Nanopolymer shows promise for helping reduce cancer side effects

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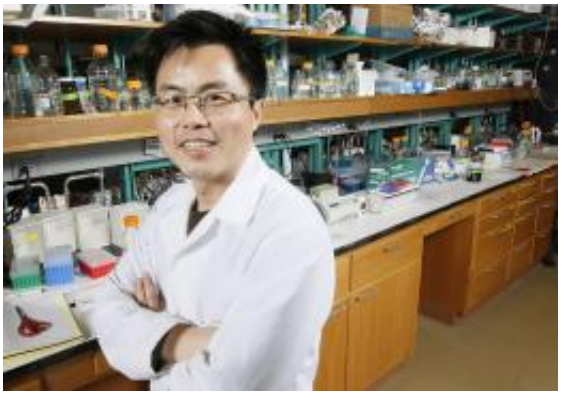

W. Andy Tao's nanopolymers can better assess whether cancer drugs are reaching their targets, a development that may reduce the side effects of those drugs. (Purdue Agricultural Communication photo/Tom Campbell)

(PhysOrg.com) -- A Purdue University biochemist has demonstrated a process using nanotechnology to better assess whether cancer drugs hit their targets, which may help reduce drug side effects.

W. Andy Tao, an associate professor of biochemistry analytical chemistry, developed a nanopolymer that can be coated with drugs, enter cells and then removed to determine which proteins in the cells the drug has entered. Since they're water-soluble, Tao believes the nanopolymers also may be a better delivery system for drugs that do not dissolve in water effectively.

"Many cancer drugs are not very specific. They target many different proteins," said Tao, whose findings were published in the early online in the journal *Agnewandte Chemie International Edition*. "That can have a consequence - what we call side effects."

In addition to the drug, the synthetic nanopolymer is equipped with a chemical group that is reactive to small beads. The beads retrieve the nanopolymer and any attached proteins after the drug has done its work. Tao uses mass spectrometry to determine which proteins are present and have been targeted by the drug.

Knowing which proteins are targeted would allow drug developers to test whether new drugs target only desired proteins or others as well. Eliminating unintended protein targets could reduce the often-serious side effects associated with cancer drugs.

Tao said there currently is no reliable way to test drugs for off-targeting. He said drugs are often designed to inhibit or activate the function of a biomolecule associated with cancer, but those drugs tend to fail in late-stage clinical tests.

Tao also believes his nanopolymers could better deliver drugs to their targets. Since they are nanosized and water soluble, the nanopolymers could gain access to cells more effectively than a standalone drug that is only minimally water-soluble.

Tao demonstrated the nanopolymer's abilities using human cancer cells and the cancer drug methotrexate. The nanopolymers were tracked using a fluorescent dye to show they were entering cells. Then, Tao broke the cells and retrieved the nanopolymers.

Tao has shown the nanopolymer's ability using a metabolic drug, which are small, low-cost drugs but are less target specific and have more side-

effects. He now plans to do the same using drugs that are based on synthetic peptides, which are larger and more expensive but more specific and with fewer side effects.

Provided by Purdue University