Review Paper

Targeted drug delivery system: A Review

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Available online at: www.isca.in
(Received 17th March 2011, revised 04th May 2011, accepted 05th May 2011)

Abstract

Targeted drug delivery is a method of delivering medication to a patient in a manner that increases the concentration of the medication in some parts of the body relative to others. Targeted drug delivery seeks to concentrate the medication in the tissues of interest while reducing the relative concentration of the medication in the remaining tissues. This improves efficacy of the while reducing side effects. It is very difficult for a drug molecule to reach its destination in the complex cellular network of an organism. Targeted delivery of drugs, as the name suggests, is to assist the drug molecule to reach preferably to the desired site. The inherent advantage of this technique has been the reduction in dose & side effect of the drug. Research related to the development of targeted drug delivery system is now a day is highly preferred and facilitating field of pharmaceutical world. A quantum dot is a semiconductor nanostructure which is particularly significant for optical applications due to their theoretically high quantum yield. Transdermal devices allow for pharmaceuticals to be delivered across the skin barrier. Molecules as diverse as small radiodiagnostic imaging agents to large DNA plasmid formulations have successfully been delivered inside FR-positive cells and tissue.

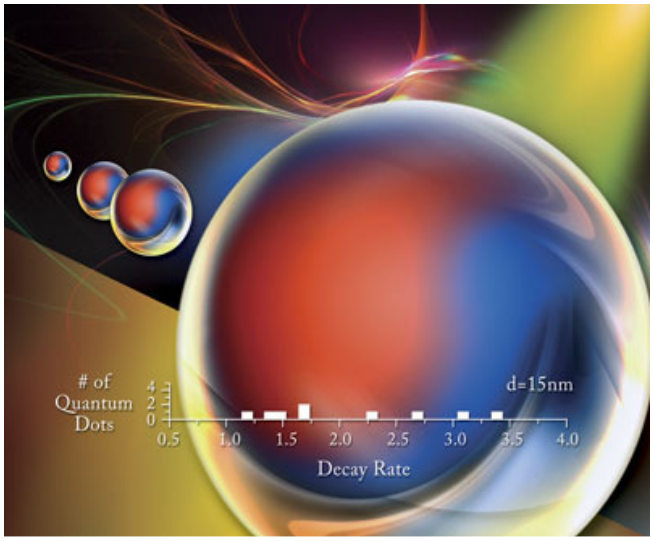
Introduction

Targeted drug delivery is a method of delivering medication to a patient in a manner that increases the concentration of the medication in some parts of the body relative to others. Targeted drug delivery seeks to concentrate the medication in the tissues of interest while reducing the relative concentration of the medication in the remaining tissues. This improves efficacy of the while reducing side effects. This improves efficacy of the while reducing side effects. Drug targeting is the delivery of drugs to receptors or organs or any other specific part of the body to which one wishes to deliver the drugs exclusively. The drug's therapeutic index, as measured by its pharmacological response and safety, relies in the access and specific introduction of the drug with its candidate receptor, whilst minimizing its introduction with non –target tissue. The desired differential distribution of drug its targeted delivery would spare the rest of the body and thus significantly reduce the overall toxicity while maintaining its therapeutic benefits The targeted or site- specific delivery of drugs is indeed a very attractive goal because this provides one of the most potential ways to improve the therapeutic index of the drugs.

Recent approaches

Quantam dots: A quantum dot is a semiconductor nanostructure that confines the motion of conduction band electrons, valence band holes, or excitons (bound pairs of conduction band electrons and valence band holes) in all three spatial directions. The confinement can be due to electrostatic potentials (generated by external electrodes, doping,

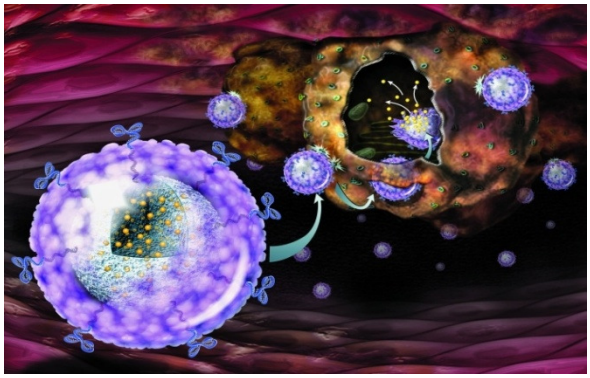
strain, impurities), the presence of an interface between different semiconductor materials (e.g. in core-shell nanocrystal systems), the presence of the semiconductor surface (e.g. semiconductor nanocrystal), or a combination of these. Quantum dots are particularly significant for optical applications due to their theoretically high quantum yield. The ability to tune the size of quantum dots is advantageous for many applications and it is one of the most promising candidates for use in solid-state quantum computation and diagnosis , drug delivery, Tissue engineering, catalysis, filtration and also textiles technologies.



