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To Study On Nanoparticle Containing Anticancer Drug.

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ABSTRACT

The rapid growth of nanotechnology in the development of nanomedicine agents has great promise for the development of anti-cancer therapies. Nanomedicine products represent an opportunity to achieve complex identification techniques and multiple applications. Today, nanoparticles (NPs) have many applications in various fields of science. In recent years, NPs have repeatedly been reported to play a vital role in modern medicine. Various clinical applications have been analyzed, such as drug carriers, genetic delivery to tumors, and different imaging agents. A wide range of nonmaterial based on organic, inorganic, lipid, or glycan compounds, as well as synthetic polymers have been used to develop and develop new cancer treatments. In this study, we discuss the role of NPs in cancer treatment among the various drug delivery modalities for cancer treatment.

Keywords: nanoparticle, cancer, drug delivery.

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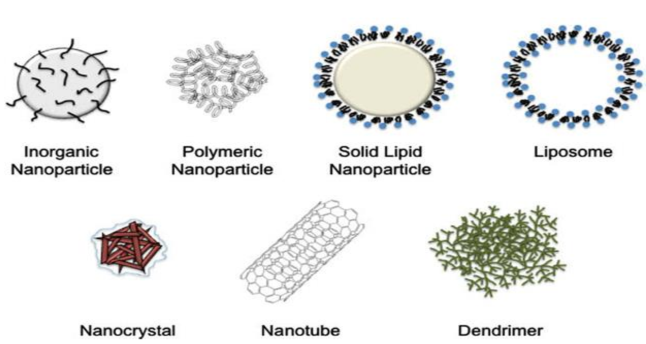
INTRODUCTION

Technology is a science that tends to deal with a wide range of sizes ranging from nanometers to several 100nm, depending on its intended use. It is very promising in the diagnosis and treatment of cancer because it can penetrate tissue at the cellular level. Cancer nanotechnology is actively tested and used in cancer treatment which shows great progress in diagnosing, diagnosing and treating the disease. Various studies have been performed to determine the precise treatment of cancer nanotechnology by reducing the risk of adverse effects. Nanotechnology, a research field that combines the fields of chemistry, engineering, biology, and medicine, has great potential for early detection, accurate diagnosis and treatment of cancer for you. Nanoparticles are usually smaller than several hundred nanometers in size, compare to larger organic molecules such as enzymes, receptors, and antibodies. With an estimated 100 to 10 billion human cells, these nanoparticles can provide unprecedented interactions with both bio-molecules on the surface and inside cells, which can alter cancer diagnosis and treatment. Cancer is a actually a disease of failure to regulate tissue growth. In order for a normal cell to turn into a cancer cell, the genes that control cell growth and differentiations must be altered. The affected genes are divided into two broad categories. Ontogeneses are genes that promote cell growth and reproduction [1]. Cancer is one of the most deadly diseases in the world, today killing millions of people every year.It is one of the major health concerns of the 21st century that is boundless and that can affect any human organ from anywhere. Cancer, an uncontrolled growth of cells in which apoptosis disappears, requires a more complex treatment. Due to the complexity of genetic and phenotypic levels, it reflects clinical differences and treatment resistance. There are various treatments for cancer, each with its own specific limitations and side effects. Cancer treatments include surgical removal, chemotherapy, radiation, and hormone therapy. Chemotherapy, the most common treatments, delivers anticancer drugs systematically so that patients can suppress the uncontrolled increase in cancer cells.Unfortunately,due to the undisclosed supervision of anticancer agents ,many side effects occur and the illicit drug delivery of those agent is not able to produce the desired effect in most cases [2].

Nanoparticle

Nanotechnology is a multidisciplinary field that uses principles from chemistry, biology, physics, and engineering to design and build nano scale devices. In its most powerful formula, nanotechnology refers to a structure with a diameter of 1-100nmin at least one degree developed using high or low engineering. The emergency nano-material demonstrates the unique strengths found in internal structures such as shape and size and functional structures assigned to landscaping as shown in the Cancer Institute (NCI) identified nanotechnology as a potential paradigm shift in the diagnosis, treatment and prevention of cancer. A nanoparticle is a very small particle whose size is measured in nanometers (nm). It is defined as particles with at least one size <200nm.or nanoparticles are solid colloidal particles ranging from 10nm to 1000nm. They contain macromolecular substances in which the active vaccine melts, binds or binds, and / or where the active vaccine is taken or attached [3].

