

Lipid-polymer Nanocarrier Platform Enables X-Ray Induced Photodynamic Therapy against Human Colorectal Cancer Cells

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Abstract : In this study, we brought together X-ray induced photodynamic therapy (X-PDT) and chemo-drug (5-FU) for the treatment on colorectal cancer cells. This was achieved by developing a lipid-polymer hybrid nanoparticle delivery system (FA-LPNPs-VP-5-FU). It was prepared by incorporating a photosensitizer (verteporfin), chemotherapy drug (5-FU), and a targeting moiety (folic acid) into one platform. The average size of these nanoparticles was around 100 nm with low polydispersity. When exposed to clinical doses of 4 Gy X-ray radiation, FA-LPNPs-VP-5-FU generated sufficient amounts of reactive oxygen species, triggering the apoptosis and necrosis pathway of cancer cells. Our combined X-PDT and chemo-drug strategy was effective in inhibiting cancer cells' growth and proliferation. Cell cycle analyses revealed that our treatment induced G2/M and S phase arrest in HCT116 cells. Our results indicate that this combined treatment provides better antitumour effect in colorectal cancer cells than each of these modalities alone. This may offer a novel approach for effective colorectal cancer treatment with reduced off-target effect and drug toxicity.

Keywords : pdt, targeted lipid-polymer nanoparticles, verteporfin, colorectal cancer

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