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Researchers deliver first 'nanotherapeutics' to tumor

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For the first time, WSU researchers have demonstrated a way to deliver a drug to a tumor by attaching it to a blood cell. The innovation could let doctors target tumors with anticancer drugs that might otherwise damage healthy tissues.

To develop the treatment, a team led by Zhenjia Wang, an assistant professor of pharmaceutical sciences, worked at the microscopic scale using a nanotherapeutic particle so small that 1,000 of them would fit across the width of a hair. By attaching a nanoscale particle to an infection-fighting white blood cell, the team showed they can get a drug past the armor of blood vessels that typically shield a tumor. This has been a major challenge in nanotechnology drug delivery.

The researchers reported on the technique in the latest issue of the journal *Advanced Materials*.

Working with colleagues in Spokane and China, Wang implanted a tumor on the flank of a mouse commonly chosen as a model for human diseases. The tumor was exposed to near-infrared light, causing an inflammation that released proteins to attract white blood cells, called neutrophils, into the tumor.

The researchers then injected the mouse with gold nanoparticles treated with antibodies that mediate the union of the nanoparticles and neutrophils. When the tumor was exposed to infrared light, the light's interaction with the gold nanoparticles produced heat that killed the

tumor cells, Wang said.

In the future, therapists could attach an anticancer drug like doxorubicin to the nanoparticle. This could let them deliver the drug directly to the tumor and avoid damaging nearby tissues, Wang said.

"We have developed a new approach to deliver therapeutics into tumors using the white blood cells of our body," Wang said. "This will be applied to deliver many anticancer drugs, such as doxorubicin, and we hope that it could increase the efficacy of cancer therapies compared to other delivery systems."

More information: Dafeng Chu et al, Photosensitization Priming of Tumor Microenvironments Improves Delivery of Nanotherapeutics via Neutrophil Infiltration, *Advanced Materials* (2017). DOI: 10.1002/adma.201701021

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