

Theranostic nanoparticles for personalized cancer therapy

Lily Yang

Emory University School of Medicine, USA

Resistance to therapy and development of recurrent tumors are the major challenges in clinical oncology. Human tumors are highly heterogeneous with multiple genetic and signal pathway abnormalities. Effective cancer treatment will require integrated approaches that include early detection, targeted therapy, and tumor imaging for monitoring treatment responses. Multifunctional nanoparticles offer great opportunities to develop novel image-treatment approaches that are based on the single nanoparticle platforms. We have developed multifunctional magnetic iron oxide nanoparticles (IONPs) that are targeted to epidermal growth factor receptor, Her-2/Neu, and urokinase plasminogen activator receptor, which are cellular receptors highly expressed in many types of human cancers. These receptor-targeted IONPs are engineered to carry single or multiple drugs for targeted delivery, multi-modality tumor imaging for monitoring treatment responses, and image-guided surgical removal of drug resistant tumors. We have shown specificity and sensitivity of tumor imaging using those nanoparticles in orthotopic human breast, pancreatic and ovarian cancer xenograft models. We further developed theranostic nanoparticles by encapsulating or conjugating drugs into the nanoparticles. Efficacy of targeted therapy and MRI-monitoring drug delivery and response after systemic delivery of the theranostic nanoparticles has been demonstrated in above animal tumor models. To prevent tumor recurrence, hand-held imaging devices have also been developed for image-guided surgery to detect and remove drug resistant tumor lesions in the surgical cavity. The ultimate goal of our research is to translate the targeted therapy and image-guided treatment and surgery protocol into clinical applications for personalized management of cancer patients.

Biography

Dr. Yang is Nancy Panoz Chair of Surgery in Cancer Research and Professor of Surgery at Emory University School of Medicine. Yang received her medical training at West China University of Medical Sciences and then PhD degree at Brown University. After postdoctoral training at the University of Southern California, she joined Department of Surgery at Emory University as a faculty member. Her research experiences include liver cancer stem cells, gene therapy, apoptosis, targeted cancer therapy, and cancer nanotechnology. Dr Yang has been working on the development of multifunctional nanoparticles for cancer detection, targeted drug delivery, and image-guided treatment.

lyang02@emory.edu