The Office of Technology Management

UNIVERSITY OF TEXAS ARLINGTON

Tech ID: UTA 11-13

Biomedical Super-Resolution Imaging based on Ultrasound-Switchable Fluorescence

INVENTOR: Baohong Yuan

TECHNOLOGY NEED

Noninvasive imaging of tumor structural, functional and molecular abnormalities plays significant roles in tumor detection, diagnosis, post-therapy assessment and drug development. Therefore, it is highly desirable to image tissues as early as possible at a reasonable depth. Currently available noninvasive imaging techniques are significantly limited in spatial resolution, imaging depth and contrast sensitivity. Although photoacoustic (PA) techniques have significantly improved spatial resolution, it is still not high enough to resolve small targets such as tumor microvessels. Also, its 3mm imaging depth limits its application to superficial tissues only. Therefore, there is a need for a technology that not only has high resolution but also has high imaging depth and high contrast sensitivity.

INVENTION DESCRIPTION/SOLUTION

Super resolution macroscopy (SR-Mac), a system based on fundamentally different principle, ultra-sound switchable fluorescence (USF), has been developed to address the resolution and depth issues of the conventional systems. The USF technology uses an environment-sensitive near infrared (NIR) fluorescent dye whose fluorescence exhibits a switch-like function of the temperature. When ultrasound waves are focused on a tissue containing fluorophores, temperature at the focus increases above the threshold temperature switching the fluorophores. The fluorophores emit light which is delivered centimeters deep via light scattering. The resulting ultrasound induced photons are used to image the tissue. Additionally, the image has high resolution as the photons are activated only from the region around the ultrasound focus. Thus, the proposed SR-Mac simultaneously achieves both high resolution and large imaging depth with high optical sensitivity to contrast, which has not been achieved by other imaging modalities.

APPLICATIONS

- Cancer mechanisms, tumor biology, drug development
- Imaging cancers and small tumor angiogenic microvessels in deep tissues
- Monitoring deep tissue damage recovery

KEY BENEFITS

- Super high-resolution (tens of microns) imaging in deep tissue (tens of millimeters)
- Depth-to-resolution ratio of 300-1000 (current barrier of 100)
- Cost efficient than CT, MRI, PET and SPECT
- Non-ionized radiation
- Both vascular and extravascular molecules can be imaged

STAGE OF DEVELOPMENT

Prototype

INTELLECTUAL PROPERTY STATUS

Patents pending in
-Australia
-Brazil
-Canada
-China
-Egypt
-India
-Japan
-Mexico
-USA
-South Africa

RELATED TECHNOLOGY

- **UTA 11-28 Noninvasive imaging of Blood Pressure in the Microvasculature of the Retina**
- **UTA 16-27 Tissue thermometry via multi-color ultrasound-switchable fluorescence (MC-USF)**
- **UTA 16-50 Highly Specific Tissue Imaging**

More about the Inventor:

Baohong Yuan

Contact information

For licensing, please contact
Sharon Ngwenya, Ph.D.
(Licensing Associate)
sngwenya@uta.edu
otm@uta.edu
P: 817.272.1130

Our mailing Address:

The Office of Technology Management
701 S Nedderman drive,
Suite 350, Arlington, TX 76019

Connect with us: