AS1411 Aptamer-Mediated Targeted Drug Delivery of Doxorubicin-loaded PLGA Nanoparticles to Cancer Cells through Cell Surface Nucleolin

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Abstract

Background & Aim: Nucleolin is one of the most abundant proteins in the nucleolus that is overexpressed on the surface of the plasmic membrane of cancer cells. It has been suggested that nucleolin is a new and promising candidate for effective targeted active-targeted delivery of nanoparticles with anti-nucleolin AS1411 aptamer (hereafter Apt), as a single-strand DNA, into a variety of high nucleolin-expressing cancer cells compared to low nucleolin-expressing cell lines.

Methods: In this study, doxorubicin (Dox), as a chemotherapy drug with a fluorescence nature, was entrapped into the Poly (lactic-co-glycolic acid) (PLGA)-based nanoparticles (NPs). Next, these NPs were conjugated to Apt and the targeting ability of these Apt-NPs was investigated by flow cytometry and cytotoxicity analysis.

Results: As a result, more rapidly internalization of Apt-NPs into C26 and C6 cancer cells was verified compared with L929 as a low nucleolin-expressing cell line. Similarly, the Apt-NPs increased the cytotoxicity effect of Dox compared with NPs and free Dox solution alone.

Conclusion: We think that Apt-NPs, as a ligand, first bind to nucleolin and that the receptor-ligand complex is then incorporated into the cells through receptor-mediated endocytosis pathway. In conclusion, the Apt-NPs were found to be a promising targeted delivery system for therapeutic purposes.

Keywords: Nucleolin, AS1411 aptamer, targeted delivery, PLGA, Doxorubicin