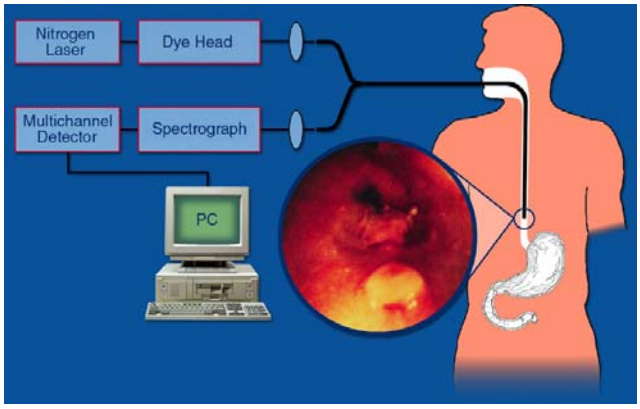
Laser-induced fluorescence (LIF) sensor for cancer diagnostics

Scientists in the ORNL's Advanced Biomedical Science and Technology Group and collaborators at the Thompson Cancer Survival Center have developed a minimally invasive optical diagnostic procedure based on laser-induced fluorescence (LIF) for *in-vivo* cancer diagnosis without requiring biopsy.

Technical Concept

The diagnostics procedure uses the differential normalized fluorescence (DNF) that is designed to enhance small but consistent spectral differences between the normal and malignant tissues. This technique greatly improves the accuracy of diagnosis for malignant tissue. As a result of this normalization procedure, the differences in spectral features between the normalized fluorescence spectra of normal and malignant tissues become more easily detectable.



Endogenous fluorescence of normal and malignant tissues was measured directly using a fiberoptic probe inserted through an endoscope. The measurements were performed *in vivo* during routine endoscopy. Using laser excitation, the detection of the fluorescence signal from the tissue was performed instantaneously (within less than a second). The methodology was applied in a clinical study involving over 200 patients to detect cancer of the esophagus. The results of this DNF approach were compared with histopathology results of the biopsy samples and indicated excellent agreement (98% agreement) in the classification of normal tissue and malignant tumors for this study.

Development Approach

We are currently further developing the LIF technique into a multi-spectral imaging (MSI) modality for the *in-vivo* diagnosis of cancer and dysplasia. The development approach of the novel MSI system is based on the synchronous luminescence methodology, acousto-optic tunable filters (AOTFs) and advanced imaging fiberscope technologies.

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