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Research Article

Targeted drug delivery mechanisms and systems

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ABSTRACT

Drug delivery systems are a possible solution to control the delivery of drugs at a specific dose and for a predetermined time at the target location. In this way, providing effective concentrations of the drug in the affected area increases the therapeutic effect, reduces the destruction of the drug, and maintains blood circulation for a long time. The efficiency of drug delivery using ultrasound, magnetic field, electric field and optical field in combination with nanotechnology, has significant potential to enhance the effectiveness of therapeutic properties. In this paper, the types of conventional drug methods, drug delivery patterns and targeting mechanisms of drug delivery systems are reviewed.

Keywords: Drug delivery; Targeted drug delivery; nanotechnology.

1. Introduction

Medical nanotechnology is the study of nanotechnology methods and carriers for the diagnosis, prevention or treatment of diseases through the repair of damaged tissues at the molecular level. The goal of nanotechnology in medicine is to provide a solution for the diagnosis and treatment of diseases at the nanoscale.Targeted drug delivery is a set of

activities that lead to the accumulation of drugs in a specific area of the body. Depending on the location of the disease, these activities may cause the drug to reach a specific organ, a specific cell type, or even some intracellular organs. The main advantage of using targeted drug delivery is to increase the therapeutic effects of the drug without inducing side effects on healthy organs, tissues or cells. There are different types of drug delivery systems, one of the newest and most advanced types of drug delivery systems are systems that use nanostructured carriers in design. The dimensions of nanostructured carriers are between one and 100 nanometers. The other is that the dimensions of one of the nanostructured carriers can include nanoparticles and structures of 100 nanometers. These nanoparticles trap the drug inside, and because it has a small volume, high contact surface, and small dimensions, it has the ability to cross cell membranes and biological barriers, and the drug can cross areas with many limitations.

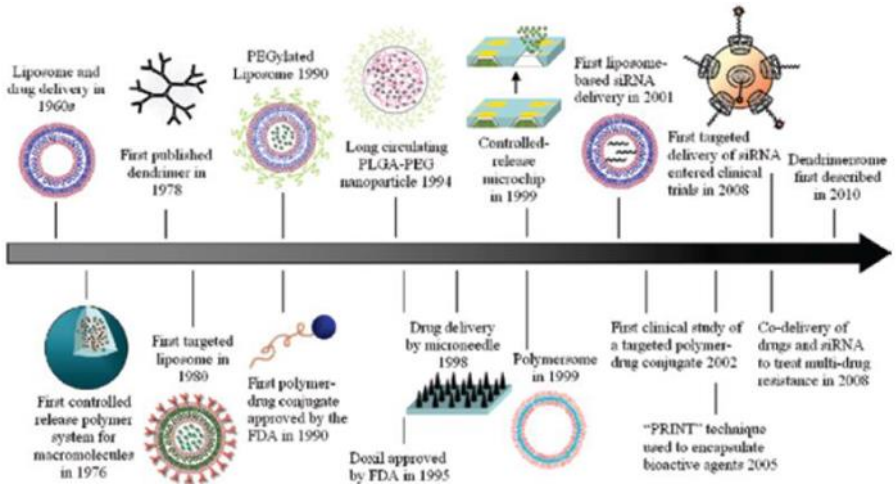

Fig.1. Drug release schedule based on nanotechnology

2. Experimental

2.1. Major drug delivery technologies

Oral - Pulmonary / Respiratory - Intramuscular - Injectable polymer systems.

2.2. Oral

Oral drug delivery is the best way to deliver the drug. This method is known as the safest, easiest and most economical method of drug delivery and includes microencapsulation, coating and polymer / membrane technologies.

2.3. Pulmonary / Respiratory (via lungs)

Pulmonary drug delivery is also an effective technology that is still growing. The pulmonary delivery, uptake, and deposition systems of the drug through the alveoli in the lungs cause the rapid absorption of proteins and the direct delivery of the drug to the center of the system for its general distribution in the body.

2.4. Intramuscular injection

Technologies for such injections are being developed for the delivery of small and large molecular drugs. These drug delivery methods are so successful that their application makes it possible to meet the need for biopharmaceuticals such as monoclonal antibodies. Intramuscular drug delivery is interesting because these membranes are thin and permeable, allowing the drug to enter the body rapidly. Intramuscular drug delivery systems have several advantages, including direct absorption, rapid entry, and lower doses. Such drug delivery systems are relatively simple and therefore not costly to produce.

