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Review Article

Review on Nanotechnology in Diagnosis and Detection of Disease

Dr. Saher Mahmood Jawd[1*], Maryam Jabbar Nasser[2,3], Dr. Amal Saadoon Majeed[4]
[1]Professor, Ph.D., Biology Department, College of Education for Gils, Iraq
[2]Medical Laboratory Technique Department, the Islamic University, Diwaniya, Iraq
[3]Research and Studies Department, the Islamic University, Najaf, Iraq
[4]Assist.Prof. Department of Basic Science, University of Kufa, Iraq

***Corresponding Author**
Dr. Saher Mahmood Jawd
Professor, Ph.D., Biology Department, College of Education for Gils, Iraq

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Abstract: The recent review conversed about nano-technology. Nanotechnology is very important in the diagnosis and detection of disease, as nanotechnology is the fifth generation that appeared in the world of electronics, the first generation represented in the use of the electronic lamp, including television, then the discovery of the transistor, and the spread of its wide applications and then the use of integrated circuits, which is a very small piece. Nanotechnology today has reduced the size of many devices, increased their efficiency and numbered their functions. Then the microprocessor, which made a huge revolution in the field of electronics by producing personal computers and silicon chips, and then nanotechnology. Nano-size as the material is made by light etching, cutting, scraping and grinding. Chemical methods can be used that start with single molecules as smaller A unit and assembled into a larger structure. The properties of nanomaterials can be examined and studied and their composition is confirmed using a number of devices and techniques.

Keywords: Diagnosis, Treatment, Nano Applications, Nano Medical.

INTRODUCTION

Several studies have been conducted on the use of metallic elements in a nanometer form in animal and poultry nutrition with the aim of increasing the efficiency of absorption of elements and reducing the user of them, thus reducing waste in the environment, which reduces pollution. Manufacture of pesticides in nanometer capsules a person can precisely control the rate of excretion of pesticides from the capsule or by manufacturing pesticides in nanometer size and benefit from increasing their efficiency with the lowest possible concentrations. Or by developing a new generation of specialized pesticides that are not specific to others. In the field of industry, nanotechnology techniques have been used to develop the paper industry in Egypt, where a research team at the National Research Center was able to prepare advanced types of paper from dusty nano-fibers that were used from agricultural waste such as rice straw and bagasse. This type of paper is characterized by high quality specifications and durability that exceeds on paper prepared by traditional methods. This technology can also be used in the manufacture of doors, seats and supports for aircraft, as they are solid, highly flexible and light in weight. A specific type of nanoparticles was used in “active glass.”. It also forms a waterproof surface, which makes cleaning them so easy that it was launched It is labeled "self-cleaning glass". Nanotechnology paints are characterized by their ability to resist scratching, abrasion and abrasion, which will make them perfectly suitable for painting ships and boats. Also, screens that have been optimized with nanotechnology save a lot of operating power and

are characterized by clarity, high accuracy, small thickness and light weight. Water desalination and purification is one of the most important applications that use nanotechnology, as many developing countries suffer from a shortage of water, Nanotechnology may improve the combustion rate of engines by designing special catalysts with a larger surface area. In 2005, University of Toronto scientists developed a sprayable nanoparticle material that, when sprayed onto a surface, instantly transforms it into a solar collector. Energy saving by using sufficient lighting and stronger luminous materials. The light bulbs currently used convert only about 5% of electrical energy into light. However, nano-methods, such as the LED (or quantitatively determined atoms (QCA), may lead to rationalization of electricity consumption for lighting purposes. Currently available solar cells have low efficiencies ranging from 15-20. % however, nanotechnology may help to increase the efficiency of light conversion through the use of nanostructures.

Diagnosing of Diseases and tumors by Nanotechnology

Several studies related to animal nutrition through nanotechnology applications have been conducted at the Animal Production Research Institute of the Agricultural Research Center. Nano-fibers are used in the manufacture of fabrics that are water and stain repellent in addition to being resistant to shrinkage. Nanotechnology has also been used to integrate the membranes of small carbon particles to ensure that the entire surface is protected from electrostatic changes for the wearer. The traditional method of UV protection suffers from its lack of long-term stability in the block sun, but the mineral nanoparticles, including titanium dioxide, provide more advantages. The nano titanium oxide particles have a comparable effect on the UV protection property.

Nanomedicine for the treatment and diagnosis of some diseases

Chemotherapy is an effective way to treat many types of cancer, most notably liver cancer. Because it uses strong chemicals to kill fast-growing malignant cells in the body, but in return it also carries the risk of side effects, most notably loss of hair and appetite, problems in the heart, kidneys and nerves, in addition to damage to healthy cells. These problems appear as a result of the inaccuracy in directing the drug to kill cancer cells, a dilemma that can be solved by using what is called “nano-medicine,” which uses “nanotechnology” techniques to direct drug doses to cancer-affected cells only.

