Under-twisted DNA origami delivers cancer drugs to tumors

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Scientists at Karolinska Institutet in Sweden describe in a new study how so-called DNA origami can enhance the effect of certain cytostatics used in the treatment of cancer. With the aid of modern nanotechnology, scientists can target drugs direct to the tumour while leaving surrounding healthy tissue untouched.

The drug doxorubicin has long been used as a cytostatic (toxin) for cancer treatment but can cause serious adverse reactions such as myocardial disease and severe nausea. Because of this, scientists have been trying to find a means of delivering the drug to the morbid tumour cells without affecting healthy cells. A possible solution that many are pinning their hopes on is to use different types of nanoparticles as 'projectiles' primed with the active substance.

In the present study, which is published in the scientific journal *ACS Nano*, scientists at Karolinska Institutet show how DNA origami can be used as such a projectile (or carrier) of doxorubicin. DNA origami is a new technique for building nanostrucutres from DNA, the hereditary material found in the cell nucleus. Using this technique, researchers can produce highly complex nanostrucutres with surfaces to which complex patterns of proteins and many other molecules can easily be attached.

What the researchers did on this occasion was to package the doxorubicin in a DNA origami configuration designed in such a way that relaxed the degree of twist of the DNA double helix. This allowed the drug to be released more slowly and operate more effectively on the

cancer cells at lower concentrations than is otherwise possible.

"When the DNA has a lower degree of twist, there's more room for the doxorubicin to become attached, which leads to its slower release," says group leader Dr Björn Högberg. "Another advantage to using DNA origami is that we will quickly be able to develop the targeted protein system. This will enable us to deliver drugs in a way that is even more sparing of healthy cells."

More information: 'A DNA Origami Delivery System for Cancer Therapy with Tunable Release Properties', Yong-Xing Zhao, Alan Shaw, Xianghui Zeng, Erik Benson, Andreas M. Nyström & Björn Högberg, *ACS Nano*, online first 5 September 2012. pubs.acs.org/doi/abs/10.1021/nn3022662

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