

Synergistic Effect of Doxorubicin-Loaded Silver Nanoparticles - Polymeric Conjugates on Breast Cancer Cells

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Abstract : Cancer is one of the most devastating diseases, and has over than 10 million new cases annually worldwide. Despite the effectiveness of chemotherapeutic agents, their systemic toxicity and non-selective anticancer actions represent the main obstacles facing cancer curability. Due to the effective enhanced permeability and retention (EPR) effect of nanomaterials, nanoparticles (NPs) have been used as drug nanocarriers providing targeted cancer drug delivery systems. In addition, several inorganic nanoparticles such as silver (AgNPs) nanoparticles demonstrated a potent anticancer activity against different cancers. The present study aimed at formulating core-shell inorganic NPs-based combinatorial therapy based on combining the anticancer activity of AgNPs along with doxorubicin (DOX) and evaluating their cytotoxicity on MCF-7 breast cancer cells. These inorganic NPs-based combinatorial therapies were designed to (i) Target and kill cancer cells with high selectivity, (ii) Have an improved efficacy/toxicity balance, and (iii) Have an enhanced therapeutic index when compared to the original non-modified DOX with much lower dosage. The in-vitro cytotoxicity studies demonstrated that the NPs-based combinatorial therapy achieved the same efficacy of non-modified DOX on breast cancer cell line, but with 96% reduced dose. Such reduction in DOX dose revealed that the combination between DOX and NPs possess a synergic anticancer activity against breast cancer. We believe that this is the first report on a synergic anticancer effect at very low dose of DOX against MCF-7 cells. Future studies on NPs-based combinatorial therapy may aid in formulating novel and significantly more effective cancer therapeutics.

Keywords : nanoparticles-based combinatorial therapy, silver nanoparticles, doxorubicin, breast cancer

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