TWO-PHOTON FLUORESCENCE MEASUREMENT OF A TARGETED NANODEVICE USING A SENSITIVE DOUBLE CLAD OPTICAL FIBER

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Abstract
Fluorescence quantification in tissues using conventional techniques is problematic owing to the absorption and scattering of light in the tissues. Whole body fluorescence imaging techniques do not provide accurate minimally invasive technique for quantifying fluorescence in solid tumors in live mice in a real-time basis (Tolias, A. Proceedings of SPIE, 2005, 5700: p. 23-27). In-house studies have used a single mode-coherent light source (SMF) through which targeted tumor doses were delivered by the tumor, which retained as is to appear for normal minimally invasive fluorescence techniques. It is essential that a more significant improvement over traditional single-clad fibers.

The targeted nanodevice G5-6T-FA specifically binds and internalizes into FA-receptor-expressing KB cells in vitro, as determined by flow cytometry and confocal microscopy. Blue: Nuclei stained with DAPI; Red: 6-TAMRA fluorescence

Conclusions
This study demonstrates that the DCF/TPOFF probe has about 4-fold lower tissue detection limit in comparison to an SMF probe. The improved sensitivity of the DCF vs. SMF and the application of a small 30-gauge needle make this a superlative optical fiber probe technique in quantifying fluorescently tagged nanoparticles and for monitoring targeted drug delivery in deep tissues. Nanomolar quantities of multiple fluorophores with different excitation wavelengths or having different lifetimes could be discriminated and quantified using the technique described here. We envision that the TPOFF probe will serve as a minimally invasive diagnostic tool for screening tumor markers such as the human EGF-receptor 2 (HER2) in women with breast cancer, when used in conjunction with a fluorescent marker such as the fluorescently tagged antibody Herceptin.