Techniques for “targeted therapy” for cancer are still in their infancy, and despite conducting hundreds of animal studies around the world to test their effectiveness in targeting liver cancer, these technologies still lack a reference guide that monitors the conclusion of the science in this regard, and the most prominent challenges facing its application. On humans, and provides the opportunity to build on what has been achieved to bring this technology to practical application to humans.

An Egyptian research team from the universities of Ain Shams, Helwan, Cairo and Tanta, in cooperation with a researcher from Algeria, took upon themselves this task, and succeeded in extracting a reference guide, and publishing the details of its reference study in the latest issue of the journal Seminars in Cancer Biology, to improve the effectiveness and safety of chemotherapy to combat cancer liver, using vectors of nanoparticles; To target cancer cells and transfer the drug to them. This study comes as a result of the work of a team calling itself "Tetraploid Team", which includes a group of young researchers in the medical field from Egyptian and Arab universities, whose goal is to produce valuable scientific research that benefits the medical field in Egypt and the Arab world, and to spread the culture of scientific research in society of Egypt For his part, Mohamed El-Naggar, Associate Researcher in the Department of Biochemistry, Faculty of Science, Ain Shams University, and head of the tetraploid team, said: “Our study focused on one of the applications in this field, which is the use of nanotechnology to target liver cancer cells, by encapsulating chemotherapy molecules with molecules. Nano, and directing it to cancer cells, allowing the drug to be collected inside the targeted malignant cells without harming the rest of the body's healthy cells. He added, in an interview with "Science": Medical nanotechnology (Nanomedicine) is one of the modern medical technologies that are used in the diagnosis, treatment and prevention of several diseases, and it simply depends on the use of nano-sized therapeutic or diagnostic materials, ranging in size from 1- 100 nanometers (1 millimeter equals one million nanometers). Abdel Rahman Abu Shouk, a researcher involved in the study, at the Medical Research Center, Faculty of Medicine, Ain Shams University, adds that “there are multiple treatments for cancer, but they do not affect only cancer cells, but reach healthy cells, which increases their dangerous side effects, on the The main body organs such as the liver, kidneys, etc., but the advantage that treatments based on medical nano applications give is the delivery of drugs to the cancer cells to be treated very precisely without harming the surrounding healthy cells.” He explained - in statements to "Al-Alam" - that the team based its study on more than 140 studies conducted in this regard, to come up with a

reference guide that researchers can follow in this field. To conduct their future studies, on targeted therapy for liver cancer. To conduct the study, "Abu Shouq" added that the team used global databases that publish research specialized in medical applications of nanotechnology, such as the (PubMed) database of the American Medical Library, to recall the studies conducted in this regard, and the results of these studies were placed in electronic form; To extract the data found in the studies, to discuss and formulate them differently. To direct the drug to cancer cells using nanotechnology accurately, the study concluded that this is achieved through 3 main rules, the first of which is that the dose of chemotherapy is placed in nanocarriers, which are nanomaterials that are used as a drug transport unit to direct it to cancer cells only. The second is that there are so-called "chemical ligands" on the surface of these vectors, and their function is to identify the third element in the process, which is the "receptors" that are present in a large amount on the surface of cancerous cells without healthy ones, and when the ligands and receptors unite together, The dose of the targeted drug is emptied into the cancer cells very precisely, without the drug reaching the healthy cells. Al-Najjar says that the team focused in its study on summarizing the different properties of nanocarriers, receptors, and chemical ligands, studying the differences between their different types, and the advantages and disadvantages of using each type in treatment, as many receptors on the surface of divided cells (Membrane Receptors) were identified. During the development of hepatocellular carcinoma, it was found that most of these receptors are a normal part of the plasma membrane components of healthy liver cells, but they are present in large quantities, and their width increases only on the surface of cancer cells." He added, "From here came the idea of studying the composition of these receptors for use in targeting malignant cells, as the study focused on monitoring 6 types of receptors in detail, their chemical composition and different forms, and the advantages and disadvantages of using each type, such as inaccuracy or lack of quality." The study focused on 3 main aspects, namely: determining the most effective chemical drugs in the treatment of liver cancer, the most common receptors, in addition to the most chemical ligands, which ensures the development of a complete plan for treatment, as a prelude to further studies.

