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Talk between immune cells could lead to new cancer vaccine

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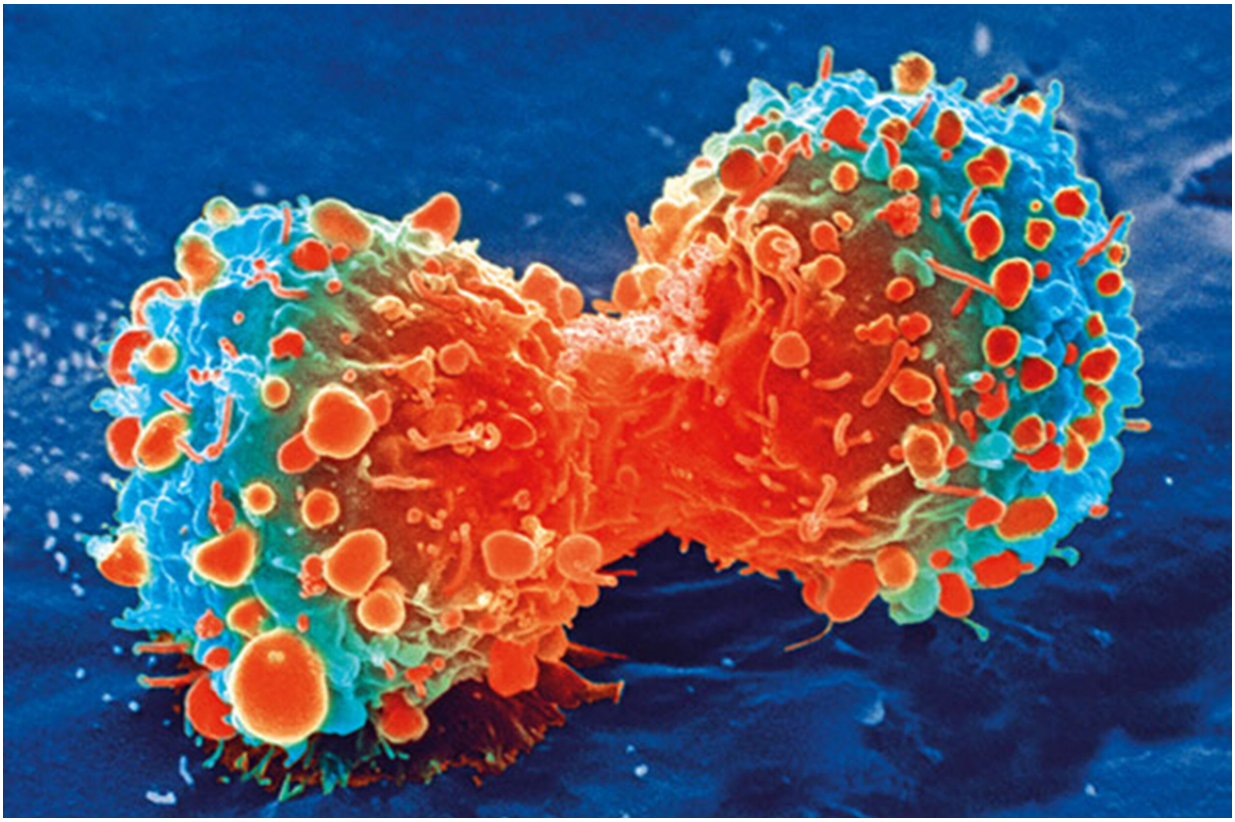

Cancer cell during cell division. Credit: National Institutes of Health

In the past decade, immunotherapy has helped save the lives of many cancer patients, many with lung cancer, who might have otherwise faced almost certain death sentences. However, only about 20% of patients

who received immune therapies—designed to enhance or override natural limitations on immune system response—saw sustained benefits from treatment.

Now Yale scientists have helped identify crucial ways that immune system cells congregate and communicate with each other to identify and eradicate tumors, an insight that can help improve these outcomes.

Writing in the journal *Cell* on Dec. 9, they report these findings might pave the way for new vaccines that may help increase survival rates in several forms of cancer.

In recent years, scientists have found that patients who are most likely to survive lung cancer often develop lymph node-like structures around tumors. And like lymph nodes, these structures produce a host of immune system cells such as CD4 helper T cells, which identify tumors; B cells, which produce antibodies against the cancer; and CD8 killer T cells, which can attack cancer cells.

"The field has been trying to figure out how these mini-immune systems are set up in the tumor micro-environment and why do they correlate to great outcomes?" asked Nikhil Joshi, assistant professor of immunobiology and co-senior author of the paper.

It turns out that these immune system cells communicate with each other.

For the study, a team led by Joshi, Can Cui, a Ph.D. student and physician at Yale School of Medicine, and Joseph Craft, the Paul B. Beeson Professor of Medicine (rheumatology) and professor of immunobiology, analyzed tumor genetics of cancer survivors and then created mouse models with genetic characteristics similar to those survivors.

Their analysis found that B cells actually do more than simply make antibodies against cancer. In order to also unleash a robust response by CD8 killer T cells, the B cells must first interact with CD4 helper T cells in order to identify tumors to target.

"T cells and B cells need to talk to each other before tumors can be targeted," Craft said.

Several cancer vaccines are already under development designed to spur production of T cells which have taken up residence around several types of cancer, including melanoma and glioblastomas, as well as lung cancer. In fact, both BioNTech and Moderna—which during the COVID-19 pandemic helped develop vaccines to help the human body identify and fight the virus—were initially formed in part to develop cancer vaccines.

"The model is already in place," Joshi said.

Cui suggests that future cancer vaccines may be more effective if they can jumpstart both antibody-producing B cells and helper T cells to bolster a broader immune system response.

Such vaccines could be used in conjunction with traditional immunotherapy treatments to increase survival rates of patients with several forms of cancer, the researchers said.

Provided by Yale University