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ABSTRACT

The development of safe and efficient diagnostic/therapeutic agents for treating cancer in clinics remains challenging due to the potential toxicity of conventional agents. Although the annual incidence of neuroblastoma is not that high, the disease mainly occurs in children, a population vulnerable to toxic contrast agents and therapeutics. We demonstrate here that cancer-targeting, gas-generating polymeric nanoparticles are useful as a theranostic tool for ultrasound (US) imaging and treating neuroblastoma. We encapsulated calcium carbonate using poly(D,L-lactide-*co*-glycolide) and created gas-generating polymer nanoparticles (GNPs). These nanoparticles release carbon dioxide bubbles under acidic conditions and enhance US signals. When GNPs are modified using rabies virus glycoprotein (RVG) peptide, a targeting moiety to neuroblastoma, RVG-GNPs effectively accumulate at the tumor site and substantially enhance US signals in a tumor-bearing mouse model. Intravenous administration of RVG-GNPs also reduces tumor growth in the mouse model without the use of conventional therapeutic agents. This approach to developing theranostic agents with disease-targeting ability may provide useful strategy for the detection and treatment of cancers, allowing safe and efficient clinical applications with fewer side effects than may occur with conventional agents.

KEYWORDS

Gas-generating nanoparticle; Neuroblastoma; Theranostic system; Rabies virus glycoprotein