The Torch
Vol. 2 (13)

The current progress of RNA aptamers in therapeutics

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To overcome and reduce the systemic toxicity caused by chemotherapy, novel and improved strategies are being developed by the researchers. One of the strategies to address systemic toxicity is designing the anticancer drug delivery system to target cancer cells effectively to prevent massive amounts of cell death and depletion of immune cells. This is being achieved with RNA aptamer-conjugated liposomes, termed aptamosomes. Anticancer drug-carrying aptamosomes offer specific recognition of cancer cells and targeted cancer therapy. In general, aptamers are single-stranded nucleic acids with stable three-dimensional structures. RNA aptamers are preferred in targeted delivery because they can bind to cell surface proteins as they are cell-specific. They bind and block enzyme activities through protein-protein interaction and act as a new class of therapeutic agents in the treatment of cancer as well as neurological disorders. Thus far, the most established cell-specific RNA aptamers for targeted therapy are the 2′-fluoro modified anti-PSMA (prostate-specific membrane antigen) aptamers that are used to treat human prostate cancer. It has been researched that, RNA aptamers could effectively help in the treatment of cancer as they can prevent metastasis and immune system inactivation, cause depletion of tumour-associated macrophages (TAMs) and myeloid-derived suppressor cells (MDSCs), prevent the growth of tumours by inhibiting receptor tyrosine kinases (RTKs), etc. In neurological diseases treatment, they provide viable options with their small size that allows deep tissue penetration and crossing of the blood-brain barrier. Hence, the larger therapeutic index has made RNA aptamers enter the clinical development pipeline for treating a number of diseases.

Keywords: RNA aptamers, Liposomes conjugated with aptamers, Cancer cell-specific RNA aptamers, Neurological disease treatment

Citation:
Syed Wasfi Fatma Abidi. The current progress of RNA aptamers in therapeutics. The Torch. 2021. 2(13). Available from: https://www.styvalley.com/pub/magazines/torch/read/the-current-progress-of-rna-aptamers-in-therapeutics.