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Nanoparticles in Medicine: Applications and Hope

Chateen I. Ali Pambuk and Fatma Mustafa Muhammad*

College of Dentistry, University of Tikrit

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Medical applications in nanotechnology are the most important applications and the most promising ever. Scientists in the nanotechnology field are innovating new techniques and instruments measured in nanometer scale. Nanotechnology has contributed in recent years to the development of the smart device industry, mechanical engineering and bioengineering. Medical specialists count on nanotechnology to make nanomachines or nanorobots that can compensate for the traditional ways of preventing, diagnosing and treating the spread of diseases by injecting or swallowing tiny blood robots to perform complex tasks within the human body, such as delivering drugs to specific organs Imaging of cells or treatment of blood clots, tumors and surgery on nanometers.The aim of this descriptive minireview, generally, is to shed light on the main Applications of Nanoparticles in Medicine.

Keywords: Nanomedicine, Nanotechnology, Nanoparticles, Targeted drug delivery system, Nanoshells.

Nanoscale medical applications are the most promising applications ever. It is possible to obtain nanoparticles that enter the human body, monitor disease sites, inject drugs, order cells to release appropriate hormones, and repair tissues. These intelligent compounds can also be injected Insulin inside the cells with appropriate doses[1]. The nanoscale sensors can be implanted in the brain so that the person with quadriplegia is able to walk. Recently a dental prosthesis the same size of the cell can chew and swallow and then release erythrocytes it to the blood at 10 cells per second. This dental implant can assist in the introduction of drugs or genes into the cells and thus enhance the cellular therapy of many diseases[2]. Medical applications for nanotechnology are the most important applications of this technology among all the applications expected of this modern technology for its direct connection with the life Human Health Nanotechnology is a wide range of medical applications related to accurate diagnosis, high-efficiency treatment as well as many applications in the field of health care. The following is a review of the most important future medical applications for nanotechnology [3,2,1].

Nanoscale technology in cancer tretment

Using nanotechnology, it is possible to obtain sophisticated images from the medical point of view of tumors and cancer cells. The sizes of these images help doctors and researchers obtain accurate information about these tumors. The latest research shows that scientists have developed a new nanoscale way to imaging tumors inside the body. Furthermore, The researchers developed nanoparticles that can move in the patient's blood and reach the tumors, where an anti-tumor drug is

*Corresponding author E-mail: dr.chatin2@yahoo.com

released to halter the work of an important gene that helps to grow cancer. the team researchers used Nanotechnology for the manufacture of very small chemical components of a polymer covered by a protein called transferrin that searches for receptors or any molecular gateway in many different types of tumors[4,5].

Scientists from the American Cancer Center have been able to develop microscopic bombs that penetrate the cancer cells and explode them from the inside. The scientists used nuclear technology to produce nanoparticles and then use them to kill the cancer cells of laboratory mice and to release radioactive atom actinium 225, which binds to a type of molecular immunoglobulin. These atoms succeeded in penetrating and killing cancer cells. Nanoparticles were able to extend the life of mice from 43 days to 300 days[6,5,2]

Scientists have discovered that gold at the nanoscale has some therapeutic properties, especially cancer treatment. Studies show that nanoparticles have the ability to absorb light and convert it into thermal energy. This has been used to treat cancer by injecting the tumor with a certain amount of light energy. Gold particles absorb the light turning them into heat, sufficient to kill and destroy the cancer cells without damaging intact cells. Gold nanoparticles are also used in the process of diagnosing cancer, as their color varies with the size of their molecules. It is noted that the gold particles at some level give the red color and the smaller particles give the yellow color while the very small particles give the green color. That enables them to be utilized in the process of diagnosis[1,6]

Nano robots journey in tissues

There are several suggested methods in this regard and we will review only one method because of its ease and ease of use and mode. This method is based on sending voice signals to the robots in the human body using sonar dependent signals at frequencies of 1 to 10 MHz. In this fascinating method, the supervisor can easily send new commands or instructions, and the robots can be delivered these commands and instructions by sensors spread on their surface and deal with them by the nanosensor computers they carry[7,3]. The other part of the process is to answer the question: How does the doctor receive messages from the nanorobots? The answer to this is through audio waves. But the studies and calculations currently available on microprocessors in a water environment will not allow more than a few hundred micrometers per nanometer to be broadcast and sent, so it would be appropriate to establish a communications network within the human body that can collect the incoming responses from the robots and pass them to a central location where easily dealt with a physician. The scientists hope that it will not take more than an hour to plant a network like this within the human body and that the resulting heat will not exceed 60 watts, knowing that the heat from human activities reaches about 100 watts[8,6,1].

It is worth mentioning by referring to the medical errors, it is pointed out that there is a fear of DNA damage to the cell itself, but the use of nanoparticles greatly reduces this risk. The other fear of using nanoparticles is that it can attack the normal immune system of medical nanomaterials once it enters the body. That the immune system's reaction to foreign objects is essentially based on the surface of these internal bodies. In the case of nanotubes, it depends on their size, in addition to their motor capacity, surface quality and other factors. However, the problem of rejection of the body of these nanotubes are not different from their rejection of organ transplants and may be simpler because many of them will remain in the body for a limited time[7,2].