Al-Najjar pointed out that the study concluded that the most suitable drug that can be compatible with nanocarriers to kill liver cancer cells is the drug "HPMA-doxorubicin." This drug is used with special receptors to deliver the drug to the malignant cells; The study found that the most accurate receptor in targeting is the Asialoglycoprotein Receptor (ASGP-R), as it is found in large numbers on the surface of cancerous liver cells, and not on healthy cells, which ensures that the drug reaches the hidden cells, and the best chemical ligands that It binds to the receptors with high efficiency and accuracy, it is the compounds "lactose" and "galactosamine". However, some research has found that the number of ASGP-R receptors present on the surface of the cancerous cell varies with the development of the disease, so the patient must be examined and the stage of his disease determined before applying this treatment to him to ensure the validity of the treatment.

Types of Nano-carriers

The team's "model" on animals is not quite the same as humans, because researchers are working on giving animals certain substances that cause liver cancer, and thus this condition is different from humans with cancer., For her part, Shaima Yahya, assistant professor in the Medical Division at the National Research Center to construct on anything has been achieved, and ultimately to find effective treatments for diseases. She added in an interview with "Science", that what distinguishes this study is that it focused on a relatively new field. She explained that the study provided a vision and an in-depth reading of what has been reached in this field, and extracted the most prominent receptors that increase production in liver cancer cells, and effective chemical treatments that can target them, and explained the ways in which drug doses can be transferred through nanometric materials, which precisely target cells. Cancer in the liver, thus increasing the effectiveness of the treatment and decreasing its side effects. What is distinctive is that it presented the most important challenges facing this type of treatment, and concerns about its side effects; for consideration in future experiments. She noted that reference research is an important part of the research work; The researcher has no role in conducting laboratory experiments to prove or deny a specific scientific hypothesis, but his role extends to conducting reference research that sheds light on the most prominent achievements of experiments and results, and extracts from them the most important recommendations that workers in the field can benefit from. Scientific and medical. Dalia Ibrahim Badran that is agreed with her stressing that this reference study provides a very good review in terms of the method of scientific writing and modern scientific information, in the field of targeting cancer cells with nanotechnology, which may contribute to discovering ways Modern treatment increases the cure rate of liver cancer. In statements to Al-Alam, she considered that the use of nanoparticles to deliver chemical drugs to target

liver cancer cells directly without harming healthy cells is a field of study.

Designing Types of Nano-capsules for Cancer Treatment

Cancer is one of the leading causes of death in the world. The most common treatment options are chemotherapy, radiation, and surgery. Conventional anticancer drugs present a number of disadvantages and unwanted side effects, with potential for normal tissue toxicity and multidrug resistance. One of the modern strategies to counter these drawbacks is to come up with new safe compounds from natural sources that have high specificity, selectivity and ability to kill malignant cells with minimal side effects. In this context, a joint Egyptian research team from Mansoura University and Zewail City of Science and Technology found a new potential benefit of silymarin in fighting cancerous tumors, after loading it onto nanocarriers. The research team was led by Mohamed El-Far, Professor of Biochemistry at Mansoura University and member of the Advisory Committee for Graduate Studies and Research at the university, and Ibrahim El-Sherbiny, Founding President of the Nanoscience Program and Director of the Materials Science Center in Zewail City.

Silymarin is famous for its effective role as a nutritional supplement for liver patients, and another research team in which El-Sherbiny participated had succeeded two years ago in preparing a nano-composition of it that gave hope that it could be used to resist infection and type 2 diabetes, or control it in case of infection, after trying it on animals, Experiments. The new research team came to add a potential benefit to the same drug by using it to fight cancerous tumors, by experimenting in the laboratory with the model of Ehrlich ascites carcinoma cells. This type of cancer cells can be transferred and implanted into the peritoneal cavity (which encases the abdominal cavity and covers most of the abdominal organs) to experimental mice in the form of ascitic tumor, which are rapidly multiplying strongly and do not regress, and are used in the laboratory and research to experiment with new drugs and materials for evaluation.

