Highly Sensitive Fluorescent Dyes for Near Infrared Multiphoton Bio-Imaging of Complex Biological Systems and Subcutaneous Tissue

Advantages
- The probes increased sensitivity requires lower intensities of excitation light, thereby decreasing the amount of light induced damage to both the specimen and probes themselves
- Excitability over a broad range of near infrared wavelengths allows for deeper tissue penetration and minimal damage to the sample area

Invention
Method and apparatus for the synthesis of two-photon absorbing fluorescent probes for biological and biomedical imaging [U.S. Patents 7,253,287 and 7,282,514]

Background
Two-photon fluorescence is quickly becoming the premier technique for nondestructive 3-D imaging in the biological and biomedical research fields for both living and nonliving systems. Fluorescent probes are targeted to various molecular bodies within a biological system and excited with specific wavelengths of light. These probes then absorb the excitation light and fluoresce (or release) light of a different wavelength which is then visualized with a conventional fluorescent microscope. Unfortunately, current fluorescent probes are not optimized for two-photon absorption utilizing near infrared wavelengths of light. This causes the currently available probes to exhibit low sensitivity, and requires the utilization of high intensities of light to acquire any fluorescence signal. These high intensities can damage the specimen under investigation and cause decomposition of the probes themselves, leading to an even greater decrease in fluorescence.

Researchers at UCF have developed efficient two-photon fluorescence probes for bio-imaging purposes. These probes exhibit extreme sensitivity to light in the near infrared range, and are designed for site-specific biological labeling of molecular bodies (e.g. proteins, antibodies and DNA). These probes provide several advantages over existing compounds. The probe’s higher sensitivity, allows for the utilization of lower intensities of light to acquire a fluorescence signal for imaging. This greatly reduces the decomposition of the probe and is less damaging to tissues and specimens. Additionally, since broad range near infrared light is not readily absorbed by most cells within the body, signals can be seen far past a specimen’s surface. Thus the invention is the creation of a near infrared two-photon fluorescent molecular probe with increased sensitivity and longevity, which can be utilized for imaging a wide range of biological systems including well below the skins surface.

Application
The synthesis methods for creating this highly desirable two-photon molecular probe can be utilized by research and developmental supply manufactures, including the molecular probes industry, to provide a product with superior longevity and sensitivity. Their product could then be conjugated to various molecular bodies for labeling biological systems, and utilized for bio imaging and diagnostics applications. Any probe which utilizes nondestructive near infrared excitation light would be highly desirable for subcutaneous fluorescent imaging and diagnostics by the biomedical industry.

Lead Inventors
K. D. Belfield, Ph.D.

Selected References
Belfield, K.D., et al./ Fluorene-based fluorescent probes for two-photon imaging applications/ Polymer Preprints (American Chemical Society, Division of Polymer

Contact: John Miner; University of Central Florida; Office of Research and Commercialization, 12201 Research Parkway, Suite 202, Orlando, FL 32826-3246
Phone: (407) 882-1136; Fax: (407) 882-9010; jminer@mail.ucf.edu UCF IP #30333 & 31114