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Dual-imaging enable nanoparticles for diagnosis and therapy of prostate cancer

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Abstract

With an increasing rate of cancers, the need for effective cancer management has led to the development of theranostic systems for cancer diagnosis and therapy. Conventional techniques for cancer management, however, have limited success due to inaccurate diagnosis and systemic toxicity of therapeutic reagents. Using novel biodegradable photoluminescent polymers developed in our group and superparamagnetic nanoparticles (MNPs), we have developed prostate cancer cell-selective dual-imaging enabled nanoparticles to overcome a few limitations of conventional technologies. These nanoparticles were synthesized and characterized for their properties *in vitro*. The stable and well dispersed nanoparticles had an average diameter of about 200 nm and displayed strong superparamagnetic properties. Dual-imaging capabilities of these nanoparticles via optical imaging and magnetic resonance imaging (MRI) demonstrated that nanoparticles exhibited bright fluorescence under UV light and dark negative contrast in MRI. Moreover, cytocompatibility studies conducted with human dermal fibroblasts using MTS assays showed excellent cytocompatibility up to a concentration of 500 µg/ml. Furthermore, cellular uptake studies using two different prostate cancer cells, PC3 and LNCaP, demonstrated a dose-dependent nanoparticle uptake. The presence of external magnetic field also reinforced the uptake of these nanoparticles by prostate cancer cells. In addition, these nanoparticles released the model drug, Doxorubicin, in a sustained manner up to 3 weeks. Our results suggest that these nanoparticles possess unique capabilities for prostate cancer cell-selective uptake, magnetic targeting, dual-imaging and controlled drug release, and could be used for prostate cancer diagnosis and therapy in the future.

Biography

Dr. Nguyen received her training from the University of Minnesota (B.S. in 1995) and Rice University (Ph.D. in 2000). Currently, she is an Associate Professor in the Department of Bioengineering at the University of Texas at Arlington. Her research expertise covers a broad area of biomaterials, cellular engineering, tissue engineering, and micro-/nanoparticles for controlled drug delivery and tissue engineering applications.