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APPLICABILITY OF THE NANO-DRUG DELIVERY SYSTEM FOR THE DEALING OF CARDIOVASCULAR DISEASES: A REVIEW PAPER

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ABSTRACT: ***In human life and wellbeing, cardiovascular diseases (CVDs) have become a significant threat. Although many drugs that act through different mechanisms of action are available on the market as conventional CVD treatment formulations, due to poor water solubility, low biological efficacy, non-targeting, and drug resistance, they are still far from satisfactory. With the advancement of nanotechnology, nano-drug delivery systems (NDDSs) provide a modern drug delivery approach for the treatment of CVDs, showing great advantages in solving the above issues. Nevertheless, there are several questions that need to be discussed about NDDSs, such as cytotoxicity. The types and targeting methods of NDDSs have been summarized in this study and the latest research advancement in the diagnosis and treatment of CVDs has been reviewed in recent years. In order to provide more ideas for the improvement of cardiovascular drugs, future prospects for nano-carriers in drug delivery for CVDs include gene therapy.***

KEYWORDS: ***Cardiovascular, Materials, Nanotechnology, Nano-Drug, System.***

INTRODUCTION

Cardiovascular disorders (CVDs) have become a major public health concern worldwide, with other diseases ranked first in the world for morbidity and mortality. Considering such a severe situation, the production of medicines for the treatment of CVDs has become a top priority. Because of the exponential growth of nano science and the excellent output of nano materials, nanotechnology has become a new solution to solving the bottleneck of cardiovascular disease care[1].

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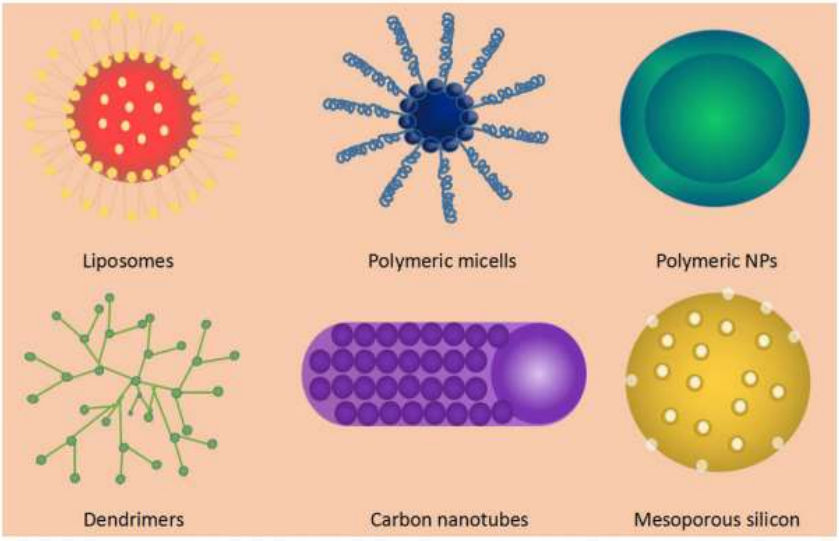

Figure 1: Illustrates the general types of the nano-drug carriers.

