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Nanotechnology and Drug Targeting in Cardio Vascular Disease

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Description

The vast majority of cardiovascular nano medicine has concentrated on the development of designer nanoparticles for improved targeting as a means of circumventing biological barriers. The micro- or nanoparticles are frequently administered into the vasculature or targeted vessel for cardiac-related disorders such as atherosclerosis, hypertension, and myocardial infarction are for avoiding problems associated with conventional drug delivery, such as negative systemic side effects [1]. Furthermore, novel nano-drug carriers the circulation can be selectively up taken by immune cells with the intention of modulating inflammatory processes and migrating locally to the plaque for therapeutic payload delivery. Indeed, cutting-edge design in nanoparticle composition, formulation, and functionalization has advanced the field as a means of achieving therapeutic efficacy for a wide range of cardiac disease indications. Current (Cardiovascular Disease) CVD treatments are aimed at restoring normal blood flow through or around the damaged vasculature as well as preventing recurrent cardiovascular insults [2].

Atherosclerosis is the cause of arterial stenosis and decreased blood flow. To stabilize the disease, the most common treatments are medication and surgery. Nanotechnologies are essential in the treatment of vascular disease [3]. After being infused into the circulation, nanomaterial may be able to deliver medications to lesion sites. Nano materials can aid in the performance of therapeutic functions that are difficult to achieve with traditional biomaterials. Nano materials can act as carriers and travel through the endothelium of blood vessels, as well as interfere with the internalization step involved in preloaded drug delivery. There are several distinct types of nanotechnologies for biomedicine that have emerged over the last two decades, each with its own set of features and benefits. Liposomes, NPs, and the use of nano coating techniques are all examples of nanomaterials.

Nanotechnologies are critical for treating vascular disease

The use of nanotechnology in disease treatment is currently focused on cancer, specifically on curing and diagnosing cancer [4]. However, it is beginning to expand into other areas of treatment, specifically the management of CVDs. Current CVD therapies focus on restoring normal blood flow through or around the damaged vasculature and avoiding repeated cardiovascular shocks [5]. Statin treatment reduces the subsequent formation and thickness of atherosclerotic plaques as well as the effects on exterior elastic membranes and fibrous and dense calcium volumes. Dual antiplatelet therapy with cyclooxygenase inhibitors like aspirin and P2Y12 inhibitors like clopidogrel is a first-line treatment for CVD prevention that aims to reduce clot formation and platelet aggregation. There is a need for advancement in these therapies, particularly given the risks associated with taking antiplatelet medication, which has significantly unfavorable side effect profiles and poor patient compliance. Furthermore, some patients may not respond well to antiplatelet medication, which has a negative impact on their long-term prognosis. Individuals who have had an acute myocardial infarction but have a poor response to clopidogrel are at a higher risk of recurrent cardiovascular events during follow-up, according to research. This highlights the need for technological advancements as well as the potential for nano medicine. As a result, novel nanomaterial for disease diagnosis and treatment are urgently needed. Because of their small size, nanomaterial can reach more areas of the heart and arteries, making them ideal for CVDs.

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