# Nanoparticles can overcome drug resistance in breast cancer cells

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Nanoparticles filled with chemotherapeutic drugs can kill drug-resistant breast cancer cells, according to a study published in the scientific journal *Biomaterials*.

Nanoparticles are just as small, or even smaller, than many blood proteins. They can therefore pass through the walls of healthy and sick cells, which make them interesting carriers of drugs against cancer and other diseases.

In the present study, researchers from Karolinska Institutet have shown that nanoparticles made from biodegradable plastics can overcome drug resistance in breast cancer cells. Such resistance is especially common in relapsing cancer patients and depresses, even neutralises the effect of the therapy against the tumour in many instances.

In their experiments, the researchers used breast cancer cells that responded poorly to drugs owing to their high concentrations of the enzyme microsomal glutathione S-transferase-1 (MGST-1). Abnormally high levels of MGST-1 have been associated with poor responses to several cancer drugs. The team treated the resistant breast cancer cells with nanoparticles filled with doxorubicin, a chemotherapeutic used clinically to treat bladder, lung, ovarian and breast cancer, amongst others.

"Our experiments on cultivated cells showed that the particles themselves are harmless," says research team member Dr Andreas

Nyström, Associate Professor at the Institute of Environmental Medicine, Karolinska Institutet. "We made it possible for the nanoparticles carrying the drug to kill resistant cancer cells by controlling where in the cancer cell they delivered their payload. This improved the efficacy of the drug even at a much lower dose, which is important for limiting the adverse reactions to therapy."

Nanoparticles can also be used to control where the drug is delivered in the body, and the team is now planning to equip them with targeting groups such as peptides or antibodies, that direct them to specific tumour cells to increase the uptake of the particles and their drug content by the tumour while sparing healthy cells.

**More information:** 'Nanoparticle-Directed Sub-cellular Localization of Doxorubicin and the Sensitization Breast Cancer Cells by Circumventing GST-Mediated Drug Resistance', Xianghui Zeng, Ralf Morgenstern, Andreas M. Nyström, *Biomaterials*, corrected proof online 6 November 2013. www.sciencedirect.com/science/ … ii/S0142961213012726

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