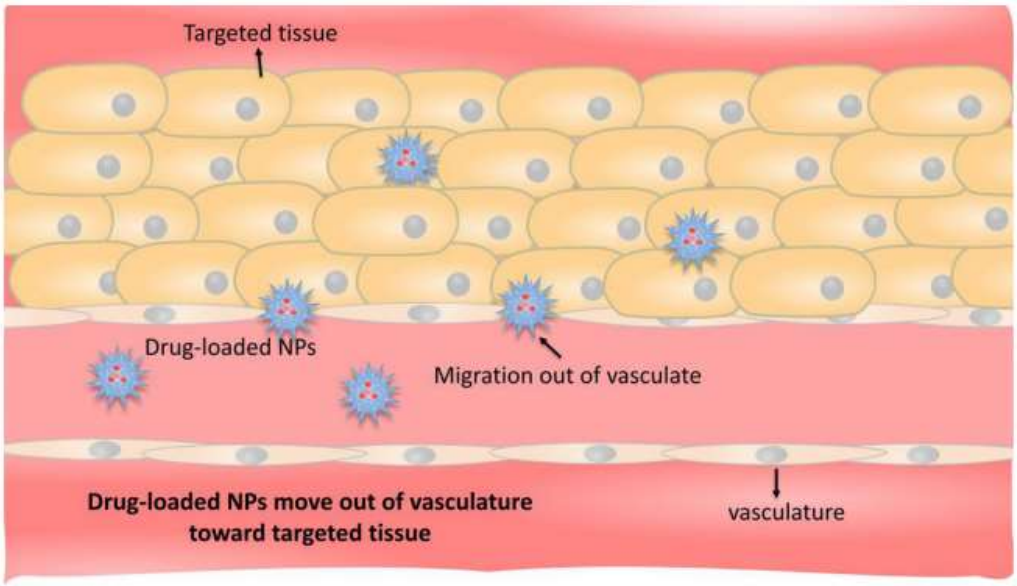

Figure 2: Depicts the schematic representation of passive targeting[2]**.**

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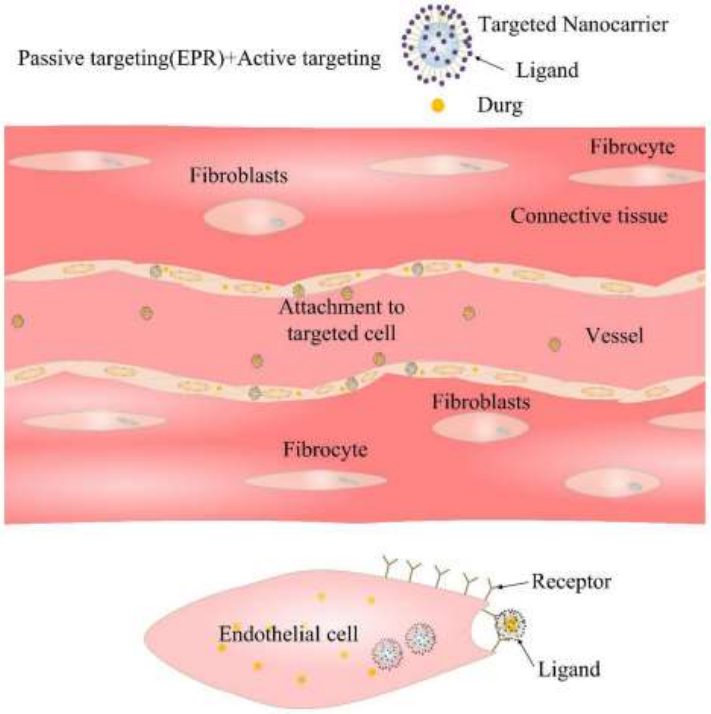

Figure 3: Depicts the diagrammatic drawing of the active targeting[3]**.**

Nanotechnology has become a modern approach to solve the bottleneck of cardiovascular disease treatment due to the rapid growth of nano science and outstanding performance of nano materials. Nano-drug delivery systems (NDDSs) are a class of nano-materials with the ability to increase drug stability and water solubility, prolong cycle time, increase target cell or tissue uptake rates, and decrease enzyme degradation, thereby increasing drug safety and efficacy. NDDSs may be delivered by different pathways, including inhalation, oral administration, or intravenous injection, thus improving bioavailability. More scholars have started to build nano-drug carrier systems for the diagnosis and treatment of CVDs in recent years[4].

DISCUSSION

In addition, the possibility of exposure to nano materials in clinical application also increases as the application of nano materials increases, resulting in nano materials having more opportunities to communicate with blood vessels, blood, and their components, which can have a direct effect on human health. Therefore, the various forms of NDDSs, their targeting strategies and application in CVDs, and the protection of nano materials were mainly introduced in this article[5].

