Gold-plated nano-bits find, destroy cancer cells

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(Phys.org) —Comparable to nano-scale Navy Seals, Cornell scientists have merged tiny gold and iron oxide particles to work as a team, then added antibody guides to steer the team through the bloodstream toward colorectal cancer cells. And in a nanosecond, the alloyed allies then kill the bad guys – cancer cells – with absorbed infrared heat.

This scenario is not science fiction – welcome to a medical reality.

"It's a simple concept. It's colloidal chemistry. By themselves, gold and iron-oxide alloys are benign and inert, and the infrared light is low-power heating," said Carl Batt, Cornell's Liberty Hyde Bailey Professor of Food Science and the senior author on the paper. "But put these inert alloys together, attach an antibody to guide it to the right target, zap it with infrared light and the cancer cells die. The cells only need to be heated up a few degrees to die."

Batt and his colleagues – Dickson K. Kirui, Ph.D. '11, a postdoctoral fellow at Houston Methodist Research Institute and the paper's first author; Ildar Khalidov, radiology, Weill Cornell Medical College; and Yi Wang, biomedical engineering, Cornell – published their study in *Nanomedicine* (print edition, July 2013).

For cancer therapy, current hyperthermic techniques – applying heat to the whole body – heat up cancer cells and healthy tissue, alike. Thus, healthy tissue tends to get damaged. This study shows that by using gold nanoparticles, which amplify the low energy heat source efficiently,

cancer cells can be targeted better and heat damage to healthy tissues can be mitigated. By adding the magnetic iron oxide particles to the gold, doctors watching MRI and CT scanners can follow along the trail of this nano-sized crew to its target.

When a near-infrared laser is used, the light penetrates deep into the tissue, heating the nanoparticle to about 120 degrees Fahrenheit – an ample temperature to kill many targeted cancer cells. This results in a threefold increase in killing cancer cells and a substantial tumor reduction within 30 days, according to Kirui. "It's not a complete reduction in the tumor, but doctors can employ other aggressive strategies with success. It also reduces the dosage of highly toxic chemicals and radiation – leading to a better quality of life," he explained.

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