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Self-Carried Theranostic Nanoparticles for in vitro and in vivo Cancer Therapy with Real-Time Monitoring of Drug Release

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Abstract : The use of different nanocarriers for delivering hydrophobic pharmaceutical agents to tumor sites has garnered major attention. Despite the merits of these nanocarriers, further studies are needed for improving their drug loading capacities (typically less than 10%) and reducing their potential systemic toxicity. So development of alternative self-carried nanodrug delivery strategies without using any inert carriers is highly desirable. In this study, we developed a self-carried theranostic curcumin (Cur) nanodrug for highly effective cancer therapy in vitro and in vivo with real-time monitoring of drug release. With a biocompatible C18PMH-PEG functionalization, the Cur nanoparticles (NPs) showed excellent dispersibility and outstanding stability in physiological environment, with drug loading capacity higher than 78 wt.%. Both confocal microscopy and flow cytometry confirmed the cellular fluorescent “OFF-ON” activation and real-time monitoring of Cur molecule release, showing its potential for cancer diagnosis. In vitro and in vivo experiments clearly show that therapeutic efficacy of the PEGylated Cur NPs is much better than that of free Cur. This self-carried theranostic strategy with real-time monitoring of drug release may open a new way for simultaneous cancer therapy and diagnosis.

Keywords : drug delivery, in vitro and in vivo cancer therapy, real-time monitoring, self-carried
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