Researchers develop novel, non-invasive cancer therapy using targeted single-walled carbon nanotubes

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A staggering 1.7 million persons in the United States will be diagnosed with cancer in 2016, with 600,000 cases ending in death. University of Oklahoma researchers have collaborated to design a novel, non-invasive cancer therapy that could eliminate tumors without affecting the healthy cells in the body.

The cancer therapy targets specific cancer cells using single-walled carbon nanotubes that bind directly to the tumor, then are heated with near-infrared light. The OU photothermal therapy is most effective against shallow or surface tumors in breast, bladder, esophageal and melanoma cancers, without the adverse side effects of chemotherapy, radiation or surgery.

The therapy was created by Roger G. Harrison, Jr. and Daniel E. Resasco, professors in the School of Chemical, Biological and Materials Engineering, Gallogly College of Engineering. Harrison is also affiliated with the Stephenson School of Biomedical Engineering. Harrison's expertise is protein design, production and purification, while Resasco focuses on nanostructured materials based on single-walled carbon nanotubes.

"Single-walled carbon nanotubes are unique in that they strongly absorb near-infrared light in very narrow, but tunable, wavelength ranges, while biological systems have very low levels of absorption of near-infrared

light," said Harrison. "The targeting of single-walled carbon nanotubes to tumors and subsequent localized application of near-infrared light allows the selective elimination of tumors."

"Very few groups around the world are able to synthesize nanotubes which absorb light in a narrow range of wavelength," said Resasco. "We have a unique method of synthesis that produces single-wall nanotubes with a narrow distribution of diameters and carbon atom arrangements, which causes this selective light absorption in the near-infrared spectrum."

The new OU photothermal therapy consists of single-walled carbon nanotubes of tailored absorption wavelength injected into the blood stream where proteins on the nanotubes selectively bind to blood vessels that supply a tumor. Within 24 hours, a laser light is applied to the tumor causing the nanotubes to heat up, which causes the tumor to heat and be eliminated. The photothermal therapy has been tested and proven in the laboratory.

The OU researchers already have one U.S. patent for this technology, and a second patent is nearing issuance. The OU Office of Technology Development and the inventors are actively seeking licensees for this novel therapy to move to clinical trials.

Provided by University of Oklahoma

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