NDDSs apply to material that is composed of at least one dimension in the nanometer scale range (1-100 nm) or as basic units in three-dimensional space. NDDSs have been a research hotspot in the field of pharmacy and modern biomedicine as an important way of improving drug delivery.

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For more than 40 years, NDDSs have been studied, producing a mass of nano-drug carriers[6]. The nano materials used in NDDSs can be split into organic, inorganic and composite materials according to the structure of the materials. Figure 1 illustrates the general types of the nano-drug carriers. Figure 2 depicts the schematic representation of passive targeting. Figure 3 depicts the diagrammatic drawing of the active targeting. Figure 4 illustrates the abridged general view map of targeted nanoparticles[7].

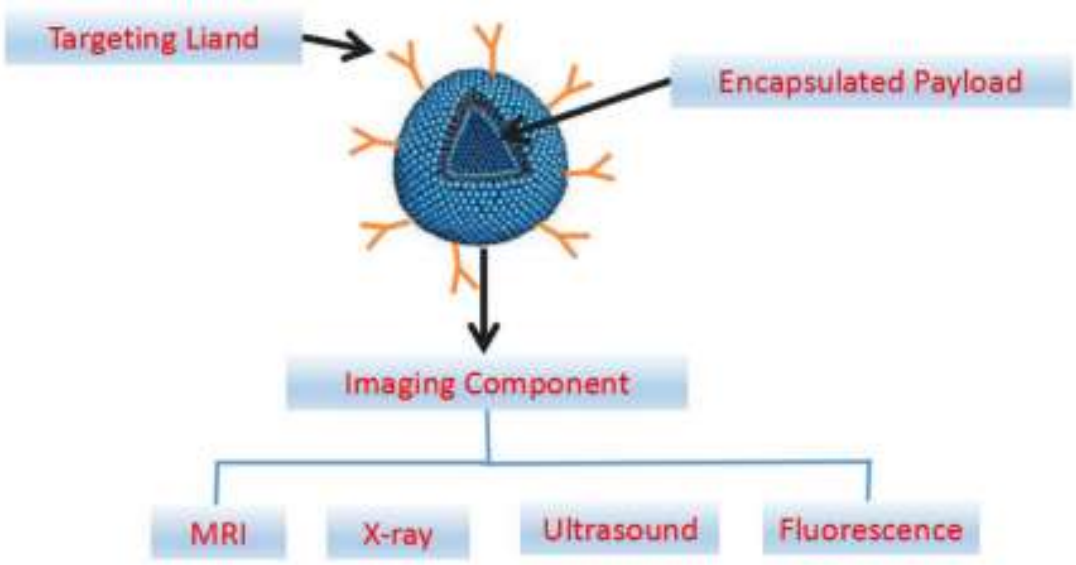

Figure 4: Illustrates the abridged general view map of targeted nanoparticles[8]**.**

Gold and silver nano materials are the most widely used metal nano materials, formed in various structures that can be categorised into nanoparticles, nano rods, nano capsules, nano cuboids, and nanowires. Gold nano materials are also used in photo thermal treatment of tumors and rheumatoid arthritis, in addition to being used as a nano-contrast agent for CT and surface enhanced Raman spectroscopy. As several studies have shown, antibacterial, anti-infection and anti-tumor applications of silver nano materials are primarily involved.

CONCLUSION

In conclusion, the nano-carrier has demonstrated unique advantages in the diagnosis and therapy of CVDs as an effective, precise and controllable intracellular drug delivery system. As it develops towards the multifunctional and integrated direction of diagnosis and therapy, it can effectively solve the problems of targeting, local drug delivery, controlled release, sustained release, and reducing toxicity. The application of NDDSs will be promoted with the innovation of nanotechnology and deepening studies on the molecular pathological mechanisms of CVDs, and

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new techniques and methods for clinical diagnosis and therapy will be provided. Moreover, because the study of these nano-carriers is in its infancy, several questions are still unanswered. The main challenge is how to address the biocompatibility of the nano-drug-loaded particles themselves or their degradation products, which will have to be addressed in the future in the field of nano-biomedicine.

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