Types of nanoparticle [4]

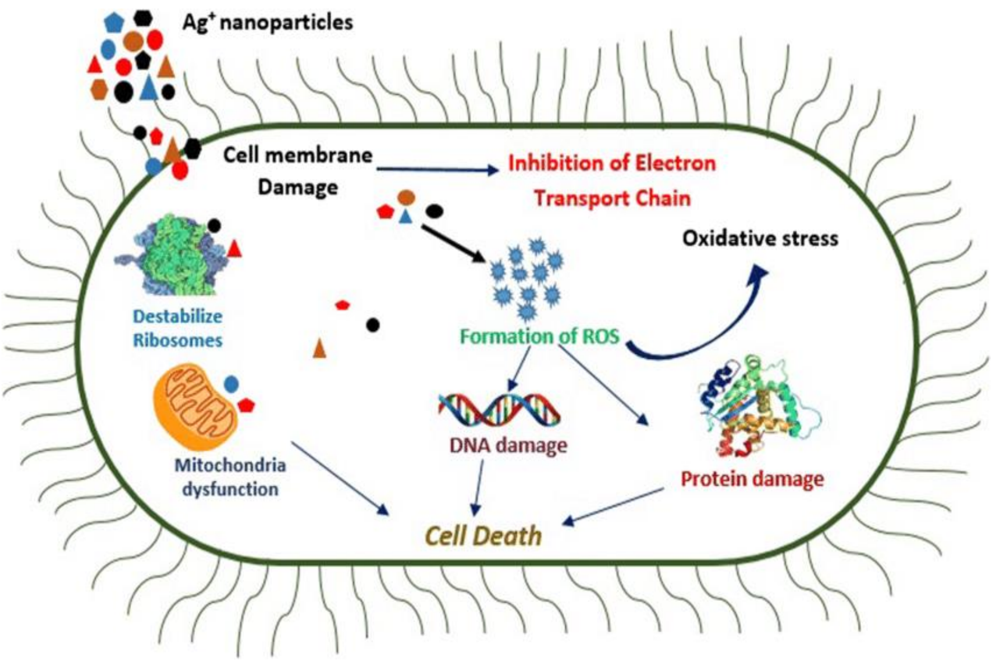


Nanoparticle used as anticancer

Silver nanoparticle: - Metal nanoparticles, such as silver, gold, and platinum NP, are usually small, about 50 nm and have a high surface area. They have space to cross capillaries in muscles and cells due to their reduced size. The high level they provide and the opportunity to change their properties through chemical (tunable surface chemistry), allow them to carry the right amount of medication.

In this sense, iron NPs have been used as a controlled release of drugs in the treatment of cancer. Despite the wish that these metals do not work, there may be a collection of organisms and toxins. On the other hand, one of the great advantages of metal NPs is their ability to absorb energy in the form of light and convert heat. Therefore, some can be used in the treatment of hyperthermia tumors, where image stimulation provides thermal energy, making this treatment more obvious.

Among the many metal NPs, silver nanoparticles (AgNPs) are increasingly used in medicine, aerospace, microelectronics, food industries, and medicine because of their unique chemical, physical, and biological intrinsic properties. Their visual, biological, and electrical properties can be highlighted. AgNPs have been shown to be useful in industrial and health products, such as coating of medical equipment, biosensors, photography, such as antibacterial, antifungal, antiphrastic, antiviral, anticancer agents, and as drug carriers, among other applications. Silver nanoparticles are highly processed and recognized as a useful medical tool, as they have a high degree of space / volume, easy mixing, more readable chemicals and environmental performance, as well as better penetration and traction in living organisms. Despite the fact that AgNPs are widely used in vitro studies using different types of cancer cells (due to their internal anti-cancer effect), abuse of AgNPs combined with anti-cancer drugs has been the goal of some recent scientific research, demanding increased antineoplastic efficacy, especially when used in combination with natural anti-cancer products used in its compounds (Green-Chemistry methods) [5].