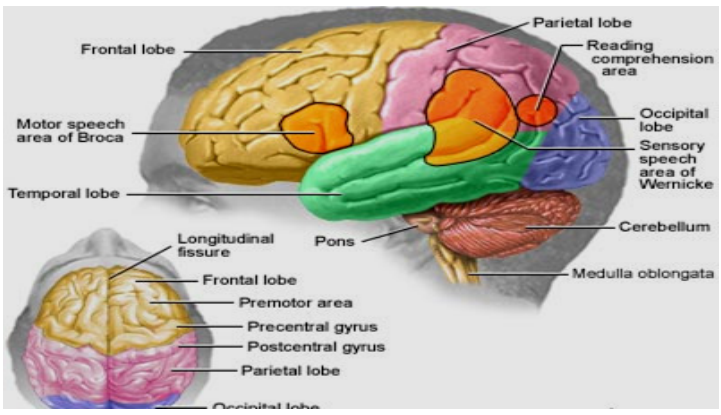
Transdermal Approach: Transdermal drug delivery system is topically administered medicaments in the form of patches that deliver drugs for systemic effects at a predetermined and controlled rate. A transdermal drug delivery device, which may be of an active or a passive design, is a device which provides an alternative route for administering medication. These devices allow for pharmaceuticals to be delivered across the skin barrier. In theory, transdermal patches work very simply. A drug is applied in a relatively high dosage to the inside of a patch, which is worn on the skin for an extended period of time. Through a diffusion process, the drug enters the bloodstream directly through the skin. Since there is high concentration on the patch and low concentration in the blood, the drug will keep diffusing into the blood for a long period of time, maintaining the constant concentration of drug in the blood flow.

Folate Targeting: Folate targeting is a method utilized in biotechnology for drug delivery purposes. It involves the attachment of the vitamin, folate (folic acid), to a molecule/drug to form a "folate conjugate". Based on the natural high affinity of folate for the folate receptor protein (FR), which is commonly expressed on the surface of many human cancers, folate-drug conjugates also bind tightly to the FR and trigger cellular uptake via endocytosis. Molecules as diverse as small radiodiagnostic imaging agents to large DNA plasmid formulations have successfully been delivered inside FR-positive cells and tissues. FA also displays high affinity for the folate receptor (FR), a glycosylphosphatidyinositol-linked protein that captures its ligands from the extracellular milieu and transports them inside the cell via a non-destructive, recycling endosomal pathway.–The FR is also a recognized tumor antigen/biomarker. Because of this, diagnostic and therapeutic methods which exploit the FR's function are being developed for cancer.

Brain targeted drug delivery system: The brain is a delicate organ, and evolution built very efficient ways to protect it. The delivery of drugs to central nervous system (CNS) is a challenge in the treatment of neurological disorders. Drugs may be administered directly into the CNS or administered systematically (e.g., by intravenous injection) for targeted action in the CNS. The major challenge to



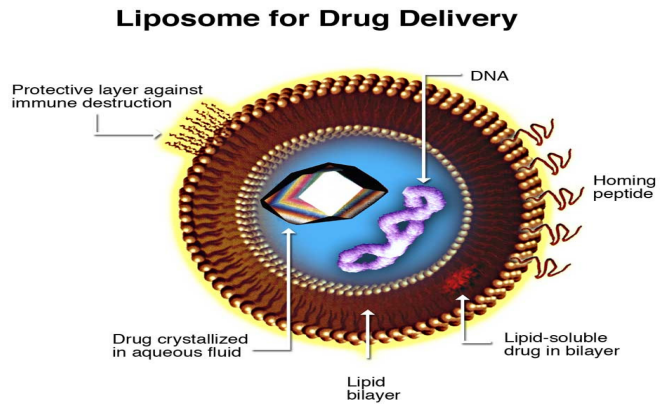
CNS drug delivery is the blood-brain barrier (BBB), which limits the access of drugs to the brain substance. Advances in understanding of the cell biology of the BBB have opened new avenues and possibilities for improved drug delivery to the CNS. Various strategies that have been used for manipulating the blood-brain barrier for drug delivery to the brain include osmotic and chemical opening of the blood-brain barrier as well as the use of transport/carrier systems. Other strategies for drug delivery to the brain involve bypassing the BBB. Various pharmacological agents have been used to open the BBB and direct invasive methods can introduce therapeutic agents into the brain substance. It is important to consider not only the net delivery of the agent to the CNS, but also the ability of the agent to access the relevant target site within the CNS. Various routes of administration as well as conjugations of drugs, e.g., with liposomes and nanoparticles, are considered.



Liposomes: These are vesicular concentric structures, range in size from a nanometer to several micrometers, containing a phospholipids bilayer and are biocompatible, biodegradable and non-immunogenic. Liposomes have generated a great interest because of their versatility and have played a significant role in formulation of potent drugs to improve therapeutics. Enhanced safety and efficacy have been achieved for a wide range of drug classes, including antitumor agents, antiviral, antimicrobials, vaccines, gene therapeutics etc. . Recently pharmaceutical science is using liposomes to reduce toxicity and side effect of drugs. The various problems like poor solubility, short half life and poor bioavailability & strong side effect of various drugs can be overcome by employing the concept of liposomes especially in various diseases like cancer etc. Liposomes offer ample opportunities for the investigators to explore the unidentified breakthrough in the field of pharmaceutical technology.

Conclusion

Research related to the development of targeted drug delivery system is now a day is highly preferred and facilitating field of pharmaceutical world. It has crossed the infancy period and now touching height of growths from the pharmacy point of view. It is very difficult for a drug molecule to reach its destination in the complex cellular network of an organism. Targeted delivery of drugs, as the name suggests, is to assist the drug molecule to reach preferably to the desired site. The inherent advantage of this technique has been the reduction in dose & side effect of the drug. Overall it may be concluded with the vast database of different studies, the science of site specific or targeted delivery of these drugs has become wiser. Manifestation of these strategies in clinical now seems possible in near future.



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