

X-ray triggerable photodynamic therapy for colorectal cancer treatment based on lipid-polymer hybrid nanoplatform

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X-ray triggerable photodynamic therapy (X-PDT) has been explored as an alternative method for deep tumours, which utilizes X-ray as an energy source to activate reactive oxygen species (ROS) generation, similarly to photodynamic therapy. However, conventionally X-PDT effect was induced by photosensitisers assisted by either metal-based scintillators or radiosensitisers. In this work, the photosensitiser verteporfin loaded in a folate targeted lipid-polymer hybrid nanoplatform was directly activated by X-ray irradiation to generate ROS without any scintillators or radiosensitizer enhancement. This strategy exhibited effective in vitro cytotoxicity on HCT116 cell viability, causing over 75% cells death. It also controlled the tumour growth in an orthotopic mouse model bearing colorectal cancer, with only a fraction of radiotherapy dose (4 Gy). Our study establishes an effective strategy to treat colorectal cancer in a clinically relevant tumour model, offering prospects for clinical translation of this technology for deep seated cancers.