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Research Article

New Methods for Applications of Nanoparticles in Medical Physics: Diagnosis and Treatment

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Abstract

Background and Purpose

Nanotechnology is one of the most attractive and innovative branches of research with significant opportunitiesfor new developments in different branches of science. In recent years, medical physics has become one of the main branches of nanotechnology research, and in the future, medical science can greatly benefit from this technology. The use of nanotechnology in the treatment, diagnosis and prevention of treatment in the recent decades has attracted the attention of researchers. The purpose of this article is to present new technologies and applications of nanotechnology in the field of medical physics and review the future of this technology.

Materials and Methods

The present study is a review of the type of validity that is performed through search of authoritative scientific databases such as Pubmed and Scopus, Google scholar, PubMed using the key words of nano technology, modern medicine, medical physics, therapeutic methods, methods diagnosis and prevention methods are the latest information.

Results

Nanotechnology has the capability to apply in a variety of medical and medical engineering and medical physics applications. Nano-based carriers and nano adjuvants have shown great potential in the vaccine sector and they will undoubtedly play a major role in the future. Recent achievements indicate that nanoparticles can be used in diagnostic procedures, kits, biomass and magnetic imaging. Recently, nanotechnology has focused on new methods and alternatives to carrying and delivering drugs and increasing their efficacy in the treatment of various types of cancer. Also, in the treatment of cancer tumors, nanoparticles, due to increased absorption dose, played an important role in the treatment cycle in new radiotherapy techniques.

Conclusion

Nanotechnology is the source of new materials that provide many opportunities for new developments. It offers various branches of medical science and medical physics. Currently, this technology focuses on new and developing methods for the prevention, diagnosis and treatment of various diseases, especially the diagnosis and treatment of cancer.

Introduction

With the development of nanotechnology, in recent years, new delivery methods for nanoscience have been widely recognized. Nanoparticles (an evolutionary state of Nano science) are increasingly being considered as potential candidates for the delivery of therapeutic agents safely into a targeted compartment in a tissue organ or specific cells. These particles are colloid structures with diameters smaller than 1000nm and can therefore penetrate the internal organs through small capillaries [1-4].

This innovative delivery method may be a promising technology to respond to the challenges posed by drug delivery when loaded with a gene or agent. Nanoparticles can become Nano scale tablets that can effectively treat problem illnesses like cancer. This paper summarizes the different types of nanoparticle drug delivery systems and their potential therapeutic applications. This article also provides a closer look at the progress of the current challenges and the future direction of nanoparticles in drug delivery systems. The given medication is released for very specific purposes, such as minimized targets in the delivery system, for much smaller purposes. It is highly expected that these small drug delivery systems can be realized through advances in nano-biotechnology. Integration of nanotechnology products, including nanoparticles, with therapeutic agents has just been a new therapeutic trend that would otherwise be Is not possible [5-7].

Nanoparticles can be defined as colloidal systems with a diameter of less than 1000nm. Recently, many therapeutic agents, including small molecules of proteins, DNA and peptides have been developed into strong and complex factors. By using traditional delivery methods such as oral and injectable methods for treating diseases, these agents can be useless and toxic. In common oral doses, these agents often disappear during intestinal transmission or inadequate absorption, resulting in In addition to uncontrolled levels, these factors can be useless and toxic. In common oral doses, these agents are often destroyed during intestinal transfusion or inadequate absorption, resulting in ineffective, in addition to uncontrolled levels, these factors can lead to aggregation [8-11]

Consequently, it can damage the body, however, the connection of these small therapeutic agents to nanoparticles may divert many of these challenges to the delivery and production of pills. Drug Delivery Systems Nanoparticles, due to their small size, can penetrate the width of barriers through small capillaries to individual cells for effective drug accumulation in target sites. Unezaki *et al.,* 1996 Hobbes *et al.,* 1998 this reduces the toxicity of the treatment agent, reducing the side effects of the medicine and increasing the effectiveness of the treatment [12-15].

Also, therapeutic agents can be loaded into nanoparticles that are not recognized by the immune system. This tacit state has been implicated as potential candidates for the delivery of antiviral drugs as a target for an infected human immunodeficiency virus (HUV). Schaffer *et al.*, 1992, Nano particles using a number of materials, including polymers of permeated metals and ceramics they are based on their manufacturing method and materials, these particles can have different shapes and sizes with distinct properties. In this paper, nanoparticles are classified according to their materials, and are briefly presented with some potential uses as drug carriers. This paper also highlights recent developments and challenges that underpin these new nano-scale delivery systems [13-16].

