Joint Department of

BIOMEDICAL ENGINEERING

UNC CHAPEL HILL | NC STATE UNIVERSITY

Coulter Seminar Series Presents

"Convergence of light, devices, and molecules to detect and treat cancer"

Samuel Achilefu, PhD, FRSC

Michel M. Ter-Pogossian Professor of Radiology
Washington University in St. Louis

Dr. Samuel Achilefu is the Michel M. Ter-Pogossian Professor of Radiology and holds other faculty appointments as professor of Medicine and Biomedical Engineering at Washington University in St. Louis, MO. He currently serves as the Vice Chair for Innovation (Radiology), Chief of Optical Radiology Lab, Co-Leader of the Oncologic Imaging Program of the Siteman Cancer Center, and Director of Washington University Molecular Imaging Center. Dr. Achilefu is an expert in the molecular imaging of human diseases, utilizing a multimodal imaging platform to address imaging challenges. His current research interests include image-guided cancer surgery, portable imaging devices, and nanotechnology. Through a multidisciplinary team of investigators, he has guided multiple research endeavors from concept to clinic. He is an inventor of 65 U.S. patents, published over 300 scientific papers, and received over 30 local, national, and international honors and awards for research excellence, including the first Distinguished Investigator Award (DoD Breast Cancer Research Program), the Britton Chance Biomedical Optics Award (SPIE), and the St. Louis Award. He is a fellow of many professional organizations, including the National Academy of Inventors, SPIE, OSA, and AIMBE. Dr. Achilefu serves as a member of the National Advisory Council for Biomedical Imaging and Bioengineering.

ABSTRACT

Surgeons still rely on vision and touch to distinguish cancerous from healthy tissue, often leading to incomplete tumor removal that necessitates repeat surgery or favors relapse. To address these issues, we have developed Cancer Viewing Glasses (CVGs) that can provide real-time intraoperative visualization of tumors and sentinel lymph nodes without disrupting the surgical workflow. The CVGs were designed to detect near-infrared fluorescence (NIRF) from molecular probes targeted to cancer cells. Both NIRF and normal visible light used in the operating room are projected to a head-mounted display. The optical see-through CVGs prototype allows direct visual access to the surgical field while projecting NIRF to the eyes under normal operating room light conditions. Aided by a new tumor-targeted NIR fluorescent molecular probe capable of accumulating in most solid tumors, CVGs provided real-time image guidance for complete tumor resection in subcutaneous and metastatic mouse models and cancer patients. Ongoing clinical studies demonstrate that combining light, molecules, and CVG enhances high throughput surgery with improved accuracy.

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