

Towards targeted cancer therapy: Aptamer or oncolytic virus?

Abstract

Cancer is a leading cause of global mortality. Whilst anticancer awareness programs have increased significantly over the years, scientific research into the development of efficient and specific drugs to target cancerous cells for enhanced therapeutic effects has not received much clinical success. Chemotherapeutic agents are incapable of acting specifically on cancerous cells, thus causing low therapeutic effects accompanied by toxicity to surrounding normal tissues. The search for smart, highly specific and efficient cancer treatments and delivery systems continues to be a significant research endeavor. Targeted cancer therapy is an evolving treatment approach with great promise in enhancing the efficacy of cancer therapies via the delivery of therapeutic agents specifically to and into desired tumor cells using viral or non-viral targeting elements. Viral oncotherapy is an advanced cancer therapy based on the use of oncolytic viruses (OV) as elements to specifically target, replicate and kill malignant cancer cells selectively without affecting surrounding healthy cells. Aptamers, on the other hand, are non-viral targeting elements that are single-stranded nucleic acids with high specificity, selectivity and binding affinity towards their cognate targets. Aptamers have emerged as a new class of bioaffinity targeting elements can be generated and molecularly engineered to selectively bind to diverse targets including proteins, cells and tissues. This article discusses, comparatively, the potentials and impacts of both viral and aptamer-mediated targeted cancer therapies in advancing conventional drug delivery systems through enhanced target specificity, therapeutic payload, bioavailability of the therapeutic agents at the target sites whilst minimizing systemic cytotoxicity. This article emphasizes on effective site-directed targeting mechanisms and efficacy issues that impact on clinical applications.