

Research team shrinks breast cancer tumors in mice with targeted therapy

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WPI Provost Wole Soboyejo. Credit: Worcester Polytechnic Institute

A team of researchers led by Worcester Polytechnic Institute (WPI) Provost Wole Soboyejo has identified targeted drugs that reduced the sizes of hard-to-treat breast cancer tumors in mice without inducing the

toxic side effects that are typically associated with conventional chemotherapy.

The researchers said in an article published in *Scientific Reports* that a molecular recognition unit attached to drugs specifically targeted "triple-negative" [breast cancer](#) tumors, which typically do not respond to targeted therapies. The targeted drugs eliminated or reduced the sizes of [breast cancer tumors](#) in laboratory experiments that were performed on mice. No toxic side effects were observed in the experiments.

"When injected into the bloodstream, only a small fraction of traditional chemotherapeutic drugs reaches tumors," Soboyejo said. "It usually takes relatively high concentrations of conventional cancer drugs to have therapeutic effects on tumors. Hence, such concentrations are often toxic to other cells. In our case, the targeting drugs were more effective at shrinking and eliminating triple-negative breast tumors in mice. They also eliminated tumors without inducing toxicity."

Breast cancer is the most commonly diagnosed cancer in women. Chemotherapy kills fast-growing tumor cells by flooding a patient's body with potent drugs, but the treatment often produces [toxic side effects](#). Targeted therapy aims to reduce side effects by delivering chemotherapeutic drugs directly to breast cancer tumor cells. The drugs seek out and bind to specific cellular structures known as receptors.

Three common receptors that are over-expressed on the surfaces of breast cancer [tumor](#) cells are HER2, a growth factor, as well as estrogen and progesterone hormones. Most breast cancer treatments target HER2 receptors. However, between 10% and 17% of all breast cancers lack HER2, estrogen, and progesterone receptors. These "triple-negative" breast cancers are more prevalent in younger women, African American women, and African women.

Soboyejo, inspired by a relative's battle with breast cancer, previously studied luteinizing hormone-releasing hormone (LHRH) as a targeting mechanism to deliver magnetic nanoparticles to breast tumors. The targeted magnetic nanoparticles were found to improve the imaging of breast tumors in nude mice, a type of laboratory mouse. LHRH is a naturally occurring hormone in mammals. It is essential for reproduction.

More recently, Soboyejo began studying LHRH as a targeting mechanism for [chemotherapeutic drugs](#). His work has been funded by WPI and the Pan African Materials Institute at the African University of Science and Technology (AUST) in Abuja, Nigeria, which is funded by the World Bank.

In this study, the researchers attached the chemotherapy [drug](#) paclitaxel to LHRH. They also attached prodigiosin, a natural substance with anti-cancer properties, to LHRH. Both combination molecules were tested against triple-negative breast cancer cells and tissues.

Soboyejo's team hopes to continue work on LHRH-targeted nanoparticles and therapeutic drugs, and to position them for human clinical trials on breast cancer patients. The group is also working to identify other targeted drugs and nanoparticles for the detection and treatment of other tumors.

"The fact that we could target triple-negative [breast](#) cancer in mice models is important. However, I think this method has major implications for targeted [cancer](#) treatment in general," Soboyejo said.

More information: J. D. Obayemi et al, LHRH-Conjugated Drugs as Targeted Therapeutic Agents for the Specific Targeting and Localized Treatment of Triple Negative Breast Cancer, *Scientific Reports* (2020). [DOI: 10.1038/s41598-020-64979-1](https://doi.org/10.1038/s41598-020-64979-1)

Provided by Worcester Polytechnic Institute

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