Docket #: S21-441

High Precision Tumor Resection Down to Few-Cell Level Guided by NIR-IIb Molecular Fluorescence Imaging

Stanford inventors have developed a near infrared (NIR) tumor imaging platform that couples a novel rare earth cancer targeting agent and a handheld NIR-IIb fluorescence imager to enable tumor resection down to the few-cell level.

Surgical removal of tumors remains a cornerstone of cancer treatment, but with visual inspection alone, incomplete removal of cancerous residues or excess removal of healthy tissue is still quite common. Surgeons have used near infrared imaging with fluorophores in the 800-900nm range to help visualize tumor margins, but there is significant light scattering and autofluorescence in that optical window that limits the tumor-to-normal-tissue signal ratios to ~1.1 to 7.

This invention is an imager and accompanying imaging agent that uses light in the 1500-1700nm range to improve the tumor-to-normal-tissue ratio ~100 times. An anti-CD105 conjugate that uses a novel rare earth down-conversion nanoparticle targets the tumor and labels it for NIR imaging, while a handheld imager that produces both a photographic and NIR image guides resection down to the few-cell level. The researchers have shown both the sensitivity and safety of this imaging platform, which has the potential to usher in a new paradigm of image-guided tumor resection.

Stage of Development
Pre-clinical

Applications

- Imaging platform for high-resolution tumor resection guidance during surgery
- Platform for tumor imaging before surgery
- Near infrared imaging agent for diverse applications in research and clinical imaging

Advantages

- Tumor-to-muscle ratios during surgery of ~300, 100 times higher than with organic dyes
- Tumor-to-normal-tissue ratios of ~40 before surgery, as compared to ~1.1 to 7 for previous technologies
- Imaging in a NIR-IIb near infrared spectrum (1500-1700nm) shows lower background than with the current NIR imaging agents that operate in the 800-900nm range

Publications

- Baghdasaryan, A., Wang, F., Ren, F., Ma, Z., Li, J., Zhou, X., ... & Dai, H. (2022). Phosphorylcholine-conjugated gold-molecular clusters improve signal for Lymph Node NIR-II fluorescence imaging in preclinical cancer models. Nature communications, 13(1), 1-11.

Patents

- Published Application: WO2023141172

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