Nanobiotics

Researchers expect that this new technology may lead to an unprecedented revolution to counteract microorganisms, where the Nanobiotics, the new alternative to the antibiotics, relies on to make a mechanical hole in the surface of pathogenic microorganisms and viruses[9].

Nano biotics is a self-assembled, artificially manufactured ring-peptide that can be either nano pins or a nano-tube. When millions of these sticky nanotubes which made up of a ring peptide gathered on the surface of bacteria, they are chemically attracted to each other and They collect themselves into long, growing, self-assembling tubes that penetrate the cell membrane. These adjacent tubing groups open up a larger pore in the bacterial cell wall. Within a few minutes, the bacterial cell dies. There is a notable success,

in many studies, in eliminating Staphylococcus aureus a golden cluster pathogenic bacteria and Streptococci and others[10,9,4].

Scientists predict that this technique will succeed in eliminating fungus and . The nano toxins (colored rings nanobiotics) destroy bacterial cells. It is known that natural ring peptides have been very successful in resistance to microorganisms, for example, bacitracin, which is often used locally. Consequently, the principle of nanotubes is quite different from that of antibiotics and disinfectants. These organisms can develop self-resistance, so a completely different approach according to mode of action of antibiotics and chemical disinfectants that often affect the metabolic processes of these microorganisms. Such clinical trials are expected to begin in humans in the near future and the success of this method provides As reported by the World Health Organization (WHO) of $ 10 billion a year is the cost of treating infections caused by antibiotic-resistant bacteria[11,9,8].

Recently published research on the role of nanotechnology is dealing with malaria and the impact of red blood cell elasticity makes it a leading role in the understanding and treatment of infectious diseases. Studies have also demonstrated the importance of this technique in making Ceramic bones with a unique degree of smoothness and rigidity at the same time. Putative studies that shed more light on the utility of nanotechnology in writing genes codes within DNA, which saves money and examine precisely the DNA inside the body. Furthermore, the use nanotechnology to be benefited even from human urine to make long battery life nanoparticles to test diabetic patients According to the journal Engineering Mechanics, by Dr. Kai Yang Li of Nanotechnology and Biochemical Research Foundation of Singapore. Also, researchers from Spain are talking about a new way of dealing, especially breast cancer, as Laura Lishaga, Director of the National Center for Microelectronics in Spain[12,8,9,1].

Diagnostics Nanotechnology

The goal of primary medicine is to detect the disease as early as possible so that it can be eliminated before it causes side effects or complications. Using nanotechnology, the biological tests to measure the presence or activity of the tested materials become faster, more precise, and more flexible[5]. Magnetic nanoparticles can be combined with appropriate antibodies and used as markers for limited particles or microbes, as well as the use of embedded gold fragments with short sections of DNA on a sequence Of the genes in a sample. There is also the technique of nanoscale holes used in DNA analysis and the transformation of its sequence directly into electrical signals. Some nanoparticles such as selenide cadmium are quantified when exposed to ultraviolet light , so the surgeon can see the illumination in the affected area of cancer.Thebenefitial is the accurate identification of the affected area to be removed[13,4].

The physicians can also gain benefits from nanoscale test chips that have the ability to improve protein and other biomarkers left by cancer cells. Researchers hope to use these sensors in the early detection of cancer by examining a few drops of patient urine. Furthermore Using nanoparticles as differentiating agents (as a substitute for dye) , will open a new horizon in magnetic resonance imaging. Even nanoparticles can help the surgeon, during a surgical operation, to identify the location of the tumor and thus make the eradication process, which is more difficult, easy. This device is more accurate than the conventional device about 60,000 times[14,15,6].

Transmission drug to tissues

One of the advantages of nanotechnology, which is considered the priorities of research in nanoscience, is to improve the bioavailability of the drug , the presence of drug molecules and reducing side effects and the total cost of treatment[16 ,7].

For example, materials containing nanoscale holes can carry the drug molecules to the desired location. One of the most important applications of this technique is to treat cancer using iron or gold particles that accumulate in cancer cells only and cause their death without effecting in the normal cells, when compared to, the damages implicated in chemical and radiological therapy which is still under consideration and represents a great hope in the existence of safe treatment of cancer[17,18,8].

CONCLUSION

Despite all the current challenges, the technology of nanoparticles will remain scientists hopes. The entire medical sector is likely to rest on them in the future. Scientists expect to

make a quantum leap in the treatment of chronic diseases, and in parallel with their dreams of this technology can not Ignore concerns about the accumulation of non-biodegradable nanoparticles in the body, which may interact with the biological processes of the cells inside human body, which is counterproductive.This technology can also raise ethical issues. It is likely that it will be exploited in the manufacture of biological weapons that will destroy human lives instead of benefiting them. In addition, future nanoinjection- based treatments can be expensive, and therefore only the elite of rich individuals will benefit. Despite the fact that "health for all", it is regrettable not to achieve this beautiful slogan on the in reality life.

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