DNA nanotechnology for personalized medicine: from selection to advances therapeutics

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Aptamers are short, single-stranded DNA or RNA sequences obtained from a random oligonucleotide library *via* systematic evolution of ligands by exponential enrichment (SELEX) technology. They can bind to a wide range of targets with high affinity and specificity, including ions, small molecules, proteins, cells, and tissues. Often referred to as "chemical antibodies", their improved thermal and chemical stability, small size, low immunogenicity, and little to no batch-to-batch variation by chemical synthesis make them promising biorecognition tools for numerous applications including diagnosis, drug delivery, therapeutics and pharmaceutical analysis [1].
This presentation introduces the universe of aptamers, highlighting the multiple pathways they can bring specificity to the table when designing biosensors or targeted delivery systems. Our recent advancements in aptamer selection through magnetic bead SELEX technology for glycopeptide antibiotics will be presented, with possible applications in therapeutic drug monitoring and personalized treatment. Other examples include various electrochemical platform designs that combine aptamers and nanomaterials as diagnostic tools for cancer. Moreover, the use of aptamers as targeting agents on the surface of magnetic nanocarriers will be shown, for the development of novel drug delivery systems for hepatocellular carcinoma treatment [2]. The advantages and future directions for the continued development of aptamer-based personalized medicine are also discussed.

References

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