MOA of silver nanoparticle

Nano carriers for drug delivery: - At present, nanotechnology has allowed remarkable progress in the movement and release of drugs in specific target areas of biodiversity, as well as, at specific target time (control of drug release time). The development of nanosystems designed for the release of a drug in a specific area, usually allows reducing some of the side effects and toxicity of the treated drug. Several nanocarriers are currently being investigated, including organic (liposome, dendrite's, micelles, among others) and nanoparticles (NPs), such as magnets, silver NPs, gold NPs, quantum dots, etc. In addition to organic and inorganic NPs, there are also hybrid natural nanoparticles, such as NPs with inorganic compounds surrounded by living organisms.

The target drug delivery system should allow to control the end of the drug in the body, protecting cells and tissues that are not intended for treatment. These nanocarriers are endowed with advanced and well-defined physical, chemical, and biological features to effectively enhance cellular, or drug acquisition in relation to large molecular structures. In addition, the ability to control the size, charge more, and the chemical overload of nanoparticles acting as carriers, as well as the release of pre-loaded drugs in the area, allows to overcome some of the limitations of conventional therapies, i.e., demand. For high doses, low bioavailability, and chemical instability of the controlled drug. If nanocarriers are designed and manufactured to successfully accumulate on target, there will be lower effects of systemic side effects and better therapeutic efficacy. Nowadays, the production of nanoparticles associated with predefined chemical properties is allowed to modify nanoparticle delivery drugs for specific cancers and different types of anti-cancer drugs, as each type of cancer has different biological properties [6].

Drug delivery therapy of nanoparticle

Targeted drug delivery for cancer:- The delivery of cancer drugs no longer just wraps the drug in a new way for different delivery methods. Information and knowledge from other technologies such as nanotechnology, advanced polymer chemistry, and electronic engineering, are integrated into developing new drug delivery methods. Advances in our knowledge of cancer cell biology and mechanisms involved in malignant mutations are changing the treatment of cancer with a focus on targeted cancer treatment.

Cancer treatments are currently limited to surgery, radiation, and chemotherapy. All three methods risk normal tissue damage or complete eradication of cancer. Nanotechnology provides ways to target chemotherapies directly and selectively to cancer cells and neoplasm, to guide tumor resection, and to improve the therapeutic efficacy of radiation-based and current therapies. All of this can add to a patient's risk of injury and increased chances of survival. Research into nanotechnology cancer treatment goes beyond the introduction of drugs into the development of new therapies that are only available through non-material properties. Although smaller than cells, nanoparticles are large enough to hold many small computers, which can be of many types. At the same time, a large area of the nanoparticle can work with legends', which include small molecules, DNA or RNA strands, peptides, a tamers or antibodies. These legends' can be used for therapeutic effect or to direct the nanoparticle endpoint in vivo. These properties enable integrated drug delivery, multidisciplinary treatment and combination therapy, known as "therapeutic action," action. The physical characteristics of nanoparticles, such as energy absorption and radiation exposure, can also be used to disrupt diseased tissues, such as laser removal and the use of hyperthermia [7].

Delivering chemotherapy: The traditional use of nanotechnology in the treatment of cancer has been to improve the pharmacy and reduce the systemic toxicity of chemotherapies through the selective administration and delivery of these anti-cancer drugs to tumor tissue. The advantage of nanosized carriers is that they can enhance the therapeutic potential of the drug delivered through nanoformulations with chemotherapeutics may be incorporated or integrated into the area of nanoparticles. This ability is largely due to their flexible size and surface area. Size is a major factor in the delivery of nanotechnology-based treatments to plant tissues. Selected delivery of nanotherapeutic platforms relies heavily on tissue guidance for improved penetration and retention (EPR) effect. This phenomenon depends on the specific complexity of the tumor microenvironment such as deformities in lymphatic drainage, as well as an increase in the stiffness of the tumor vasculature, allowing nanoparticles (<200 nm) to accumulate in a small tumor area. In addition, the time or place of release of a drug can be determined by stimulated events, such as ultrasound, pH, temperature, or by chemical reactions.

Awards for New Research in Cancer Nanotechnology awards focus on understanding the fundamental aspects of nonmaterial interaction with the biological system in order to advance the development of cancer treatment and diagnostic techniques [8].

