Rice, TMC team take aim at pancreatic cancer

EurekAlert

Researchers from Rice University's Laboratory for Nanophotonics (LANP), the radiology department at Baylor College of Medicine (BCM) and the University of Texas MD Anderson Cancer Center are preparing to test a combined approach for diagnosing and treating pancreatic cancer with a specially engineered nanoparticle.

The five-year, preclinical testing program will be funded by a newly announced $1.8 million grant from the National Cancer Institute's (NCI) Alliance for Nanotechnology in Cancer program.

"Pancreatic cancer is notoriously difficult to treat, and we hope nanoparticle-based 'theranostics' can change that," said LANP Director Naomi Halas, Rice's Stanley C. Moore Professor in Electrical and Computer Engineering and professor of chemistry and biomedical engineering. "Our nanoparticles are designed to specifically target cancer cells and to function as both diagnostic and therapeutic agents."

Pancreatic cancer is one of the most deadly forms of cancer. Surgery is often the only treatment option, and the five-year, postsurgical survival rate is less than 25 percent.

Halas is the inventor of gold nanoshells, tiny gold-sheathed particles that can harvest light and convert it to heat. She also helped pioneer the use of nanoshells for cancer treatment, and she is the principal investigator on the new NCI grant. The theranostic project team includes co-principal investigators Amit Joshi, assistant professor of radiology at BCM; Sunil Krishnan, associate professor in radiation oncology at MD Anderson; and Peter Nordlander, professor of physics and astronomy at Rice.

Theranostics involve technologies and agents that can diagnose and treat diseases in a single procedure. The theranostic particle that will be tested at Rice, BCM and MD Anderson was invented at LANP.

"A seamless integration of multiple imaging and therapeutic technologies within a single nanoparticle is required to tackle diseases like pancreatic cancer, which often resist conventional therapies," Joshi said.

At the heart of the particle is a nanoshell that can be used to kill cancer cells with heat. The particle can also be tagged with antibodies that allow it to home in on specific types of cancer cells. In addition, the nanoparticle is designed to provide high-resolution images regarding its location in the body and in the tumor. This is accomplished by combining an FDA-cleared dye for fluorescence imaging with an active marker for MRI imaging. These combined capabilities allow researchers to track the nanoparticles throughout the body and even observe their distribution within the tumor before, during and after treatment.

"This level of highly detailed information on nanoparticle location in the body has not been obtainable previously," Halas said.

In the first published tests of the new particle last year, Joshi, Halas and colleagues showed it could be used to simultaneously detect and destroy breast and ovarian cancer cells in cell cultures.

In the NCI study, researchers will test whether the particles can be used to image and treat pancreatic cancer in mice. The tests will investigate how well the particles work as imaging agents -- both in MRI scans and in fluorescent optical scans, how well they target specific cell types, where they go inside the body after testing and treatment and how well they perform as therapeutic agents. In addition, Krishnan's lab at MD Anderson has a particular interest in testing the particles to see if they can be used to boost the effectiveness of radiation therapy.

"Nanoparticle-based theranostics holds great promise, not only for treating pancreatic cancer, but for treating other forms of cancer as well," Halas said. "But successfully translating new technology like this from the lab to the clinic requires excellent research partnerships, like those we have at Baylor College of Medicine and MD Anderson."

SOURCE [1]

Links:
[1] http://www.eurekalert.org/pub_releases/2010-10/ru-rt101810.php