damage caused by audiovisual and sensory devices in humans by implanting nanoscale devices into the body. For example, researchers are now working on a nanoparticle in the blind retina to improve the vision process (7,2,6).

NANOTECHNOLOGY APPLICATIONS IN MEDICINE

Delivery of medicines

Targeted drug delivery system : Scientists are currently studying one of the future nanotechnology applications of the drug delivery technique using a nanotechnology called DENDRIMER, one of the nano-delivery devices that can easily enter infected cells and supply them with multiple doses of the drug without any negative results. This nano devise Is characterized by its ability to identify and treat infected cells as well as to report on the effectiveness of the drug. It is known that pharmacology is a science that needs high accuracy because it is directly related to human health. The arrival of a large amount of medicine to the body organs of affected body reduces the effectiveness of the drug and lead to undesirable side effects. For example, traditional methods of treating cancer, such as chemotherapy and radiotherapy, have significant side effects and are less effective in treating the disease. Therefore, it is important that anti-cancer drugs are delivered to the infected parts with extreme precision for the maximum possible benefit of the drug (8,9,4).

NANOBIOTICS

Currently a new term introduced to the science of medicine is nano- biotic which is a new alternative to antibiotics. At the University of Hang Bang in Seoul, researchers were able to introduce nano-silver into antibiotics. Silver is known to kill 650 microbial germs without harming the human body.This technique will solve many of the antibiotic resistant bacteria that have caused mutations that inhibit the antibacterial effect of these bacteria, such as Staphylococcus aureus and Pseudomonas, where the nanotubes pierce the bacterial cell wall or infected cells, allowing water to enter Into the cells (10).

The use of nanotechnology as a surgical assistant:

Corvus has manufactured nanomaterials, a nanometer-sized robot used as an assistant to doctors in critical and dangerous surgeries. The doctor can control the robot with a special device, which helps to make the process more efficient and precise. It is better than traditional methods and reduces the risk a lot. . The surgeon uses the control stick to control the robot arm that holds the microcomputer and a miniature camera to transform the large movements into small movements. This allows for more surgical precision (12,1).

MEDICAL IMAGING

Nanoscale imaging enables researchers and doctors to track any tiny event that occurs in the living tissue within the human body. This is because the study of some cells of the body is difficult, and scientists resort to coloring them. Another problem is that cells that emit different wavelengths of light do not work always in the same ways . This is why medical imaging has problems in the correct diagnosis. Scientists have solved this problem by using some nanoparticles that show different reactions to the different wavelengths that naturally arise from wavelength variation (13,4).

MACHINES FOR THE RECONSTRUCTION OF DAMAGED CELLS

In traditional treatment methods used in medicine and surgery, doctors treat damaged tissues and cells through various surgical procedures and multiple medications. However, the situation is different if the machines to reconstruct damaged cells are used. In this modern therapeutic method, the fact that the cells of the body show reactions to external motors is used. However, if the nanoparticles or micro robots reach this reaction, they change the work of the cells and takes them out of the disease process to the healing and this method also seems a direct method of treatment.There are also nanotechnology-engineered compounds to match the level of molecules and atoms, so using this technique helps in both diagnosis and

treatment of diseases from various fields including heart disease, brain, nerves, burns, injuries, reproduction, and cosmetics (14,2,3).

DIAGNOSIS

The primary objective is to detect the disease as early as possible so that it can be eliminated before it causes symptoms or complications. By using nanotechnology the biochemical tests measuring the presence or absence the activity will be faster, more precise and more flexible. Magnetic nanoparticles can be combined with appropriate antibodies and used as markers for specific molecules or microbes, and similarly using gold molecules embedded with short sections of DNA to identify a sequence of genes in a sample. There is also the technique of nanodots for DNA analysis, which transforms the sequence of its units directly into electrical signals. Using nanoparticles as contrast agents(As an alternative to dye) we obtain better magnetic resonance imaging and ultrasound images. In addition, nanoscale particles can help the surgeon during surgery to identify the location of the tumor and thus make it easier to remove (15,6,2,1).

CONCLUSION

Medical applications for nanotechnology are the Most important of this technique among all expected applications regarding this modern technology and for its direct link in human life and health, Nanotechnology promises much of medical applications related to accurate diagnosis and treatment, as well as many applications in the field of health care. facing of the most deadly diseases in humans such as cancer will be possible, may be with ongoing development of nano engineering , within the next ten years through the nano-medicine, which began many of its research and experimental applications In many research centers around the world.

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