

Nayar Prize I, Phase II Quarterly Progress Report (Q5) January 2018

Project: ADEPT Cancer Imager
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Progress Summary of Nayar Prize I, Phase II, Quarter 5

Highlights:

- (1) *October 30, 2017:* Jovan and Ken met with Catherine Vorwald, Associate Vice Provost of Technology Development at Illinois Institute of Technology, and Jim McGough, co-founder of EdgeOne Medical Inc., to discuss the commercialization potential of ADEPT System.
- (2) *November 20, 2017:* The first fluorescence tomographic image of a pig lymph node loaded with 200-micron diameter fluorescence beads to mimic tumor burden was collected on the ADEPT system.

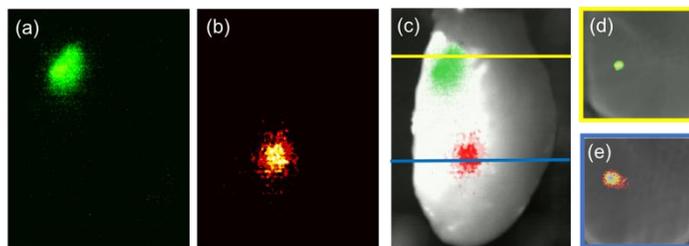


Figure 1. False-colored fluorescence images from a single projection of a porcine lymph node with two fluorescent inclusions. Fluorescence signal of an (a) IRDye 800CW inclusion, (b) IRDye 700DX inclusion, and (c) fluorescent signals overlaid onto a white light image (d, e). Reconstructed transverse sections of inclusions within the node: corresponding slices highlighted by the yellow and blue lines in (c).

- (3) *November 29, 2017:* A revised version of an article with a full description of the ADEPT system was submitted for publication to the journal *Review of Scientific Instruments*:

- a. L Sinha, M Fogarty, W Zhou, JG Brankov, KM Tichauer. Design and characterization of a dead-time regime enhanced early photon projection imaging system. *Review of Scientific Instruments*. (Reference #: A171660R)
- (4) *December 5, 2017*: The ADEPT team met with Marcia Faye and her team to discuss and plan for an article on the ADEPT System in the spring issue of *IIT Magazine*.
- (5) *December 15, 2017*: Two abstracts on the ADEPT work were submitted to Optical Society of America: Biomedical Optics Conference (OSA Biomed) 2018 in April 2018, Hollywood, FL:
 - a. VC Torres, C Li, L Sinha, JG Brankov, KM Tichauer. Demonstration of dual channel fluorescent optical projection tomography to guide lymph node pathology.
 - b. L Sinha, JG Brankov, KM Tichauer. Image resolution improvements in optical imaging: comparison of angular vs. time-domain restriction of highly scattered photons.
- (6) *December 20, 2017*: Novel rapid approach for staining and rinsing whole lymph nodes was developed in pig node model.

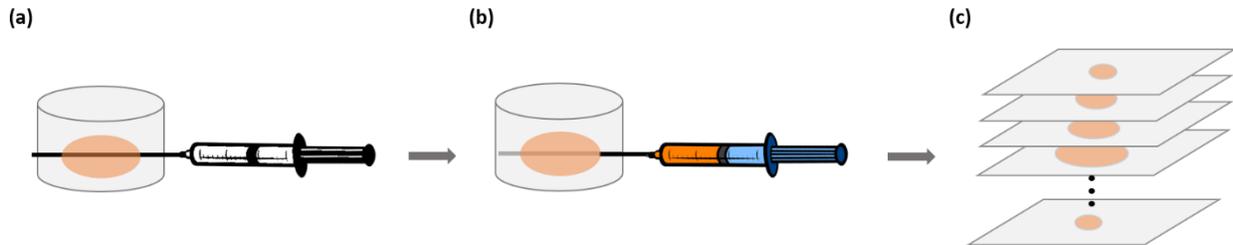


Figure 2. Stepwise illustration of injected diffuse lymph node staining and rinsing procedure. (a) Embedded lymph node was punctured through by a 27-gauge syringe-needle to create a linear channel. (b) Needle was withdrawn and followed by injection of a 500- μ L cocktail of imaging agents for staining and a 200 μ L PBS for rinsing. (c) Lymph nodes serial frozen-sectioned were performed at 80- μ m intervals and spatial distribution of fluorescence in lymph nodes was investigated by cross-sectional fluorescence image.

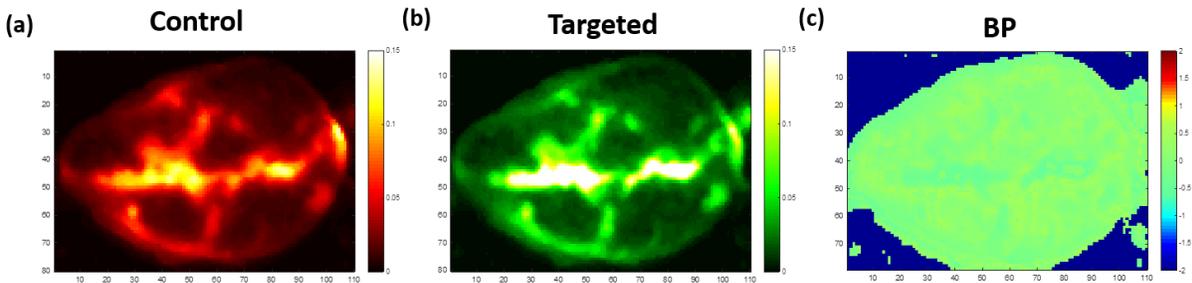


Figure 3. Images of cross-sectional pig lymph node after injected diffuse staining. The images shown in (a) and (b) are the uptake of both imaging agents in the entire lymph node. Fluorescence signals were acquired at 700 nm channel (false-colored red), indicating hydrolyzed IR700DX, and at 800 nm channel (false-colored green), indicating IR800CW labelled ABY-029 affibody. The binding potential map of entire lymph node on a pixel-by-pixel basis is presented in (c) in the absence of binding.

- (7) *January 5, 2018:* Three conference proceedings on the ADEPT work were submitted for publication in *SPIE Conference Proceedings*:
- L Sinha, JG Brankov, KM Tichauer. Getting more early photons with less background: detection rate and signal-to-background improvements in enhanced early photon imaging.
 - C Li, X Xu, Y Basheer, HA Sattar, JG Brankov, KM Tichauer. Paired-agent fluorescent imaging to detect micrometastases in breast sentinel lymph node biopsy.
 - N Sadeghipour, SC Davis, KM Tichauer. Quantifying cancer cell receptors with paired-agent fluorescent imaging: a novel method to account for tissue optical property effects.