Potential for New Nanoparticle-Based Cancer Detection

May 25 2010

(PhysOrg.com) -- Recent studies support the idea that the standard methods of screening men for prostate cancer leave much to be desired, particularly in terms of their inability to have much effect on prostate cancer survival.

Now, a team of investigators at the University of Missouri School of Medicine have created a targeted gold nanoparticle that appears to offer a more sensitive and accurate method for detecting early stage prostate cancer. These nanoparticles may also be useful for detecting lung and breast cancers, too.

The investigators, led by Raghuraman Kannan and Kattesh Katti, published the results of their studies in the Proceedings of the National Academy of Sciences. Dr. Katti is the principal investigator of a National Cancer Institute Cancer Nanotechnology Platform Partnership.

Drs. Kannan and Katti and their colleagues created their potential imaging agent by coating gold nanoparticles with bombesin, also known as Gastrin Release Peptide (GRP), a naturally occurring molecule that binds to a specific receptor that is abundant on prostate, breast, and small cell lung cancer cells. To do so, they had to develop new synthetic methods for linking this peptide, as well as other related peptides, to the gold nanoparticles.

With the nanoparticles in hand, the research team used them to image prostate tumors growing in mice. These experiments demonstrated that

the nanoparticles were very specific at binding to prostate tumors and that this binding enabled the tumors to be spotted easily using computed tomography x-ray imaging. Moreover, tumors took up approximately 10 times more of the targeted nanoparticles than bombesin linked directly to the radioactive element technetium, a construct now in clinical trials as an imaging agent. These experiments also showed that injecting the nanoparticles into the peritoneal cavity produced better results than when the nanoparticles were injected directly into the blood stream, in large part because fewer nanoparticles became trapped in the liver and spleen.

This work, which is detailed in a paper titled, "Bombesin functionalized gold nanoparticles show in vitro and in vivo cancer receptor specificity," was supported in part by the NCI Alliance for Nanotechnology in Cancer, a comprehensive initiative designed to accelerate the application of nanotechnology to the prevention, diagnosis, and treatment of cancer. An abstract of this paper is available at the journal's Web site.

Provided by National Cancer Institute