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The History and Applications of Targeted Drug Delivery

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Opinion Article

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DESCRIPTION

Targeted drug administration also known as smart drug delivery, is a means of administering medication to a patient in such a way that the concentration of the medication in some portions of the body is higher than in others. This method of delivery is mostly based on nanomedicine, which intends to use nanoparticle-mediated drug delivery to address the shortcomings of conventional drug delivery. These nanoparticles would be drug-loaded and targeted to certain sections of the body with only diseased tissue, avoiding interaction with healthy tissue.

A targeted drug delivery system's purpose is to extend, localise, target and have a safe medication contact with affected tissue. The standard drug delivery technique involves drug absorption across a biological membrane, whereas the targeted release system involves drug release in a dose form. The benefits of the targeted release system include a reduction in the frequency of the patient's dosages, a more uniform action of the medicine, a reduction in drug side effects, and less variability in circulating drug levels. The main disadvantages of targeted drug delivery systems are its expensive cost which makes productivity difficult and its limited capacity to change dosages.

To improve regenerative procedures targeted medication delivery systems have been developed. The system is based on a method that delivers a certain amount of a therapeutic agent to a diseased part of the body over a long period of time. This helps to maintain the proper plasma and tissue drug levels in the body, preventing any drug-induced harm to healthy tissue. The drug delivery system is highly interconnected and optimizing it involves the collaboration of multiple disciplines, including chemists, biologists and engineers.

The medication is transported throughout the body *via* the systemic blood circulation *via* traditional drug delivery modalities such as oral consumption or intravascular injection. Most treatment medications only reach a tiny

section of the diseased organ, such as chemotherapy, where nearly 99% of the chemicals injected do not reach the tumour site. The goal of targeted drug delivery is to concentrate the medication in the tissues of interest while decreasing the relative concentration of the medication in the other tissues. A system, for example, can reach the intended site of action in larger quantities by evading the host's defensive mechanisms and limiting non-specific distribution in the liver and spleen.

Targeted delivery is considered to improve efficacy while reducing side effects. When establishing a targeted release system the following system design factors must be considered: the drug qualities, drug side effects, the route selected for drug administration, the targeted site and the disease.

Increasing development of novel treatments need a regulated microenvironment, which can only be achieved through the use of therapeutic agents whose negative effects can be prevented by targeted drug delivery. Advances in targeted medication delivery to heart tissue will be critical in the regeneration of cardiac tissue.

Active targeted drug delivery is used in certain antibody treatments and passive targeted drug delivery such as the improved permeability and retention effect are the two types of targeted drug delivery (EPR-effect).

Many disorders including cardiovascular disease and diabetes can benefit from targeted drug administration. The most important application of targeted medication delivery, however, the treatment of malignant tumours and the passive technique of tumour targeting capitalize on the Enhanced Permeability and Retention effect (EPR).