

# Cells' lack of glucose dulls immune system's ability to fight cancers

25 September 2015, by Michael C. Purdy

One of scientists' great hopes in fighting cancer is the immune system. If the same cells that battle viruses and other invaders recognize a tumor as foreign, the expectation is that they should be able to attack the cancer.

Cancers, however, have many strategies for avoiding attacks from the [immune system](#). But the more scientists are able to understand about those strategies, the more effectively they will be able to use the immune system to fight cancer.

To that end, researchers at Washington University School of Medicine in St. Louis have identified a new strategy. They found that if [tumor cells](#) take in enough glucose from their immediate environments, they effectively starve T cells—key immune system cells that defend the body—of this critical nutrient and render them unable to attack.

"This finding opens up a whole new aspect of the relationship between cancers and the immune system," said senior author Erika Pearce, PhD, now at the Max Planck Institute of Immunobiology and Epigenetics in Germany. "If we can learn how to intercede, it could provide us with new ways to convince the immune system to fight cancer."

Pearce noted, however, that such interventions would be unlikely to consist of simply giving [tumor cells](#) more glucose, which inadvertently would cause them to grow and multiply.

The findings are available online in *Cell*.

Working in mice, the researchers studied tumors known as sarcomas. They used a type of sarcoma that expresses a protein that T cells are known to recognize. Normally, when these tumors are transplanted into mice, they are recognized and rejected by T cells.

However, when the study's first authors, Chih-Hao Chang, PhD, a research instructor, and Jing Qiu, a

graduate student, genetically altered the sarcomas so that they were more capable of utilizing available glucose, the tumors grew in an uncontrolled fashion. T cells still infiltrated the tumors, but with all the glucose used up, there was no fuel for them to mount an attack.

Cells of higher organisms have more than one way to make energy. Cancers long have been known to favor glycolysis, a method of making energy that uses only sugar and can occur without oxygen. Scientists have assumed this is because [cancer cells](#) can't always get enough oxygen from the bloodstream and, consequently, turn to glucose for energy. Glycolysis also was thought to be a more reliable way to fuel cancers' rapid growth.

But the new study suggests that glycolysis offers another advantage to cancer cells: It serves to nutritionally incapacitate T cells, thereby preventing them from mounting an optimal immune response against tumors.

"The situation is like a tug-of-war for sugar between tumors and T cells," Chang said.

Added Qui: "The side that can pull in sufficient resources for itself will win the game."

Glycolysis may not be the only way cancer cells avoid immune system attack, the researchers noted. Tumors may successfully compete for other nutrients and metabolites that [immune cells](#) need for survival and function. Scientists need to look at this possibility to better understand how to use the immune system to fight cancer.

**More information:** "Metabolic Competition in the Tumor Microenvironment Is a Driver of Cancer Progression," *Cell*, Volume 162, Issue 6, 10 September 2015, Pages 1229-1241, ISSN 0092-8674, [dx.doi.org/10.1016/j.cell.2015.08.016](https://doi.org/10.1016/j.cell.2015.08.016)

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