Material and Methods

Collect and summarize information from databases PubMed and Google Scholar. Articles research and review using MeSH pattern from: Nanoparticles, Cancer, Diagnostic Methods, Therapeutic Methods, Nanotechnology, Tumor imaging, magnetic nanoparticles, biomarkers, methods Diagnosis and treatment of cancer using nanoparticles and nanoparticles. In this study, different categories of nanoparticles were studied. In other studies, the nanoparticles are classified into organic and inorganic groups in the organic matter category. Organic molecules are the main component of nanoparticle synthesis, and in mineral categories, metals (iron-gold, etc.), and Mineral elements play a major role in the structure of the nanoparticle.

Liposomes, dendrimers, carbon nanotubes, solid nanoparticles, polymers are placed in organic particles, and inorganic nanoparticles have a central core of mineral and metal elements that are covered by an organic coating. These nuclei have fluorescence, magnetic, and electrical properties. In another category, the nanoparticles are made of macromolecular or polymeric materials, natural or synthetic, which, according to their manufacturing method, are classified into two (Nanocapsules) and nanospheric nanocapsules (Nanosphere) types. Structural nanocapsules are cases in which the drug is placed in the center of the compartment and surrounded by a polymeric layer. Nanospheres are matrix systems in which the drug and polymer are either homogeneously dispersed or absorbed on the surface. Polymers used as nanoparticles are associated with

drugs that have a specific therapeutic goal for a specific disease, including cancer, which are combined with nano-mediums in two ways. 1: The drug in the nanoscale is incubated. 2: The drugs are absorbed on the nanoparticles of the conjugate (chemical bond).

Findings

Polymer carriers are very much considered in the last few decades due to their multiple functions and ability to function. In general, polymer nanoparticles are small in size small colloidal systems where the drug is either physically dispersed or dissolved or chemically bonded to their main polymer chains. The advantages of using polymer nanoparticles as pharmaceutical nanomaterial's is that solubility and drug stability increase. Therefore, polymer nanoparticles are among the most widely used drug release systems. So far, different polymers have been investigated according to their properties, and some of them are mentioned [17-20].

Proteins are very good sources of natural materials for the production of nanoparticle systems. Various proteins such as gelatin and albumin and curcumin are widely used to deliver the drug. With the mental design of the protein nanoparticles, based on their behavior in a microscopic environment and based on cancerous tumor cells, improving the efficacy and safety of cancer treatment can be promising. In addition, protein nanoparticles that are capable of carrying diagnostic and therapeutic material are currently considered for effective cancer management. Although the use of protein nanoparticles for treatment now brings exciting results and further benefits in the future, performance comparisons and therapeutic efficiencies, proteins and other delivery systems still have defects and represent (Human serum) is a further study in this field [21-24].

Poly (lactic-co-glycolic acid) polymer is one of the most successful polymers used for drug release. Due to some advantages such as: biocompatibility, drug compatibility, mechanical properties, process easy production, as well as its hydrolysis, leads to the formation of monomers of lactic acid and glycolic acid metabolites, and these two monomers are androgens, and are easily associated with PLGA with a systemic insufficiency of systemic metabolism through the body and through the metabolic cycle of metabolic syndrome. The destruction of the PLGA protects nanoparticles and increases their stability. These systems also have some disadvantages, including low drug loading for many medications [25-28].

The cost of production and the problem of increasing the scale. Placing a relatively low drug-loaded drug, the PLGA drug, is probably the main barrier to the use of nanoparticles in clinical trials [1-4].

Discussion

Its release systems based on nanotechnology have a dramatic effect on cancer [29,30]. Advances in biomaterials and bio-engineering-engineering are contributing to new approaches to nanoparticles that may create a new window in improving cancer patients. Nanotechnology in the drug release system has had a great impact on the selection of cancer cells, the release of targeted drugs, and overcoming the limitations of conventional chemotherapy. In the meantime, polymer nanoparticles are organized in the carriers of anti-cancer nanomaterial's due to the process of easy production, biocompatibility and biodegradability[10]. Although the loading of hydrophilic compounds is still subject to limitations, but due to the diversity of nanoparticle structures, it is possible to encapsulate various molecules. . In the meantime, in order to detect

cancer at an early stage, scientists must be able to detect molecular changes (even if they have a small percentage of cells). This means the very high sensitivity of the method used. In the meantime, the ability of nanostructures to enter cells and analyze them is promising to do this [30].

