Aptamer

Aptamers (from the Latin aptus - fit, and Greek meros - part) are oligonucleotide or peptide molecules that bind to a specific target molecule.

Aptamers are widely used as molecular recognition elements for detecting and blocking functional biological molecules. Since the common “alphabet” of DNA and RNA consists of only four letters, the chemical diversity of aptamers is less than the diversity of protein recognition elements built of 20 amino acids. Chemical modification of nucleotides enlarges the potential of DNA/RNA aptamers.

Aptamers are usually created by selecting them from a large random sequence pool, but natural aptamers also exist in riboswitches. Aptamers can be used for both basic research and clinical purposes as macromolecular drugs. Aptamers can be combined with ribozymes to self-cleave in the presence of their target molecule. These compound molecules have additional research, industrial and clinical applications.

Classification

More specifically, aptamers can be classified as:

DNA or RNA or XNA aptamers. They consist of (usually short) strands of oligonucleotides. Peptide aptamers. They consist of a short variable peptide domain, attached at both ends to a protein scaffold.

see RNA aptamer

Tetrahedral framework nucleic acid (tFNA), entering U87MG cells and bEnd.3 cells, was chosen to deliver two aptamers, GMT8 and Gint4.T, and paclitaxel. GMT8 and Gint4.T, which specifically bind with U87MG cells and with PDGFRβ, were linked with tFNA, to form Gint4.T-tFNA-GMT8 (GTG). GTG was efficiently internalized by U87MG and bEnd.3 cells and penetrated an in-vitro blood-brain-barrier model. GTG loaded with paclitaxel (GPC) had potentiated anti-glioma efficacy. It inhibited the proliferation, migration, and invasion of U87MG cells, and enhanced apoptosis induction in these cells. The expression of apoptosis-related proteins was significantly changed after treatment with GPC, confirming apoptosis induction. Our study demonstrated that the combination of GTG and paclitaxel has great potential for glioma treatment and tFNA shows great promise for use in drug delivery [1].

1)
Shi S, Fu W, Lin S, Tian T, Li S, Shao X, Zhang Y, Zhang T, Tang Z, Zhou Y, Lin Y, Cai X. Targeted and effective glioblastoma therapy via aptamer-modified tetrahedral framework nucleic acid-paclitaxel Nanoconjugates that can pass the blood brain barrier. Nanomedicine. 2019 Jul 22:102061. doi: 10.1016/j.nano.2019.102061. [Epub ahead of print] PubMed PMID: 31344499.