Boosting the Immune Response to Brain Cancer

Stopping certain immune cells from using fructose for fuel enhanced the immune response to brain cancer in mice.

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At a glance:

- Stopping certain immune cells from using fructose for fuel enhanced the immune response to brain cancer in mice.
- The results point to a way to make immunotherapies more effective for a form of cancer that is often resistant to their effects.

Glioblastoma is the most common form of brain cancer in adults. It is a form of glioma, a group of cancers that arise from brain cells called glia. Glioblastoma is also the most aggressive type of brain tumor. The average patient survives less than 18 months after diagnosis.

One reason glioblastoma is so difficult to treat is that the environment around the tumor suppresses the body's immune response to the cancer. Immune cells called microglia are a major component of this environment, known as the tumor microenvironment.

Microglia are a type of glial cell that serve as primary immune cells in the brain. They produce a protein called GLUT5, which moves fructose into cells so it can be used to produce energy.

A team of NIH-funded researchers, led by Dr. Jason Miska of Northwestern University's Feinberg School of Medicine, investigated how fructose use by microglia affects glioblastoma growth. The study was published March 17, 2026, in the Proceedings of the National Academy of Sciences.

The researchers first showed that fructose is abundant in the brains of mice consistent with previous findings in humans. Moreover, they confirmed that microglia are the only cells in the glioblastoma microenvironment that can use fructose for fuel. They also found that microglia produced much more GLUT5 than any other immune cell. And glioblastoma had much higher levels of GLUT5 than normal brain tissue.

That ability to use fructose turned out to be a disadvantage when microglia were confronted with cancer cells. Microglia growing in petri dishes had less of an inflammatory response to glioma in the presence of fructose. Fructose also reduced microglia's ability to ingest glioma cells, a key step in the immune response.

Stopping microglia from using fructose for fuel by removing GLUT5 had beneficial effects in mouse models of brain cancer. Removing GLUT5 improved survival in a majority of mice across several glioma models.

Both microglia and immune cells called CD8+ T cells were more active in mice lacking GLUT5. However, the absence of GLUT5 failed to improve survival in mice that lacked mature T cells or B cells. This suggests that the tumor-fighting effects of deleting GLUT5 also depend on other key immune system players.

The results suggest that reducing the ability of microglia to process fructose could help boost the immune response to glioblastoma. Immunotherapies are often ineffective against glioblastoma. Blocking microglia from using fructose for fuel might make those treatments more effective.

"The challenge with glioblastoma is that the standard of care has barely changed in 20 years," Miska says. "That's why identifying an entirely new therapeutic approach like this is so exciting."

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