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Quantitative imaging of inflammation toward diagnosis of systemic inflammation and tumor growth

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Dysregulated host inflammatory response causes many diseases, including cardiovascular and neurodegenerative diseases, cancer, and sepsis. Sensitive detection of the site of inflammation will, therefore, produce a wide-ranging impact on disease diagnosis and treatment. We hypothesized that nanoprobes designed to mimic the molecular interactions occurring between inflamed leukocytes and endothelium may possess selectivity toward diverse host inflammatory responses. To incorporate inflammation-sensitive molecular interactions, superparamagnetic iron oxide nanoparticles were conjugated with integrin lymphocyte function-associated antigen (LFA)-1 I domain, engineered to mimic activated leukocytes in physiology. Whole body optical and magnetic resonance imaging in vivo revealed that leukocyte-mimetic nanoparticles localized preferentially to the vasculature within and in the invasive front of the tumor, as well as to the site of acute inflammation. This study presents the first demonstration of in vivo detection of tumor-associated vasculature with systemically injected inflammation-specific nanoparticles, presenting a possibility of tumor detection by inflamed tumor microenvironment.

Biography

Moonsoo Jin received his doctoral degree at MIT, followed by his postdoctoral training in what can be broadly defined as protein engineering and design at Harvard Medical School. In 2006, he joined Cornell University as a faculty in the department of Biomedical Engineering. His lab uses multi-scale, interdisciplinary approaches to developing proteins for therapy and diagnosis applications. He has received numerous prestigious awards including Scientist Development Grant from the American Heart Association and NIH Transformative R01 Grant. He also started a biotech company, Nanomedik, Inc., which aims to translate nanotechnology to clinics.