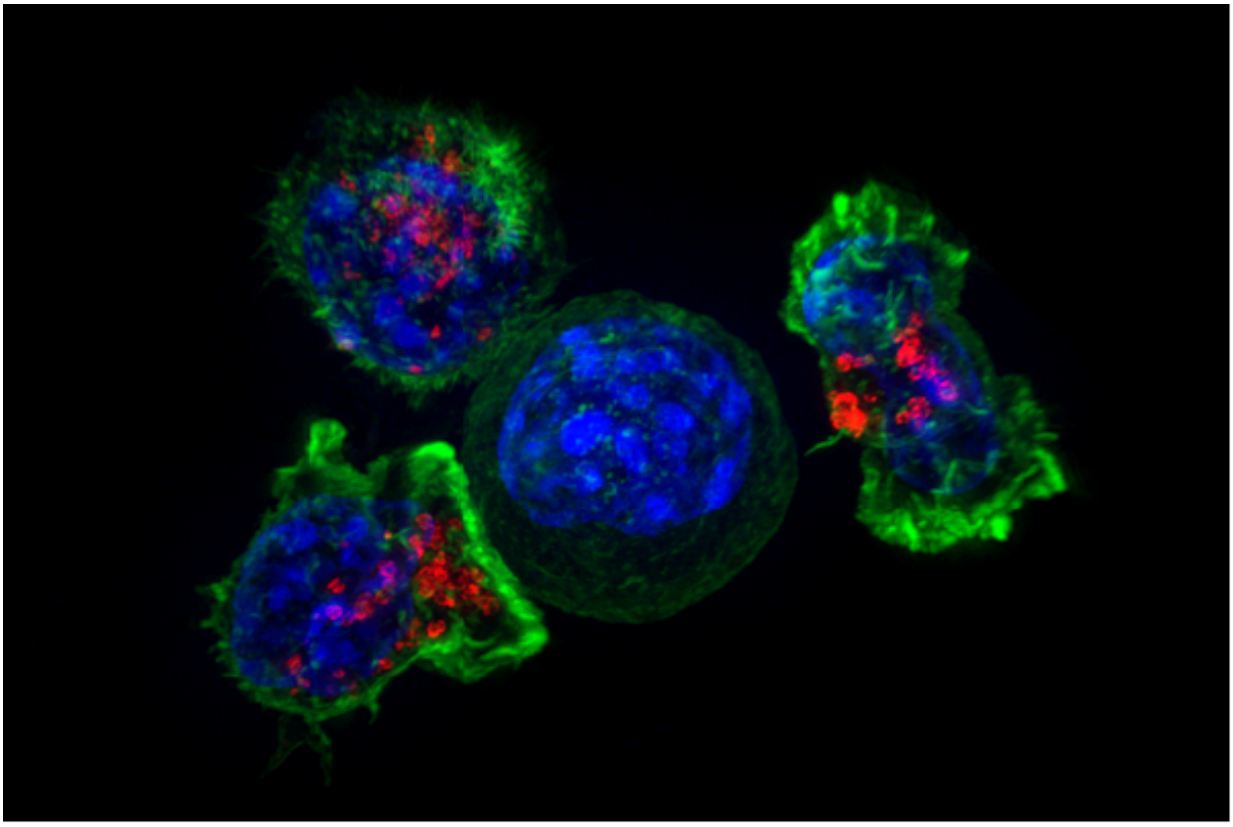
Nanoparticle therapy could deliver double blow to cancer

August 9 2018



Killer T cells surround a cancer cell. Credit: NIH

A new cancer therapy using nanoparticles to deliver a combination therapy direct to cancer cells could be on the horizon, thanks to research from the University of East Anglia.

The new therapy, which has been shown to make breast cancer and prostate cancer tumours more sensitive to chemotherapy, is now close to entering clinical trials.

And scientists at UEA's Norwich Medical School have confirmed that it can be mass-produced, making it a viable treatment if proved effective in human trials.

Using nanoparticles to get drugs directly into a tumour is a growing area of cancer research. The technology developed at UEA is the first of its kind to use nanoparticles to deliver two drugs in combination to target cancer cells.

The drugs, already approved for clinical use, are an anti-cancer drug called docetaxel, and fingolimod, a multiple sclerosis drug that makes tumours more sensitive to chemotherapy.

Fingolimod cannot currently be used in cancer treatment because it also supresses the immune system, leaving patients with dangerously low levels of white blood cells.

And while docetaxel is used to treat many cancers, particularly breast, prostate, stomach, head and neck and some lung cancers, its toxicity can also lead to serious side effects for patients whose tumours are chemo-resistant.

Because the nanoparticles developed by the UEA team can deliver the drugs directly to the tumour site, these risks are vastly reduced. In addition, the targeted approach means less of the drug is needed to kill off the cancer cells.

"So far nobody has been able to find an effective way of using fingolimod in cancer patients because it's so toxic in the blood," explains

lead researcher, Dr. Dmitry Pshezhetskiy from the Norwich Medical School at UEA.

"We've found a way to use it that solves the toxicity problem, enabling these two drugs to be used in a highly targeted and powerful combination."

The UEA researchers worked with Precision NanoSystems' Formulation Solutions Team who used their NanoAssemblr technology to investigate if it was possible to synthesise the different components of the therapy at an industrial scale.

Following successful results on industrial scale production, and a published international patent application, the UEA team is now looking for industrial partners and licensees to move the research towards a phase one clinical trial.

Also included within the nanoparticle package are molecules that will show up on an MRI scan, enabling clinicians to monitor the spread of the particles through the body.

The team has already carried out trials in mice that show the therapy is effective in reducing breast and prostate tumours. These results were published in 2017.

"Significantly, all the components used in the therapy are already cleared for clinical use in Europe and the United States," says Dr. Pshezhetskiy. "This paves the way for the next stage of the research, where we'll be preparing the therapy for patient trials."

"New FTY720-docetaxel nanoparticle therapy overcomes FTY720-induced lymphopenia and inhibits metastatic breast tumour growth," by Heba Alshaker, Qi Wang, Shyam Srivats, Yimin Chao,

Colin Cooper and Dmitri Pchejetski was published in *Breast Cancer Research and Treatment* on 10 July 2017.

"Core shell lipid-polymer hybrid nanoparticles with combined docetaxel and molecular targeted therapy for the treatment of metastatic prostate cancer," by Qi Wang, Heba Alshaker, Torsten Böhler, Shyam Srivats, Yimin Chao, Colin Cooper and Dmitri Pchejetski was published in *Scientific Reports* on 19 July 2017.

More information: Heba Alshaker et al. New FTY720-docetaxel nanoparticle therapy overcomes FTY720-induced lymphopenia and inhibits metastatic breast tumour growth, *Breast Cancer Research and Treatment* (2017). DOI: 10.1007/s10549-017-4380-8

Qi Wang et al. Core shell lipid-polymer hybrid nanoparticles with combined docetaxel and molecular targeted therapy for the treatment of metastatic prostate cancer, *Scientific Reports* (2017). DOI: 10.1038/s41598-017-06142-x

Provided by University of East Anglia