

First-of-its-kind vaccine offers cancer patients hope

By Nina Agrawal
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An experimental vaccine developed by Merck and Moderna could become the first vaccine of its kind used to treat cancer. Scientists hope it won't be the last.

On Thursday, the drugmakers announced that patients with melanoma who received a vaccine tailored to help their immune systems attack their tumors were 42% less likely to experience a recurrence of the cancer within two years than those who did not receive the vaccine. The companies have yet to show the treatment can prolong melanoma patients' overall survival.

The results come at a time of great momentum in the development of cancer vaccines — an idea scientists have tried and failed to realize for decades.

Buoyed by recent scientific advances, however, researchers are now testing whether such vaccines could one day be used for a range of cancers, including hard-to-treat ones like pancreatic and brain cancer. Those efforts have been bolstered by investments from drugmakers like Moderna as well as hospitals like Memorial Sloan Kettering Cancer Center, which in 2024 established a center dedicated to designing, producing and administering cancer vaccines on site. This year, the federal government also announced a \$200 million public-private partnership to advance these vaccines.

There is still reason for skepticism. It's unclear, for example, whether other cancers will respond to this approach as favorably as melanoma, a cancer that is easier to target with, and particularly responsive to, therapies that harness the immune system.

"This is the first step," said Dr. Robert Vonderheide, president-elect of the American Association for Cancer Research and director of the Abramson Cancer Center at the University of Pennsylvania. "Will it work in other tumors? I'm hopeful. Do we have a lot to learn? For sure."

The notion that a person's own immune system could fight off cancer has been around for a long time — more than a century, some say, citing efforts in the 1890s to treat cancer with bacterial mixtures.

A few major developments have changed the field, though. For one, scientists came to understand that tumors produce "neoantigens," new proteins that distinguish tumor cells from healthy cells — somewhat akin to an enemy flag. In the past 20 years, a significant reduction in the cost of genetic sequencing has made it easier than ever for scientists to identify these flags by sequencing tumor DNA.

At the same time, the technology to predict which flags were most likely to provoke an immune system attack was improving. The idea of a cancer vaccine like Merck and Moderna's is to deliver a bespoke set of these enemy flags, customized to an individual's tumor, to teach the immune system to recognize them and attack if the cancer reappears.

And thanks to the successes in COVID-19 vaccine development, it is now relatively cheap and easy to make vaccines using mRNA, which carry instructions for the body to make these neoantigens. The Moderna and Merck vaccine uses this approach, though scientists are also exploring others.

The companies delivered their vaccine in combination with pembrolizumab (Keytruda). The medication is part of a relatively new class of drugs called immune checkpoint inhibitors, which take the brakes off important immune cells so they can attack cancer cells once they recognize them.

"Having all of those capabilities all kind of converge at the same time led to a lot of excitement and a lot of opportunity for innovation," said Dr. Catherine Wu, head of stem cell transplantation and cellular therapies at Dana-Farber Cancer Institute in Boston. Wu led one of the first promising studies of a personalized cancer vaccine for melanoma.

The Merck-Moderna melanoma vaccine trial built on those efforts. The trial involved 1,137 melanoma patients, about two-thirds of whom were randomly assigned to receive an experimental mRNA vaccine, delivered in nine doses, in addition to pembrolizumab. The other third received a placebo and pembrolizumab.

Two years after entering the trial, those who received the vaccine were far less likely to have had the cancer come back at all or, worse, spread far in the body.