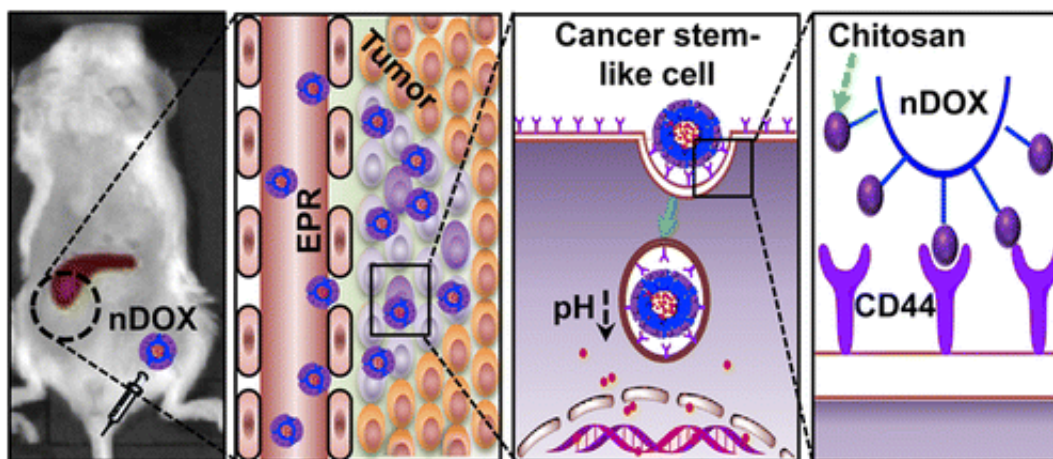


Nanoparticles target and kill cancer stem cells that drive tumor growth

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Many cancer patients survive treatment only to have a recurrence within a few years. Recurrences and tumor spreading are likely due to cancer stem cells that can be tough to kill with conventional cancer drugs. But now researchers have designed nanoparticles that specifically target these hardy cells to deliver a drug. The nanoparticle treatment, reported in the journal *ACS Nano*, worked far better than the drug alone in mice.

Anti-cancer drugs can often shrink tumors but don't kill [cancer stem cells](#) (CSCs). Although CSCs might only make up a small part of a tumor, their resistance to drugs allows them to persist. They can then cause a tumor to regrow or spread [cancerous cells](#) throughout the body.

Xiaoming He and colleagues wanted to develop a nanoparticle system to overcome these cells' defenses.

The researchers packaged the anti-cancer drug doxorubicin into nanoparticles coated with chitosan, a natural polysaccharide that can specifically target CSCs. Once in the acidic environment of the tumor, the nanoparticles degraded and released the drug. Tests on tiny, tissue-like clumps of both normal and cancer stem cells *in vitro* and on human breast tumors grown in mice showed the therapy successfully killed CSCs and destroyed tumors. The mice showed no obvious side effects.

More information: Chitosan-Decorated Doxorubicin-Encapsulated Nanoparticle Targets and Eliminates Tumor Reinitiating Cancer Stem-like Cells *ACS Nano*, Article ASAP

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Abstract

Tumor reinitiating cancer stem-like cells are responsible for cancer recurrence associated with conventional chemotherapy. We developed a doxorubicin-encapsulated polymeric nanoparticle surface-decorated with chitosan that can specifically target the CD44 receptors of these cells. This nanoparticle system was engineered to release the doxorubicin in acidic environments, which occurs when the nanoparticles are localized in the acidic tumor microenvironment and when they are internalized and localized in the cellular endosomes/lysosomes. This nanoparticle design strategy increases the cytotoxicity of the doxorubicin by six times in comparison to the use of free doxorubicin for eliminating CD44+ cancer stem-like cells residing in 3D mammary tumor spheroids (i.e., mammospheres). We further show these nanoparticles reduced the size of tumors in an orthotopic xenograft tumor model with no evident systemic toxicity. The development of nanoparticle system to target cancer stem-like cells with low systemic toxicity provides a new treatment arsenal for improving the survival of cancer patients.

Provided by American Chemical Society

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