

# **Photoacoustic Detection of Circulating Prostate, Breast and Pancreatic Cancer cells using targeted Gold Nanoparticles: Implications of Green Nanotechnology in Molecular Imaging**

Ravi Shukla<sup>1</sup>, Sagar Gupta<sup>2</sup>, Nripen Chanda<sup>1</sup>, Ajit Zambre<sup>1</sup>, John Viator<sup>2</sup>, Priyabrata Mukharjee<sup>3</sup>, Debabrata Mukhopadhyay<sup>3</sup>, Raghuraman Kannan<sup>1</sup>, Kattesh V. Katti<sup>1</sup>

Departments of <sup>1</sup>Radiology and <sup>2</sup>Biological Engineering, University of Missouri, Columbia, MO 65212; <sup>3</sup>Department of Biomedical Engineering, Mayo Clinic, Rochester, MN 55905.

## **Abstract:**

Circulating tumor cells are hallmarks of metastasis cancer. The presence of circulating tumor cells in blood stream correlates with the severity of disease. Photoacoustic imaging (PA) of tumor cells is an attractive technique for potential applications in diagnostic imaging of circulating tumor cells. However, the sensitivity of photoacoustic imaging of tumor cells depends on their photon absorption characteristics. In this context, gold nanoparticle embedded tumor cells offer significant advantages for diagnostic PA of single cells. As the PA absorptivity is directly proportional to the number of nanoparticles embedded within tumor cells, the propensity of nanoparticles to internalize within tumor cells will dictate the sensitivity for single cell detection. We are developing biocompatible gold nanoparticles to use them as probes as part of our ongoing effort toward the application of X ray CT Imaging, Ultra Sound (US) and photoacoustic imaging of circulating breast, pancreatic and prostate tumor cells. We, herein report our latest results which have shown that epigallocatechin gallate (EGCG)-conjugated gold nanoparticles (EGCG-AuNPs) internalize selectively within cancer cells providing threshold concentrations required for photo acoustic signals. In this presentation, we will describe, our recent results on the synthesis and characterization of EGCG gold nanoparticles, their cellular internalization and photo acoustic imaging of PC-3 prostate cancer cells and PANC-1 pancreatic cancer cells.