Ministry of Science & Technology

New heat-based approach to cancer treatment can reduce chemotherapy doses

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Researchers have used a combination of ultra-small magnetic nanoparticles (MDs) along with a heat shock protein 90 inhibitor (HSP90i) at suboptimal doses for effective magnetic hyperthermia-based cancer therapy. The technique could significantly enhance treatment efficacy by reducing the required chemotherapy dosage, serving as an adjuvant therapy that minimizes side effects.

As cancer rates rise worldwide, the need for new treatment methods is crucial. Traditional treatments like chemotherapy and surgery have significant limitations, including drug resistance and severe side effects. To address these challenges, we are developing innovative treatments, such as nanotherapy, which has fewer side effects.

Scientists of Institute of Nano Science and Technology (INST), Mohali, an autonomous institute of Department of Science and Technology have shown that a combination therapy consisting of combination strategy that uses 17-DMAG, an inhibitor of Heat Shock Protein 90 (HSP90), in conjunction with magnetic hyperthermia-based cancer therapy (MHCT) can improve the effectiveness of heat-based cancer treatments.

The treatment of animal models by administering the combination through intra-tumoral injections, resulted in maximum glioma cell death in a rat glioma model with Tumor inhibition rates reaching 65% and 53% at the primary and secondary tumor sites, respectively, within 8 days.

The method published in ACS Nano is less invasive and causes fewer side effects. The research team demonstrated that MNPs, when exposed to an alternating magnetic field (AMF), can effectively combat tumors. This combined magnetic hyperthermia and chemotherapy (MHCT) approach can reduce the required amount of chemotherapy, making the treatment both safer and more effective. Additionally, the therapy can treat distant tumors without the need for an additional dose at the secondary tumor site, making it a highly effective cancer treatment.

Extensive global research is needed to realize the clinical application of the new therapy, potentially developing an adjuvant or alternative cancer therapy. The study paves the way for more efficient and tolerable anti-cancer treatments, offering substantial benefits to millions of patients and providing new directions for hyperthermia-based therapies.

To address this challenge, the research team, led by Dr. Deepika Sharma investigated the role of HSP90, a gene that is upregulated in response to heat stress. By inhibiting HSP90 using the drug 17-DMAG, they aimed to reduce the cells' ability to repair heat-induced damage, leading to enhanced tumor cell death.

Their work has focused on creating ultra-small magnetic nanoparticles with exceptional heat generation capabilities and optimizing the delivery of the HSP90 inhibitor.

A key advantage of this innovative therapy lies in its potential to stimulate the immune system, enhancing the body's natural defense against cancer. Furthermore, by overcoming drug resistance, a common challenge in cancer treatment, this approach offers a new frontier in combating this formidable disease.

The researchers hypothesize that the treatment activates an immune response through cytokine secretion, further enhancing its anti-tumor effects.

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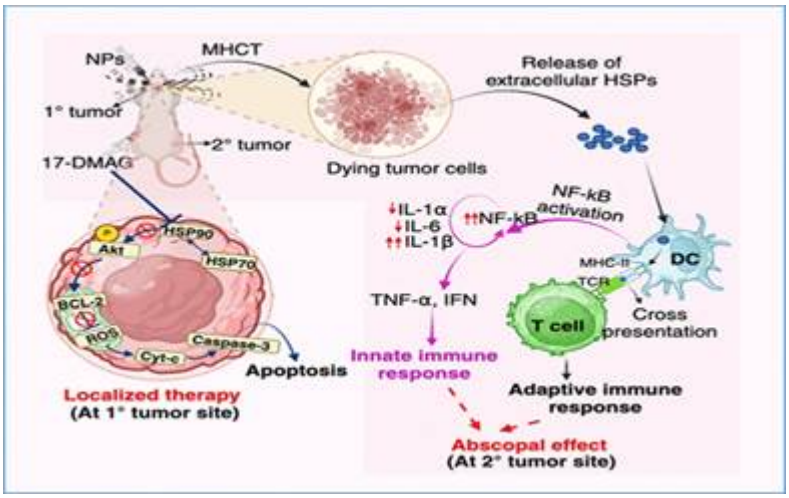

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