Research & Reviews: Drug Delivery

Strategies in Delivering Targeted Drugs in Cancer Therapy

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Opinion Article

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ABOUT THE STUDY

Targeted drug administration, also known as Smart Drug Delivery, is a technique for administering medication to a patient in such a way that the medication is more concentrated in some areas of the body than others. This delivery approach is mostly based on nanomedicine, which intends to use drug administration *via* nanoparticles to overcome the shortcomings of conventional drug delivery. To prevent contact with healthy tissue, these drug-loaded nanoparticles would only be directed to certain regions of the body that only contain diseased tissue.

A Smart delivery system aims to prolong, localise, target, and interact with the sick tissue in a safe manner. The standard drug delivery technique involves the drug being absorbed through a biological membrane, whereas the targeted release system distributes the medication in dose form. The medication will have a more constant effect, the patient will need to take fewer doses more regularly, and there will be fewer side effects.

Targeting methods

Nanoparticles can concentrate in areas of only diseased tissue using one, both, or both of the targeting strategies of passive or active.

Passive nanoparticles targeting: The therapeutic substance is included into a macromolecule or nanoparticle that passively travels to the target organ in order to achieve passive targeting. This can be accomplished by a number of chemicals, Polyethylene Glycol (PEG) being one of them. The surface of the nanoparticle is made hydrophilic by the addition of PEG, enabling water molecules to interact with the oxygen molecules on PEG through hydrogen bonding. This connection causes a film of hydration to form around the nanoparticle as a result.

Active nanoparticles targeting: In order to increase the specificity of a nanoparticle to a target site, active targeting of drug-loaded nanoparticles improves the benefits of passive targeting.

Knowing the characteristics of a cell's receptor for the medicine that will be used to target it is one technique to actively target just sick tissue in the body. Transferrin has been proven to work well as the cell-specific ligand in this type of active targeting.

To specifically target tumour cells with transferrin-receptor mediated endocytosis mechanisms on their membrane, the transferrin was conjugated to the nanoparticle. Comparing this method of targeting to non-conjugated nanoparticles, it was discovered to improve absorption.

Cancer targeted drug delivery

The treatment of malignant tumours is the most significant use of targeted medication delivery. The increased Permeability and Retention (EPR) effect is thus utilised by the passive approach of tumour targeting. This condition is exclusive to tumours and is brought on by poorly functioning lymphatic drainage and rapidly developing blood vessels. Large fenestrae between 100 and 600 nanometres in size emerge as a result of the blood vessels forming so quickly, allowing for improved nanoparticle penetration. Additionally, because there is inadequate lymphatic drainage, the massive inflow of nanoparticles seldom leaves; as a result, the tumour maintains more nanoparticles necessary for effective treatment.

By establishing or supporting a microenvironment prior to the MI, stem cell therapy can be employed to aid in the regeneration of myocardial tissue and restore the contractile function of the heart. The foundation for the emerging discipline of targeted drug delivery to cardiac tissue has been laid by advancements in targeted drug delivery to tumours.

Current study has revealed that tumours have various endothelial surfaces, which inspired the idea of tailored medication delivery to lesions *via* endothelial cell adhesion receptors.

Doctors are also using 3D printing to research the best ways to more effectively target dangerous tumours. The flow of the liquid can be seen by creating a plastic 3D model of the tumour and filling it with the medications needed for therapy. This allows the doses and target areas of the medication to be adjusted.