# Raman nanoparticle-aided imaging of tumors moves closer to human trials

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(PhysOrg.com) -- In 2008, a team of investigators at Stanford University's Center for Cancer Nanotechnology Excellence demonstrated that they could use a technique known as nanoparticle-aided Raman spectroscopy to look at microscopic structures, including nascent tumors, deep inside the body. That team has now conducted extensive preclinical tests and shown that the gold nanoparticles can be safely administered into the colon and used with a Raman endoscope to image the inside of the large intestines.

Reporting their work in the journal *Small*, Sanjiv Sam Gambhir and his colleagues describe the experiments they conducted using radioactively labeled gold nanoparticles to track the accumulation of the nanoparticle imaging agents inside mice. Dr. Gambhir is the principal investigator of the Stanford Center for Cancer Nanotechnology Excellence, one of nine such centers included in the National Cancer Institute's Alliance for Nanotechnology in Cancer.

After labeling the nanoparticles with a radioactive isotope of copper, the investigators used micro-positron emission tomography (micro-PET) to image the nanoparticles' location in the body. When the nanoparticles were injected intravenously, they accumulated in a variety of organs, with almost 10 percent of the dose of nanoparticles ending up in the liver. In contrast, when the nanoparticles were injected rectally into the colon, less than 1/10th of 1 percent of the nanoparticles accumulated outside of the large intestine even as far as two weeks after injection. In the colon, the nanoparticles could be visualized using an endoscope

modified to detect Raman signals.

**More information:** Preclinical Evaluation of Raman Nanoparticle Biodistribution for their Potential Use in Clinical Endoscopy Imaging, DOI:10.1002/smll.201002317

**Abstract**
Raman imaging offers unsurpassed sensitivity and multiplexing capabilities. However, its limited depth of light penetration makes direct clinical translation challenging. Therefore, a more suitable way to harness its attributes in a clinical setting would be to couple Raman spectroscopy with endoscopy. The use of an accessory Raman endoscope in conjunction with topically administered tumor-targeting Raman nanoparticles during a routine colonoscopy could offer a new way to sensitively detect dysplastic lesions while circumventing Raman's limited depth of penetration and avoiding systemic toxicity. In this study, the natural biodistribution of gold surface-enhanced Raman scattering (SERS) nanoparticles is evaluated by radiolabeling them with 64Cu and imaging their localization over time using micropositron emission tomography (PET). Mice are injected either intravenously (IV) or intrarectally (IR) with approximately 100 microcuries (μCi) (3.7 megabecquerel (MBq)) of 64Cu-SERS nanoparticles and imaged with microPET at various time points post injection. Quantitative biodistribution data are obtained as % injected dose per gram (%ID g−1) from each organ, and the results correlate well with the corresponding microPET images, revealing that IV-injected mice have significantly higher uptake (p

Provided by National Cancer Institute

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