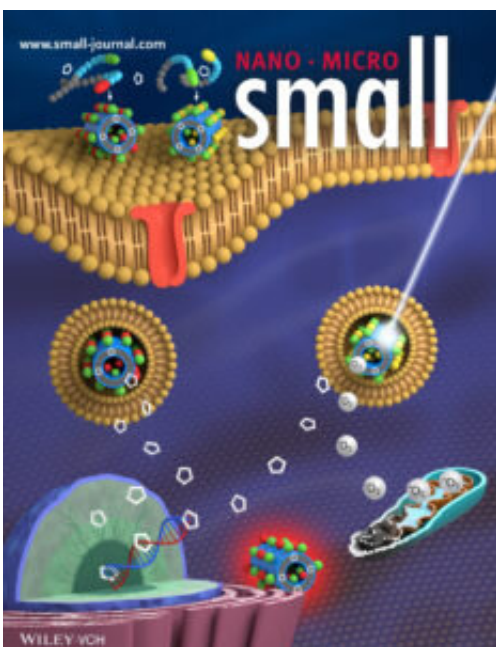


New drug-delivery technology promises efficient, targeted cancer treatment

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The researchers designed and created peptoid nanotubes for targeted tumor cell imaging and therapy. Using a combination of chemotherapy and photodynamic therapies, the nanotubes were highly efficient in killing cancer cells (Peptoid Nanotubes: Bioinspired Peptoid Nanotubes for Targeted Tumor Cell Imaging and Chemo-Photodynamic Therapy/Small 43/2019/Copyright Wiley-VCH Verlag GmbH & Co. KGaA. Reproduced with permission).

A precise and non-toxic treatment that targets lung cancer cells at the nanoscale is able to effectively kill the cells even at a low dose.

Researchers from Washington State University and the Department of Energy's Pacific Northwest National Laboratory (PNNL) used tiny tubes made from [organic molecules](#) called peptoids to deliver cancer-killing drugs in a targeted manner.

The research, led by Yuehe Lin, professor in WSU's School of Mechanical and Materials Engineering, and Chun-Long Chen, a senior research scientist at PNNL and a joint faculty fellow at the University of Washington, was published as the cover story in the prestigious journal *Small*.

The biologically-inspired nanotubes, which are about a hundred thousand times thinner than a human hair, were rolled up from membrane-like nanosheets. The [drug molecules](#), [fluorescent dyes](#) and cancer-targeting molecules were precisely placed within the nanotubes, enabling them to track the efficiency of [drug](#) delivery into the cancer cells.

The new technology allows the two drugs—one for chemotherapy and the other for a less-invasive photodynamic therapy treatment—to be delivered directly to the cancer cells. Photodynamic therapy uses a chemical that, when exposed to light, releases reactive oxygen species (ROS) that kill cancer cells. The researchers' dual-drug approach enabled the use of a lower dose of the cancer drugs than using a single drug, leading to effective killing of cancer cells with low toxicity.

"By precisely engineering these nanotubes with fluorescent dyes and cancer targeting molecules, scientists can clearly locate tumor cells and track how the drug regimen is performing," said Lin. "We can also track how nanotubes enter and deliver the drugs inside the cancer cell."

The team tested the nanotubes on [lung cancer cells](#) and found that they delivered the chemotherapy drug doxorubicin directly into the fast-dividing [cancer cells](#), resulting in highly efficient cancer killing while

using less chemotherapy drugs.

"This is a promising approach for precision targeting with little damage to healthy surrounding cells," said Lin.

While other nanomaterials, such as carbon nanotubes, have been used to deliver and track cancer-killing drugs, researchers have found that they are toxic to the body. Furthermore, they didn't do well at precisely recognizing molecules.

"By using these peptoids, we were able to develop highly programmable nanotubes and a biocompatible delivery mechanism," said Chen. "We also harnessed the high stability of peptoid and its well-controlled packing to develop nanotubes that are highly stable."

"Due to their unique structure, these nanotubes can be easily assembled for use in [cancer](#) therapy and stay in the body longer for treatment," said Lin.

More information: Yanan Luo et al, Peptoid Nanotubes: Bioinspired Peptoid Nanotubes for Targeted Tumor Cell Imaging and Chemo-Photodynamic Therapy (Small 43/2019), *Small* (2019). [DOI: 10.1002/sml.201970231](https://doi.org/10.1002/sml.201970231)

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