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ABSTRACT

Photodynamic therapy (PDT) shows great potential in anti-cancer therapy. The efficiency of PDT is greatly limited by the hypoxia environment in tumors. However, current methods developed to conquer this problem did not accurately produce oxygen for PDT of a certain amount and in a certain position, which could bring a potential risk to normal cells and tissues. Here, upconverting nanoparticles (UCNPs) and gold oxide (Au_2O_3) were integrated to prepare an efficient, self-supported, oxygen generation nano-platform in a hypoxia environment. Upon a near-infrared (NIR) laser, Au_2O_3 could produce oxygen assisted by UCNPs through the fluorescence resonance energy transfer (FRET) effect. This light-controlled, self-supported oxygen generation system effectively provided oxygen for the as-loaded photosensitizer chlorin e6 (Ce6) in PDT upon NIR irradiation, which enhanced the inhibition effect of the tumor cells, in both *in vitro* and *in vivo* experiments. The present strategy of light-induced, oxygen-producible promoted PDT may solve the long-standing contradiction between the oxygen-dependent working mechanism of PDT and hypoxia microenvironments in tumor cells.

Keywords: Au_2O_3, photodynamic therapy, hypoxia microenvironment, upconversion

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