Research & Reviews: Drug Delivery

Delivery Vehicles for Targeted Drug Delivery System

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Perspective

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ABOUT THE STUDY

Drug delivery vehicles represent different ways that medications can be packaged so that the drug can safely distribute within the body. Some examples are polymeric micelles, liposomes, drug carriers based on lipoproteins, drug carriers in nanoparticles and dendrimers. The perfect medication delivery system should be non-toxic, biocompatible, nonimmunogenic, biodegradable, and unable to be recognized by the host's defense mechanisms.

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Membrane peptides

One method for delivering medication to a specific cell uses peptides. This approach works by the peptide attaching to the surface receptors of the target cell in a way that avoids immune defenses that would otherwise compromise a slower delivery, without harming the host. Peptides in particular have demonstrated a strong affinity for binding in a

target cell, such as ICAM-1. Because of this binding affinity, this approach has shown some promise in the treatment of both autoimmune conditions and other cancers. Due to the ease of making peptides and their low cost of production, peptide-mediated delivery is also promising.

Liposomes

Liposomes are composite phospholipid structures that may also have trace amounts of other compounds present. They have a variety of targeting ligands attached to their surface, enabling their surface-attachment and accumulation in pathological areas for treating disease. The only issue with employing liposomes *in vivo* is their rapid absorption and elimination by the RES system as well as their relatively poor *in vitro* stability. Polyethylene Glycol (PEG) can be added to the liposome surface to help fight this. Circulation time *in vivo* was greatly extended from 200 minutes to 1000 minutes by increasing the mole percent of PEG on the liposomes' surface by 4%-10%.

Dendrimers and micelles

Polymeric micelles are another kind of drug delivery method. These amphiphilic co-polymers, which contain both hydrophilic and hydrophobic monomer units, are used to make them. They can be utilized to transport medications with low solubility. Techniques have been developed that use reactive polymers and a hydrophobic addition to make a bigger micelle that can create a variety of sizes. Dendrimers are delivery agents made of polymers. They feature a core that divides into smaller, spherical, and extremely dense nanocarriers at regular intervals.

Biodegradable components

Locating damaged tissue and delivering a payload as part of a controlled-release therapy are both capabilities of biodegradable particles. It has been discovered that biodegradable particles containing P-selectin, Endothelial selectin (E-selectin), and ICAM-1 ligands stick to inflamed endothelium. Consequently, heart tissue can likewise be treated using biodegradable particles.

Delivery using microalgae

For active drug administration in the lungs and digestive system, there are biocompatible microalgae hybrid micro robots. In experiments with mice, the micro robots showed promise. According to the two research, "antibioticloaded neutrophil membrane-coated polymeric nanoparticles were attached to natural microalgae" and "fluorescent dye or cell membrane-coated nanoparticle functionalized algae motors were further embedded inside a pH-sensitive capsule".

Nanostructures of synthetic DNA

Since artificial nucleic acid Nano devices can be used to target drug delivery based on directly sensing its environment, this possibility has been raised by the success of DNA nanotechnology in creating artificially designed nanostructures out of nucleic acids like DNA and the demonstration of systems for DNA computing. These techniques do not utilize DNA's biological function as a genetic information carrier; rather, they just use it as a, structural component and chemical. A system that releases a medicine solely in reaction to a stimulus, such as a certain mRNA, has the potential to utilize nucleic acid logic circuits as its core.