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Perspective

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Medical Implications of RNA Therapeutics and Drug Delivery Techniques

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DESCRIPTION

Ribo-Nucleic Acid (RNA) therapies are a new type of medical care. Significant study has been given to investigating the therapeutic potentials of several types of RNA therapies, such as Small Interfering RNA (siRNA), Messenger RNA (mRNA), and RNA aptamer. The COVID-19 vaccinations provided by mRNA nanotechnologies are the most recent successful example of RNA therapeutics. Despite the immense potential of RNA therapies in solving major difficulties in treating numerous human diseases and explaining underlying pathophysiological mechanisms, the instability of naked RNA limits its applicability, and properly delivering RNA with integrity remains a difficulty. As a result, the development and application of drug delivery systems is critical in overcoming these obstacles and advancing the clinical translation of RNA therapies. Emerging drug delivery technologies have resulted in significant advances in RNA encapsulation and overcoming biological barriers in the body. It should provide the way for academics and clinicians to explore their interests in a variety of illness situations using RNA therapies and drug delivery nanotechnologies. The current theme issue seeks to provide an overview of the most interesting advancements and breakthroughs in RNA therapeutics and drug delivery, with a focus on how these technologies may impact various medical applications. Some of the emerging investigators and notable scientists will be able to report their findings and offer their perspectives. There are several forms of RNA that can be employed as medicines, including coding RNA and non-coding RNA.

Lipid Nano Particles (LNPs) have been identified as useful delivery agents using RNA nanotechnologies. In order to deliver multiple mRNA modalities for cancer immunotherapy, a variety of nanoparticle platforms, with an emphasis on lipid, polymer, lipid-polymer hybrid, and protein/peptide-conjugates, are frequently utilised. A feasible coating method for producing mRNA vaccines and they used sodium alginate to encapsulate mRNA complexes and evaluated its potential as a Nano vaccine by delivering antigen-mRNA. Biological challenges to pulmonary siRNA distribution and the three potential methods of localised administration of siRNA-based therapies were discussed. They provided a detailed assessment of current advances in non-viral siRNA delivery for the treatment of lung disorders such as infection, inflammation, obstructive pulmonary disease, and cancer. RNA nanotechnology for specific targeting and the use of RNA nanotechnology to display ligands on the surface of exosomes, such as chemical ligands, short peptides, or RNA aptamers, as a developing delivery platform for precise cancer targeting and medication delivery.

Licensed Nurse Practitioner (LNP)-doxorubicin (DOX) substantially inhibited tumour growth in a lymphoma mouse model and provided a platform for the co-delivery of siRNA and DOX for combination cancer therapy. An endosomal pH-responsive nanoplatform to deliver siRNA of Tubulin folding Cofactor E (TBCE) and cisplatin prodrug for improved chemotherapy and overcoming chemo resistance by knocking down TBCE. This co-delivery

approach significantly slows the progression of hepatocellular carcinoma. Long Non-Coding RNAs (lncRNAs) are promising biomarkers and therapeutic targets in cancer. The mechanism and mode of action of lncRNAs were discussed, as well as the current delivery platforms for lncRNAs. They also summarised studies regarding lncRNA as a therapeutic target in cancer. Aptamers are a form of single-stranded DNA or RNA sequence. Aptamers have been thoroughly studied as a targeting ligand for conjugating with other pharmaceuticals to form Aptamer-Drug Conjugates (ApDC) with great targeting effectiveness. The many forms of ApDC, as well as the advances and challenges in the development of ApDC for cancer therapy. Nucleic acid nanoassemblies, as well as the benefits of the advancement of biological applications of RNA-based therapeutic and diagnostic procedures using DNA and RNA nanoassemblies. With the advancement of nucleic acid nanotechnology and the flexibility and deformability of nucleic acids, it is now possible to synthesise nucleic acid with desired shape and structure to form nanoassemblies as innovative treatments and medical devices.