'Smart' nanoparticles to battle cancer

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An experimental cancer treatment developed by University of Wyoming scientists may destroy tumors more effectively by using synthesized "smart" particles that target and kill cancer cells before they can detect and disable their assassins.

Funded by the university and the National Science Foundation, the three-year project devises a drug delivery system that eradicates cancer cells while sparing healthy cells. The system is intended to improve the efficiency of cancer treatments.

"These particles are like tiny cruise missiles unleashed into the blood stream," says Mac Radosz, a professor in the Department of Chemical and Petroleum Engineering and one of four scientists working on the project. "Each of the particles can recognize the cancer cell, anchor itself to it, and diffuse inside the cell. Once inside, the particle decomposes quickly. This causes a nearly instantaneous release of the drug precisely where it is needed."

Other scientists involved in the project are Principal Investigator Youqing Shen, an assistant professor in the Department of Chemical and Petroleum Engineering; Co-Principal Investigator William J. Murdoch, a professor in the Department of Animal Science; and School of Pharmacy Professor Jun Ren, director of the university's Center of Cardiovascular Research and Alternative Medicine.

Shen specializes in chemically programming the microscopic nanoparticles (about one 10,000th of one millimeter) to have an

"affinity" for the cell wall of cancerous tumors and release the drug at the right place. To be effective, the particles must slip by the body's immune system, penetrate into the cancer cells, and discharge the drugs before being recognized and destroyed.

"Cancer cells are very good at detecting and rejecting drugs, so we need to do something to fool them," he says. "It is the very rapid drug delivery, and its sufficiently high concentration, that is critical to overwhelm the cancer cell's resistance mechanisms."

Shen adds that the new treatment also should reduce side effects because it targets only the cancer cells.

"Traditional chemotherapy saturates the body and kills cancer cells, but it is very toxic," he says. "We're trying to limit exposure to the drug where and when it is needed."

Using mice as models, Murdoch is examining the in vitro (outside the body) and in vivo (inside the mouse body) cellular responses to the drug-loaded nanoparticles. In one preliminary study, Shen says, the experimental treatment reduced the number of tumors in mice from 60 to 10 while traditional therapies reduced the number of tumors from 60 to 30.

Though it could take another decade and millions of dollars before the treatment system is approved by the Food and Drug Administration and put into practice, Shen says he is encouraged by the early results.

"This is not perfect, but it can extend life," he says. "It's definitely a novel approach."

The group has submitted research proposals to the National Institutes of Health and Department of Defense. Though the proposals focus on

ovarian cancer applications, Shen says, the approach is applicable to other forms of cancer.

Source: University of Wyoming