

Multicompartment intracellular self-expanding nanogel for targeted delivery of drug cocktail

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Abstract

The combination of antiretrovirals of different acting mechanisms, known as cocktail therapy, has been proven highly effective in suppressing HIV replication and widely used to control the progression of AIDS. Inspired by the success of AIDS treatment, scientists have investigated anticancer drug combination for the treatment of various types of cancer. Whereas, the translation of this theoretical advantage to benefit the patient is hindered by their associated side effects: (i) the potent toxic drug combination can damage normal cells while it kills cancer cells, (ii) the potential drug-drug interaction can deteriorate patient health condition, and (iii) the consequence of side effect results in poor patient compliance.

In order to enhance the efficacy of anticancer drugs while attenuating their associated side effects, we designed a nano-cocktail delivery system, NCPD nanogel, which is sensitive to both acidic pH and redox potential. NCPD has a multicompartment structure with a size around 134 nm and slightly negative surface charge. Drug loaded nanogels are stable in physiological environment while spontaneous swelling and fast releasing its payload after it entering cancer cells with the help of $\alpha_v\beta_5$ integrin mediated endocytosis. NCPD, due to its enhanced cellular uptake and dual responsive releasing property, displays much stronger synergism than its free drug counterpart. We expect that NCPD can significantly attenuate the side effect of drug cocktail while achieving a boosted synergistic anticancer effect.

Biography

Peisheng Xu is an Assistant Professor of Pharmaceutics at the University of South Carolina. He received his Ph.D. degree in Chemical Engineering in 2007 from the University of Wyoming and then moved to Purdue University working as a postdoctoral associate. His research interests are Nanomedicine and Biomaterials. He has authored 20 research articles. Dr. Xu won the New Investigator Award from the American Association of College of Pharmacy. Currently he also serves as an editorial board member for *Pharmaceutica Analytica Acta*.