Docket #: S20-318

In vivo multiplexed imaging method using near-infrared surface-enhanced resonant Raman nanoparticles

Multiplexed analysis of biological components is critical for classifying molecular subtypes of heterogeneous tumors to provide patient-specific therapies. For the purpose, ex vivo multiplexed biopsy platforms have been developed to simultaneously analyze more than 20 biomarkers within the same tumor tissue after surgical resection. On the other hand, in vivo multiplexed imaging, which has been proposed for noninvasive monitoring of multiple biomarkers in living subjects, is still in its infancy owing to the limited number of multiplex channels. The Gamhbir lab at Stanford have pioneered Raman imaging and has invented the first ever preclinical non-invasive and highly multiplexed imaging method for the imaging of nanoparticle-targeting tumors in living subjects. Using near-infrared (NIR)-resonant surface-enhanced Raman scattering (NIR-SERRS) nanoparticles, the inventors performed noninvasive imaging of living mice whose tumors were targeted with these nanoparticles. The NIR-SERRS nanoparticles provided both high multiplicity originating from narrow spectral width of Raman spectra, and strong Raman scattering signals with comparable brightness to traditional NIR fluorescence. The in vivo 5-plex imaging enables noninvasive tracking of the 5-color nanoparticles in tumors, which is not feasible with currently available ex vivo multiplexing platforms, demonstrating great potential for noninvasive assessment of multiple biological targets within the tumor microenvironment. The invention provides a novel, non-invasive method that allows longitudinal monitoring of multiple tumor biomarkers.

Applications

- -Molecular monitoring (e.g. tracking biomarkers and tumors)
- -Tissue imaging
- -Multiplex imaging

Advantages

- -Noninvasive multiplexing method enabling longitudinal tumor monitoring
- -higher sensitivity for imaging compared to traditional NIR-fluorescence
- -Higher multiplicity to extended imaging channels

Publications

- Yu, J. H., Steinberg, I., Davis, R. M., Malkovskiy, A. V., Zlitni, A., Chung, D. T., ... & Gambhir, S. S. (2020). "Noninvasive and Highly Multiplexed Five-Color Tumor Imaging of Near-Infrared Resonant Surface-Enhanced Raman Nanoparticles In Vivo."

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