Invention
The invention consists of gold nanoparticles packaged in porous silicon particles. The particles are delivered to the tumor site and then heated using a near infrared laser. These particles generate heat 3 times faster than gold nanoparticles alone and the result is a 2.5 fold higher rate of tumor cell ablation as measured in human breast cancer cell lines. In addition, these particles are fivefold more effective than gold particles alone in inhibiting tumor growth in human-cancer-in-mouse xenograft model. In addition to their passive targeting to tumor beds via leaky blood vessels, the surface of the silicon particles can be labeled with a variety of molecules that allow targeted delivery to the cancer site.

Background
Thermal therapy has the advantage of killing cancer cells regardless of the genetic background and thus can be applied to all cancer patients. Thermal ablation with gold nanoparticles has been explored for many years without producing effective therapeutics due to the lack of effective delivery of the nanoparticles. Major factors including the unfavorable biodistribution of gold nanoparticles and low tumor accumulation of the gold nanoparticles have contributed to the lack of effective photothermal therapy. Moreover, the amount of gold nanoparticles often needed for effective treatment makes it impractical for use in clinical settings. Thus, more effective and targeted delivery of the gold nanoparticles is needed for more efficient thermal ablation therapy.

Advantages
- Loading gold nanoparticles into porous silicon particles increased the temperature of the gold nanoparticles 3 times faster than free gold nanoparticles.
- Gold nanoparticles loaded into porous silicon particles are 2.5 times more effective in killing breast cancer cells in vitro.
- A single treatment of thermal ablation with gold nanoparticles loaded into silicon particles resulted in a 5X inhibition of tumor growth in a human-cancer-in-mouse xenograft model.
- Linking porous silicon with site-specific molecules allows for targeted delivery of the gold nanoparticles.

For more information, contact the Office of Technology Transfer by e-mail at OTT@HoustonMethodist.org.

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