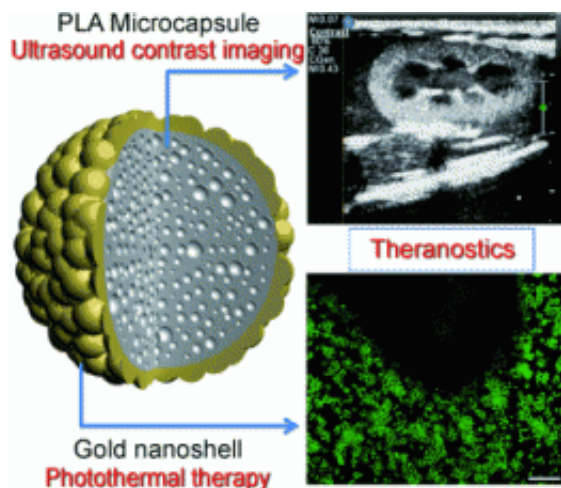


Double strike to fight cancer

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(PhysOrg.com) -- Diagnosis and treatment form the basis of modern medicine. Traditionally, they are two separate steps; however, it doesn't have to be that way. The term “theranostic” refers to the combination of a diagnostic test with a specific treatment based on the result of the test. This integrated approach should be particularly helpful in providing more targeted treatment for cancer patients.

In the journal *Angewandte Chemie*, a research team headed by Zhifei Dai at the Harbin Institute of Technology (China) has now introduced a new theranostic agent that simultaneously serves as a contrast agent for ultrasound imaging and as a drug for the photothermic treatment of tumors.

Ultrasound imaging is a safe and inexpensive diagnostic tool that delivers images in real time. A probe sends out short, directional bursts of sound waves, which are reflected and diffracted differently in the different layers of tissue. Suitable [contrast agents](#), such as tiny gas bubbles, can significantly improve the sensitivity and resolution of the images.

The Chinese researchers wished to develop a new contrast agent that simultaneously acts as a drug for photothermal treatment. In this method of treatment, an agent, such as gold [nanoshells](#), is selectively introduced into a tumor, and this region is then irradiated. This causes the gold particles to become very hot, overheating the diseased tissue and causing it to die off. Gold nanostructures can be made to specifically absorb near-infrared light, a wavelength that can penetrate deep into tissues without causing damage.

For their new theranostic agent, the scientists used a biocompatible polymer to produce nanocapsules containing tiny drops of water. They coated the capsules with gold and removed the water through freeze-drying. This produced tiny air-filled cavities within the microcapsules. These are the contrast agent for the ultrasound; the gold shell acts as the photothermally activated drug.

In animal trials, the new multifunctional agent proved to be nontoxic and demonstrated very good contrast enhancement in ultrasound examinations. When cultures of tumor cells were treated with the microcapsules, the cells could be killed off through irradiation.

“With our new therapeutic contrast agent, we were able to locate the tumor by ultrasound imaging and determine its size,” explains Dai.

“With real time monitoring, the tumor could then be irradiated, successful treatment confirmed, and healthy tissue protected.”

More information: Zhifei Dai, Gold Nanoshelled Microcapsules

Operate as Theranostic Agent for Ultrasound Contrast Imaging and
Photothermal Therapy, *Angewandte Chemie International Edition*,
[dx.doi.org/10.1002/anie.201008286](https://doi.org/10.1002/anie.201008286)

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