Award ID:
RP170564

Project Title:
Super-resolution imaging of tumor angiogenesis in deep tissue with high specificity and sensitivity

Award Mechanism:
Individual Investigator

Principal Investigator:
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Entity:
The University of Texas at Arlington

Lay Summary:

Tumor angiogenesis is the growth of new blood vessels to provide nutrients and oxygen for tumor growth. Without angiogenesis, tumor cannot grow beyond 1-2 mm and the possibility of cancer metastasis is significantly reduced. Angiogenic blood vessels in a cancerous tumor have many unique features compared with in normal tissues or benign lesions. Imaging tumor angiogenesis based on these features is playing important roles in cancer diagnosis, post-therapy assessment and prognosis. Unfortunately, several challenges significantly limit current technologies. First, current clinical imaging technologies are limited in spatial resolution (i.e. how small vessels in size can be resolved, usually >0.5 mm) and difficult to resolve small angiogenic vessels in deep tissue. Second, current imaging technologies have a tradeoff between spatial resolution and sensitivity (i.e. how small amount of contrast agents can be detected). Third, how to specifically image the wanted biomarkers (such as proteins and molecules that regulate tumor blood vessel growth) and how to image their interactions have been challenging for many years. Few existing imaging technologies can address them. We propose to develop a new imaging technology, ultrasound-switchable fluorescence (USF) imaging, to address above challenges. Our previous successes highly encourage us to develop this promising technology to make it more robust and powerful. Importantly, we will address a more challenging task, i.e. improving imaging specificity via multiplex USF imaging. If successful, with the high resolution, sensitivity and specificity, tumor angiogenesis can be imaged much earlier, more accurate and precise, and more sensitive and specific, which is highly desired for cancer diagnosis, treatment evaluation and prognosis. It has high potentials in future to be applied for human cancer in breast, prostate (via catheter), head and neck, thyroid, skin, ovary, etc.