Med Uni Graz *Pioneering Minds*

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Press release
For immediate release

Photoactivated chemotherapy for targeted tumor treatment
International research provides new perspectives

Graz, 27 August 2026: The Medical University of Graz and Hungarian research partners have developed a promising new method in the fight against cancer. The new approach uses light to control and activate active agents, representing an important step toward more targeted chemotherapy with fewer side effects. The results were recently published in the *Journal of the American Chemical Society*.

Light to precisely control drug release

Together with researchers from the HUN-REN Research Centre for Natural Sciences (RCNS) in Budapest, a new technology has been developed that allows highly effective cancer drugs to be activated by light directly at the tumor site. The active agent is initially masked with a light-sensitive chemical compound, temporarily rendering it inactive. Only when the tumor is specifically irradiated is this mask removed, releasing the active agent exactly where it is intended to take effect. “This could enable chemotherapy drugs to be used much more precisely in the future. The goal is to specifically target tumor cells while protecting healthy tissue as much as possible,” explains Linda Waldherr, project leader at the Division of Medical Physics and Biophysics at the Medical University of Graz.

International collaboration as the key to success

The new method was developed by the research group led by Márton Bojtár at RCNS in Hungary. The researchers designed particularly stable and highly efficient variants that can be activated using green to red light, making them ideally suited for use in biological systems. The molecules were then linked to various chemotherapy drugs and successfully tested initially in cell culture models.

The Medical University of Graz then took the next important step in the research. Together with Nassim Ghaffari Tabrizi-Wizsy from the Division of Pathophysiology and Immunology, the new technology was tested in a biological model that more closely replicates conditions in the body than laboratory cell cultures. The results were promising: once the drug was specifically activated with light, tumor growth slowed significantly, and the cancer cells divided less frequently until their growth came to a halt entirely. As a result, damaged cells could no longer continue to multiply, giving the body an opportunity to eliminate them.

Optimal conditions in the lab

The experiments were carried out at the Chicken CAM Lab of the Medical University of Graz. In this model, tumor cells are examined on the well-vascularized membrane of fertilized chicken eggs. This scientifically established model closely replicates important processes in a living organism and enables new active agents to be tested quickly and reliably. As an alternative to early-stage animal experiments, the CAM model also makes an important contribution to implementing the 3Rs principle. The three Rs stand for Replace, Reduce and Refine.

Better control of highly potent drugs

A particularly noteworthy result is the near-complete deactivation of monomethyl auristatin E (MMAE), an extremely potent active agent, using photocages. The drug remained inactive until targeted irradiation with light triggered its release, allowing it to exert its anticancer effect specifically at the tumor site. This demonstrates the technology's potential to make drugs that are otherwise harmful to the body significantly safer to use in the future.

The researchers also see further potential applications. In addition to cancer medicine, the system could also be used for the selective activation of specific cell receptors. This opens up a broad range of applications in photopharmacology and light-controlled cell biology.

The results now published provide an important foundation for developing new therapies in which drugs can be activated with spatial and temporal precision. In the long term, this could help make cancer treatments more effective while also improving their tolerability.

To the publication: Optimized Xanthenium Photocages with Fused Ring Systems for Photoactivated Chemotherapy and G Protein-Coupled Receptor Photopharmacology | Journal of the American Chemical Society

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