Nano enabled immunotherapy: Immunotherapy is a promising new treatment for cancer that includes a number of methods, including screening prevention and cellular therapy. Although the results of some patients have been remarkable, only a small percentage of patients treated with a small group of cancer patients have received strong responses to these treatments. Increasing the benefits of immunotherapy requires more understanding of the tumor-host host immune system. New technologies for cell analysis and the function of individual cells are being used to investigate tumor cells and cells and to clarify cellular signals and effective immune responses in treatment. To date, nano-powered devices and building materials are used for filtration, photography, Nanotechnologies are also being investigated for the introduction of immunotherapy. This includes the use of nanoparticles in the delivery of immune or immune molecules in combination with chemo- or radiotherapy or as adjuvants in other immunotherapies. The Standalone nanoparticle vaccine is also designed to increase the T cell's response to tumor suppression, by combining antigen and adjuvant delivery, the incorporation of multiple antigens to promote the purpose of multiple dendritic cells, and the further release of antigens to promote long-term immune system. Cellular antibodies in antibodies that are produced can also be incorporated into nanoparticle vaccines to alter the immune response of tumors and improve response, a procedure followed by the Nano Approaches to Modulate Host Cell Response for Cancer Therapy Center at UNC. Research at NanoSystems Biology Cancer Center [9].

Delivering or augmenting radiotherapy: Radiation therapy kills cancer cells by damaging their DNA including cellular apoptosis. Radiation therapy can directly damage the DNA or create charged cells (atoms with a strange or unstable number of electrons) within the cells that can damage the DNA. Many types of radiation used to treat cancer use X-rays, gamma rays, and charged particles. Therefore, they are naturally toxic to all cells, not just cancer cells, and are given in effective doses as much as possible while being less harmful or lethal. Nanotechnology research has focused on radiotherapy as a treatment that can greatly benefit nanoscale materials and increase tumor accumulation. The main mechanisms by which nanoscale platforms rely on the development of radiotherapy effect, therapeutic enhancement, and / or novel radiation for external applications [10].

Delivering gene therapy: The number of nonmaterial-based deliveries has been identified in new therapies such as those that use nucleic acids, which are less stable in the circulatory system and more susceptible to degradation. These include DNA and RNA-based genetic therapy such as micro organized RNAs (siRNAs), and microRNAs (miRNAs). Gene silence Therapeutics, siRNAs, has been reported to significantly increase half-life when delivered capsulated or embedded in the surface of nanoparticles. These therapies are used in many cases to identify 'uncontrollable' cancer proteins. In addition, the increased genetic stability brought on by nanocarriers, and often combined with controlled release, has been shown to increase their effects [11].

Future perspective: Nowadays, nanoparticles (NPs) have.. Nanomedicine products represent an opportunity to achieve complex targeting techniques with greater efficiency.

Researchers are developing novel therapies featuring newly discovered nanoparticles with new properties that will be used in medical science. Although small in size, nanoparticles shorten composite compounds. The vast majority of nanoparticles allow them to be adorned with legends, DNA and RNA strands, peptides, or antibodies. These 'additives' give the nanoparticle extra performance that enhances the therapeutic effect or helps directs the nanoparticle to a specific location. As a result, nanoparticles facilitate integrated drug delivery, multidisciplinary treatment, and “therapeutic” action, (combined therapy and diagnosis).Nanotechnology has shown many promises in the treatment of cancer over the years. With their improved pharmacokinetic and pharmacodynamic properties, nanomaterials have contributed to advanced cancer diagnosis and treatment [12]. Nanotechnology allows targeted drug delivery to affected organs with less systemic toxicity due to their specificity. However, like other therapies, nanotechnology is completely non-toxic and poses a number of challenges with its use that combines systemic toxicity with certain organs, which, in turn, results in the decline of their clinical applications. Given the limitations of nanotechnology, further improvements need to be made to improve drug delivery, increase efficiency while maintaining minimal damage. By improving the interaction between the physicochemical properties of applied nanomaterials, safe and effective diagnostic and therapeutic outputs can be made available for cancer control. Overall, we want to highlight the important benefits of nanotechnology and the shortcomings in its use in order to meet the clinical needs of cancer. In addition, the therapeutic benefits of nanotechnology and future developments can make them therapeutic potential that will be used in some diseases. This may include ischemic stroke and rheumatoid arthritis which may require the intended delivery of the appropriate pharmacy agent to the affected area.

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