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Co-delivery of gene and therapeutic agents using pH-responsive AG@CaP nanoparticles to enhanced anti-tumor efficacy

Wei-Ming Li
National Chiao Tung University, Taiwan

In cancer treatments, existing chemotherapeutic drugs are far from perfect, with undesirable severe side effects, high toxicity, and the development of drug resistance.

The combination of therapeutic drug and gene therapy has been developed to solve these problems. In this study, we designed a co-delivery system loading chemotherapeutic drug curcumin and gene agent pORF-hTRAIL by coprecipitation method to from amphiphilic gelatin@calcium phosphate (AG@CaP) core/shell nanoparticles. The AG@CaP demonstrated a highly pH-sensitive controlled drug release behavior, could improve the efficacy and safety of drug delivery. In addition, we reported the AG@CaP delivery system capable of drug delivery based on the function of CaP shell that is expected to dissociate in the endosomes/lysosome to induce endosomal/lysosomal membrane disruption with high osmotic pressure. It is the key issue in gene therapy to efficiently deliver a therapeutic gene into target cells. In vitro release of curcumin was fast at pH 5.0 (intracellular environment) than pH 7.4 (blood). The combination treatment resulted in a synergistic growth inhibition in MCF-7 cancer cells. We suggest that the curcumin/pORF-hTRAIL has been proposed to minimize the amount of each drug and to achieve the synergistic effect for cancer therapies.

qqw1220@gmail.com