

New nanotechnology application for difficult-to-treat cancers

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A new treatment combining shock waves with nanoparticles can successfully treat tumours that are difficult to target using conventional chemotherapy. This is the first time this combined therapy has been tested in live animals. The findings of this pre-clinical study, published in the journal *Endocrine-Related Cancer*, could lead to the development of more effective therapies for treating life-threatening cancers in the future.

Nanoparticles can be effective carriers of drugs to the [tumour](#) site through the blood stream. The particles contain the chemotherapy drugs and deliver them directly to the tumour, which reduces toxic side effects and enhances the effectiveness of treatments. However, in some cancers [drug](#) delivery can be compromised due to the disruption of tumour blood flow.

To overcome this problem, researchers led by Dr Catalano at the University of Turin, designed a [treatment](#) that combines Extracorporeal Shock Waves (ESW) and nanobubbles (NBs). ESW are sound-like waves that can be focused with high precision, so that the cancerous cells more readily absorb the drugs. NBs are nanoparticles with a gas core that can be loaded with drugs to be released at the tumour site. The combination of NBs and ESW helps to focus the effects of anti-[cancer](#) drugs at the tumour site.

In this study, researchers tested this approach on a mouse model of [anaplastic thyroid cancer](#) (ATC), a very aggressive, rare and difficult-to-

treat type of cancer. ATC is one of the most lethal cancers - after diagnosis, the average survival rate is just five months. To date, a standard therapy for ATC does not exist and the only approved chemotherapy drug, doxorubicin, has severe side effects and is beneficial in fewer than 22% of cases. Doxorubicin-loaded nanoparticles were previously investigated as a treatment in other types of tumours, but drug delivery was limited. However, this study measured tumour volume once a week for 21 days and found that doxorubicin-loaded NBs combined with ESW significantly reduced tumour volume in comparison to those treated with doxorubicin-loaded NBs and no ESW, standard doxorubicin and no treatment at all. The combined treatment also resulted in lower tumour weight, higher doxorubicin tumour content and more dying tumour cells. The most common side effect of doxorubicin treatment is heart damage, which was significantly lower in animals treated with doxorubicin NBs compared with standard [doxorubicin](#) treatment.

"This could be a feasible strategy for the treatment of this and other aggressive solid tumours in which standard chemotherapy remains the only option", says Dr Catalano. "Given the promising results of this preclinical study and the lack of a standard therapy for ATC, the next step will be conducting clinical trials with the hope of improving the cancer treatment and patient quality of life".

Provided by Society for Endocrinology

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