# Detecting, treats tumors, and monitoring response to therapy with gold 'nano-popcorn'

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Using a two-step process that creates gold nanoparticles that look like kernels of popcorn, researchers at Jackson State University have created a targeted nanoparticle that can detect as few as 50 malignant prostate cells and serve as a thermal scalpel that can kill the cells. Moreover, the optical signal produced by these nanoparticles changes as cells die, providing a means of tracking the response of prostate tumor cells to thermal therapy.

Paresh Ray led the Jackson State team that conducted this study. The results of the team's work were published in the Journal of the American Chemical Society.

As synthesized, the nanoparticles themselves would be toxic in the body, but the researchers took advantage of the toxic component to attach tumor targeting aptamers and monoclonal antibodies to the popcorn-shaped gold constructs. When irradiated with light, the nanoparticles emit light at a different frequency that can be detected using surface-enhanced Raman spectroscopy, or SERS. The nanoparticles are such efficient SERS imaging agents that they produce a detectable optical signal after binding to clusters of a mere 50 cells thanks to the fact that the nanoparticles then aggregate into clusters that produce "hotspots" in a SERS image.

Once bound to prostate cancer cells, the gold nanoparticles can absorb light and convert it to heat, raising the local temperature to 48 C, which is sufficient to kill the tumor cells to which they are attached. During

this experiment, the investigators noted that the SERS signal intensity decreased as the tumor cells died. Further study showed that there was a direct, linear correlation between the number of cells killed and the reduction in signal intensity, suggesting that this type of measurement could prove useful in assessing the therapeutic effect following photothermal therapy.

This work is detailed in a paper titled, "Gold Nano-Popcorn-Based Targeted Diagnosis, Nanotherapy Treatment, and in Situ Monitoring of Photothermal Therapy Response of Prostate Cancer Cells Using Surface-Enhanced Raman Spectroscopy." An abstract of this paper is available at the journal's website.

**More information:** View the complete abstract here: doi:10.1021/ja104924b" target="_blank">dx.doi.org/doi:10.1021/ja104924b

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