Editorial

Designing therapeutic agents requires receptor targeting and drug delivery for optimal medication to improve health. Although innovative strategies help drug delivery, many therapeutic agents have side effects due to nonspecific binding. Biomedical engineering aims to target the therapeutic agents in controlled release over an extended period of time at specific rate to a targeted location of the body. Generally, administering engineered particles affect organ locally and this process reduces or eliminates the side effects compared to systemic drug delivery [1, 2].

This thematic issue reports recent developments in the field along with the applications. These contemporary approaches provide readers an up to date summary of the current literature and future perspectives for the prospective researchers.

Dr. Hamman explains non-invasive delivery methods of protein and peptide based therapeutics via the oral, transmucosal, and inhalation routes. The study indicates current efforts to stimulate this research area to overcome degradation and absorption problems. A diabetic patient may need 60000 insulin injections and this invasive method is associated with pain and discomfort. For this reason development of the non-invasive methods will definitely increase patient's life quality and these promising efforts will also prevent potential infections due to injections.

Nanoparticles offer a unique solution for non-invasive drug delivery routes especially for protein based therapeutics. Proteins physicochemical properties, their permeability across biological membrane, and susceptibility to degradation limit non-invasive protein delivery. Nanostructured polymeric particles demonstrate significant advantages and Dr. Mitra group reviews applications of polymeric nanocarriers for protein and peptide delivery by non-invasive administrations.

Degradation of protein based therapeutics limits drug delivery to the target area of the body and therefore, drug and macromolecule delivery carriers have been designed. These carriers are serum albumin, transferrin, virus capsids, polyethyleneglycol, polyvinylpyrrolidone, polylactic co-glycolic acid, N-(2-hydroxypropyl) methacrylamide copolymer, polyglutamic acid. Dr. Mukherjee reviews current efforts on protein-polymer conjugates and their advantages, limitations, and clinical trials. These carriers provide potential formulations against several diseases.

A totally different approach to macromolecular drug delivery is cell penetrating peptides. This approach enhances intracellular delivery of therapeutic agents. Currently macromolecular drugs administered by injection due to their liable and unstable nature. Further, cell membrane is also impermeable to the macromolecules and protein based therapeutics as therapeutic candidates must be inside the cell to exert their function. These candidates can be administered via cell penetrating peptides. Dr. Huang work describes how cell penetrating peptides carry their protein cargo with non-covalent interaction for protein therapy.

Side effects of synthetic drugs directed drug designers to natural compounds. Pentacyclic tripeptide phytochemicals have several therapeutic effects however, these compounds have poor solubility and their pharmacokinetic properties must be improved to employ as therapeutic agents. Dr. Soica summarizes the methods to improve pentacyclic tripeptides physiochemical and pharmacokinetic properties by polymeric carriers.

Therapeutic drug delivery to the target depends on physicochemical properties of the drug and its receptor. Several factors may be involved in inadequate drug delivery. A computational model between doxorubicin and solid tumor was studied by Dr. Yun group to elucidate factors involved in drug delivery.

Rest of the thematic issue covers applications based on biological and polymeric carriers for therapeutic agent delivery. An anti-inflammatory effect of solid lipid nanoparticle loaded with fluorescently labeled cyclosporine A was investigated by Dr. Battaliga research group and Dr. Boateng group also employs a biological carrier, chitosan xerogels, for non-invasive delivery of insulin.

Dr. Chavda's studies show drug delivery by mucoadhesive superporous hydrogel hybrids and explain characterization of the carrier along with mathematical models of drug release mechanism.

In the last work, Dr. Patel addressed novel thermo sensitive penta-block copolymers for protein delivery in the treatment of posterior segment diseases. These biodegradable and biocompatible polymers can be used as biomaterial for controlled release and drug delivery.

Approaches to develop physiochemical and pharmacokinetic properties of therapeutic agents with carrier systems have been investigated for the past decades. Recent advances have spawned several approaches and these approaches are expected to improve current technologies.

REFERENCES

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