

Genetic “Trojan horse” Selectively Kills Cancer Cells Linked to Kaposi’s Sarcoma

Targeted gene therapy kills herpesvirus-linked cancer cells, sparing healthy tissue.

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In a preclinical study, [UC Davis Comprehensive Cancer Center](#) scientists developed a highly targeted gene therapy that could revolutionize treatment for cancers linked to a common herpesvirus, with minimal side effects.

The novel approach treats [Kaposi’s sarcoma](#) and related diseases caused by the Kaposi’s sarcoma-associated herpesvirus (KSHV). The cancer-causing virus remains a major health issue, especially for people living with HIV/AIDS in parts of the world such as sub-Saharan Africa.

[Findings from the research are now published](#) and will appear in the December issue of [Molecular Therapy Oncology](#).

The study’s lead author is [Yoshihiro Izumiya](#), a professor in the [UC Davis Department of Biochemistry and Molecular Medicine](#) and the [Department of Dermatology](#).

“The new strategy uses a specialized gene therapy technique to selectively target and kill cancer cells infected with the virus — while leaving healthy cells unharmed,” Izumiya said.

Izumiya and members of his lab at UC Davis performed their research using mouse models.

“The treatment significantly reduced tumor growth with no detectable side effects,” Izumiya said.

A smart virus that targets a dangerous one

The therapy harnesses a harmless virus called adeno-associated virus (AAV) to deliver a genetic “Trojan horse” into infected cells. It does so by using the virus’ own protein to drive the therapeutic agents into the cancer cells to kill the cells.

This gene therapy is designed to become active only in cells harboring KSHV, thanks to a viral marker protein known as LANA, which is only found in KSHV-infected cancer cells.

Once inside the KSHV-infected cell, the therapy delivers a gene for a modified thymidine kinase enzyme that converts a common anti-herpesvirus drug — ganciclovir — into a cancer-killing agent. When the drug is added, only the infected cells are affected, triggering their death while sparing healthy tissue.

“This is a precision-guided approach that uses the virus’s own tricks against it,” said Izumiya. “It’s like delivering a self-destruct signal directly into the cancer cells.”

Eliminating the KSHV-infected cells while preserving healthy cells

In tests with lab-grown human cells, the therapy successfully eliminated KSHV-infected cells while leaving uninfected ones unharmed. When tested in mice with KSHV-related tumors, the therapy — combined with ganciclovir — effectively halted tumor growth.

Importantly, the treatment caused no observable side effects in mice, suggesting a high level of safety.

Researchers also discovered that anti-cancer drugs known to reactivate KSHV made the therapy even more effective, boosting its impact by enhancing the delivery system’s activation.

KSHV is key to several types of aggressive cancers

KSHV is responsible for several aggressive cancers, including Kaposi’s sarcoma and two rare lymphomas. While current treatments exist, they often come with significant side effects and are not always effective, especially in immunocompromised patients.

This new gene therapy could offer a safer, more targeted option. By focusing only on virus-infected cells, the treatment minimizes the risk to healthy tissues — a major hurdle in conventional cancer therapy.

Next steps could lead to personalized medicine treatment

This research is still in its early stages and will require further testing before it can move to human trials. But the results offer hope for a more precise, less toxic way to treat KSHV-related cancers and possibly other cancers caused by viruses.

“Our goal is to turn the virus’s own biology into its weakness,” Izumiya said. “This is a step toward smarter, more personalized cancer treatments.”

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For a complete list of co-authors, please read the [full paper](#).

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