In fact, the use of nanotechnology in medicine in terms of timely identification and root cause cancer is the focus of research worldwide. Nanotechnology can help to bring about fundamental changes in how to deal with cancer cases and their caregivers. Most biodegradable processes, such as those that lead to cancerous cells, are formed on a nano-scale. For cancer researchers, the ability to achieve nano-scale devices into living cells provides the possibility of gaining unrivaled knowledge both for the clinical domain and for the core sciences[31]. Nano-scale devices can be a decisive technology that can provide personal cancer treatment, that is, a cancer patient who receives drugs that are specifically related to the specific genetic and molecular characteristics of a specific cancer. Nanotechnology can also provide opportunities to prevent further cancer progression. For example, nano-scale devices can be used to prevent the development of breast cancer. Nanoscopes provide the ability to detect very small cancer tumors (including about 100,000 cancer cells)[32].

The current brain does not have this diagnostic power, and cancerous tumors that are identifiable with these devices generally need to carry several billion cancerous cells and are in critical stages. Nanotechnology offers a plan to integrate research into the structure and function of proteins and how they interact with cells within cells, along with other scientific studies, and from this duct finds out the causes of cancer incidence at the molecular level. With regard to the above, it is anticipated that nanoscience technology will promise significant advances in early detection, molecular imaging, assessment of effective treatment, targeted and multifunctional therapy, and prevention and control of cancer [33].

Use of Nanoparticles in the Treatment of Cancer Cells

Nanoparticles and nanotechnologies play a crucial role in transforming knowledge into useful clinical advances in the detection and treatment of cancer cells, which will revolutionize the process of diagnosis and treatment and ultimately cancer prevention. The use of these nanoparticles as drugs and for the treatment of malignant cancer cells does not have any effect on the cells and tissues of the body. Once these nanoparticles arrive at the tumors, the drugs are activated by narrow laser light strips. These nanoparticles are also able to determine the effect of treatment on malignant cells [34].

This great idea, which can only be diagnosed, treated, and reported by the injection of an agent about the efficacy of the treatment, is only possible with the help of nanotechnology.

One of the most promising applications of nanoparticles is to use them to simultaneously perform two tumor diagnostic procedures and deliver the drug to the tumor. Nanoparticles used to treat cancer are divided into the following groups:

** Nanoparticles are small cavities that allow the passage of only one DNA strand and are used to investigate DNA changes in cancer.

** Quantum dots are also used to increase the sensitivity of cancer diagnostic laboratory methods. Also, daisies facilitate drug delivery.

These molecules have a high potential for simultaneous identification and treatment, and at the same time they have a wide range of factors that allow them to connect therapeutic agents or other active molecules.

** Nano-shells are a structure with a central core that is covered with a thin membrane of a metal such as gold, and it is possible to use thermal imaging or photocells using a laser and delivering energy to Nano sheets in a tumor, or it is used for wound healing. This technique has been implemented by Rice University researchers in animal models.

** The group is a magnetic particle of iron, which is one of the main magnetic nanoparticles in iron oxide. The most important advantage of using these particles is a size smaller than 100nm.

In fact, iron oxide particles of Fe 304 (magnetite) are particularly important due to their compatibility with biological systems [30,31].

With the help of a magnetic field, these particles can be directed to a specific area, which facilitates imaging to detect and treat cancer. Due to these characteristics, magnetic nanoparticles have many medical applications. For example, labeled cells are used to observe and track, isolate or photograph cells. Cells can be labeled with magnetic particles, such as for observing and tracking stem cells through MRI [27,28].

Another use of magnetic nanoparticles is to use it to transfer DNA into the cell, imaging MRI, treating cancer masses with the help of therapeutic therapy, hyper thermia, magnetic separation of materials, and use in tissue engineering. With the accumulation of magnetic particles in cancerous tissue, tumor detection is greatly facilitated by the use of MRI and in addition, these particles can be used as carriers of anticancer drugs [16-18].

Conclusion

In fact, targeting cancer tumors requires the binding of molecules identifying magnetic nanoparticles to specifically identify cancerous cells and accumulate in the site. In the near future, nanotechnology could provide early detection of cancer and delivery of anticancer agents to the tumors discovered simultaneously. In fact, this technology plays a decisive role in cancer treatment and can provide opportunities to prevent further cancer progression.

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