2.5. Implantable systems / Injectable polymer systems

Polymeric drug delivery systems have a great impact on drug therapies. The drug is encased in a solid polymer that can be injected into the body or otherwise. Polymeric drug delivery systems allow slow discharge or high circulation of the drug over a period of days to months. Systems are often implanted or injected; however, implantation is performed surgically.

2.6. Dermal injection

In percutaneous injection methods, drugs are delivered through the skin into the bloodstream, which facilitates their distribution. Percutaneous injection systems (active and

inactive) deliver drugs symmetrically with it in such a way that without the pain. And at least have an undesirable side.

2.7. Application of nanocarriers

Drug nanoparticles are available in the form of nanocapsules and nanoparticles. These carriers are able to absorb and encapsulate the drug, thereby protecting the drug against enzymatic and chemical degradation. Nanocapsules are vesicular cysts in which the drug is enclosed in cavities and surrounded by a polymer membrane. While in nanospheres, the drug is physically and uniformly dispersed in the polymer matrix. In recent years, considerable attention has been paid to biodegradable polymer nanoparticles acceptable as cysts for drug delivery.

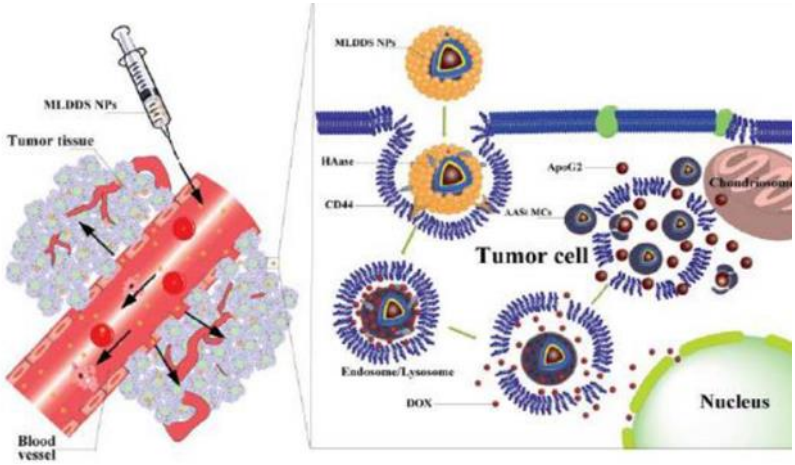

Fig.2. Principles and applications of nanocarriers

3. Results and discussion

Given what has been said, familiarity with drug delivery mechanisms and systems is very important in planning basic research and providing scientific theories on the development of new drug delivery methods. Considering the different mechanisms of drug delivery has an irreplaceable role in determining the effectiveness of the drug. In the field of physical targeting, the development of different methods of external control of drugs by using physical

knowledge and creating a relationship between drug structures and external donor factors plays an important role in the guidance and release of drugs. In passive targeting, the importance of examining tissue properties, especially in damaged tissues, is quite obvious, because it seems that having these properties will help to improve drug delivery methods. In the field of active targeting, the discovery of specific target ligands and providing their release conditions in the appropriate area has shown a significant help to improve the quality of drug delivery. Nanotechnology has the ability to control matter at the atomic and molecular scales and useful emerging properties in this dimension are used in various sciences. The medical field has benefited a lot from this technology and a clear example of this is the introduction of various nanoparticles as drug delivery systems and release systems in general.

4. Conclusions

With the increasing use of nanoproducts and the popularity of the pharmaceutical industry, all the potential of this new technology in the pharmaceutical industry must be properly estimated to take into account its impact on qualitative and quantitative changes. Therefore, nanotechnology in pharmaceuticals is one of the growing and social and economic issues. Given what has been said, familiarity with drug delivery mechanisms and systems is very important in planning basic research and presenting scientific theories on the development of new drug delivery methods. Considering different drug delivery mechanisms has a role in determining drug efficacy. Examining how drug delivery systems are expanding reveals a few points. First, in this direction, we need a close relationship between different scientific disciplines. Second, in order to plan targeted drug delivery development projects, there is a constant need to monitor the set of activities related to this field and to model them, because these scientific achievements, in addition to improving the attitude towards drug delivery

systems in the direct conversion of ideas They were widely used in basic and practical designs.

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