Natural Gum Improves Gold Nanoparticles for Cancer Imaging

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Gold nanoparticles have shown significant promise as agents to detect and treat cancer, but researchers have had difficulty creating gold nanoparticles that have suitable pharmacological properties for use in humans. A team led by Kattesh Katti, Ph.D., principal investigator of the Hybrid Nanoparticles in Imaging and Therapy of Prostate Cancer Platform Partnership based at the University of Missouri, may have solved this problem using old-fashioned gum arabic, a compound widely used in processed foods.

Writing about their studies in the journal Small, the investigators reasoned that gum arabic, a natural polymer made of sugars and some protein, would bind tightly to gold nanoparticles because of its chemical composition.

Sure enough, the researchers found that simply mixing a commercially available gold salt with a dilute solution of gum arabic and a chemical-reducing agent resulted in the nearly instantaneous formation of gum arabic-labeled gold nanoparticles. The investigators noted that over 98 percent of the gold salt was converted to gum arabic-labeled gold nanoparticles. The resulting nanoparticles were stable in biological fluids for at least seven days.

Next, Katti and his collaborators studied biodistribution properties of these nanoparticles following intravenous injection into pigs. These experiments confirmed that gum arabic could effectively stabilize gold nanoparticles in the body. This study also found that most of the nanoparticles accumulated in the liver and lungs.

Preliminary imaging studies showed that the gum arabic-labeled gold nanoparticles could function as x-ray imaging contrast agents. As part of these experiments, the investigators compared the signal enhancement produced by the gold nanoparticles with that generated by iodine-containing compounds used today as CT imaging contrast-enhancing agents. This study showed that five-fold higher iodine levels were needed to produce a signal enhancement comparable to that afforded by the gold nanoparticles.

This work, which was supported by the National Cancer Institute's Alliance for Nanotechnology in Cancer, is detailed in a paper titled, "Gum arabic as a phytochemical construct for the stabilization of gold nanoparticles: In vivo pharmacokinetics and x-ray-contrast-imaging studies." An abstract of this paper is available through PubMed.

Source: National Cancer Institute