Silymarin is extracted from a plant called Milk Thistle, whose scientific name is Silybum Marianum, and its main problem is that it is insufficiently soluble, which negatively affects the so-called "bio-availability" inside the body, i.e. the percentage of the drug that is absorbed and the patient actually benefits from it, a problem that The previous research team treated it using nanotechnology in their previous study on the use of silymarin to combat type 2 diabetes in the laboratory, and it was researched to employ it to combat cancerous tumors, by experimenting with one of the cancer models in the laboratory, and they published research on this achievement in the journal Nanomedicine last August. Ibrahim El-Sherbiny, the main researcher in the study, told "Information" that the problem of poor solubility affects the rate and duration of drug absorption inside the body, explaining that in order for it to perform its therapeutic role, the dose size must be increased, which leads to the remaining amount of the drug not being absorbed. The body and causes side effects such as loss of appetite, indigestion and the desire to vomit. He stresses that the research team overcame these symptoms by reformulating the active substance of the drug into innovative nanometer spheres that were designed and prepared in Zewail City. The use of nanotechnology is a recent trend to maximize drug value, and in cancer alone, about 117 drugs are being evaluated using nanoparticle formulations, according to 2013 Thomson Reuters Pharma data. In the latest study, polymers approved by the US Food and Drug Administration were used in the number of nanometer spheres to load the drug on, for example, (polyurenic) polymers, which consist of two types of polymers (polyethylene glycol) and (polypropylene glycol). Which helps to improve the level of bioavailability and the rate of absorption inside the body, and avoids the occurrence of any side effects, because there is no remaining part of the drug that has not been absorbed. El-Sherbiny explains that the drug loaded on nanopolymers when employed to combat cancerous tumors is directed to the affected cell and not others, because the nanocarriers were designed to be attracted to the biomarkers of diseased cells and not others. A biomarker is a molecule that may be a protein, hormone or genetic gene that indicates a person's health status. In the case of cancer, the biomarker may be a product of the cancerous tissue or a product of other cells in response to the tumor.

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Tumor Detection

There several processes for detection. It can turn to fly and disintegrate particles into the system (eg polymers for biodegradation of pH). Physiotherapy (MEC) and less than minimum toxic concentration (MTC). Gold nanoparticles as carriers are being investigated as agents such as paclitaxel. Encapsulation and management of the hydrophobic coating Molecular encapsulation and nanoparticles were found to effectively evade the retinal-endothelial system. In cancer research. Contrast Imaging in Time - The short-pulse laser tomography system has been modified for the detection of skin cancer. Figures (1-4).

Fig-1: Nano Technique in Medical Identification of Cancer

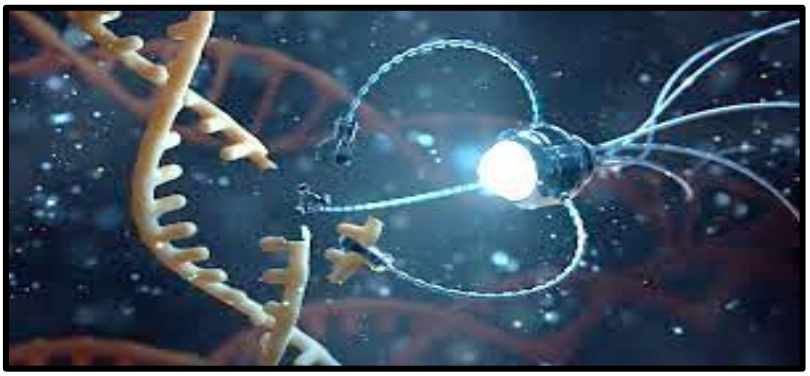

Fig-2: Nano material as a drug carrier

Fig-3: Early automated diagnosis of tumors

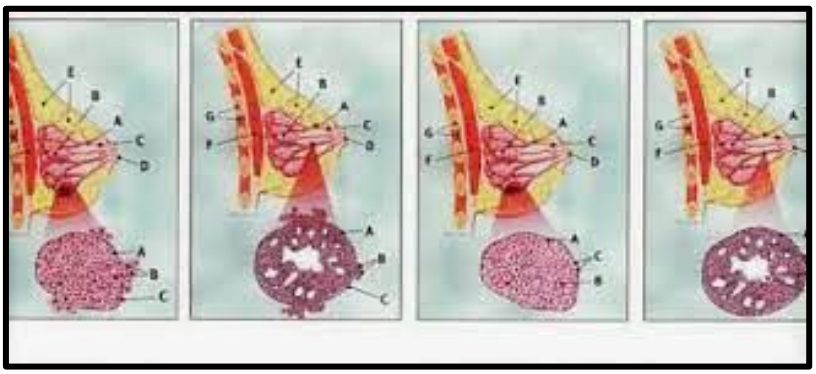

Fig-4: Stages of development of a tumor in the breast

CONCLUSION

In the past, electronic memory designs are dependent on the architecture of transistors. However, the switch provides an alternative through the use of reconfigured constraction concerning erect and parallel wire bundles and arrays in order to produce high density memory. The use of nanomaterials technology has reduced the weight of the aircraft without a motor by almost half while increasing strength and durability. In addition to

reducing the mass of supercapacitors, which will increasingly be used to power the auxiliary electric motors, in order to take off the plane without the engine from flat ground to fly in high skies. The most famous application of nanotechnology is self-cleaning or "easy-to-clean" surfaces on ceramic or glass. The ceramic nanoparticles have improved the smoothness and heat resistance of general household appliances, including irons.

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