- Vaccination / Virus

Technology used for COVID-19 vaccines slows tumor growth in liver cancer

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An approach using mRNA, the same technology used in two of the three available COVID-19 vaccines in the United States, suppresses tumor growth in liver cancer, a study published Wednesday by Nature Communications found.



Using mRNA nanoparticles, or ultra-fine pieces of messenger RNA, researchers at Massachusetts General Hospital and Brigham and Women's Hospital in Boston said they were able to restore the function of a key gene that helps slow tumor growth.

Messenger RNA is a piece of genetic material that effectively teaches cells how to make proteins, such as antibodies, which help the immune system fight off diseases, according to the Centers for Disease Control and Prevention.

When used in combination with immune checkpoint blockade, a cancer treatment strategy that promotes or suppresses immune response, mRNA nanoparticles helped "reprogram" the microenvironment of the liver, the researchers said.

This restored the function of the p53 master regulator gene, a tumor suppressor mutated in liver cancer that not only suppressed tumor growth, but also increased antitumor immune responses in hepatocellular carcinoma, a common form of liver cancer, they said

"The reprogramming of the cellular and molecular components of the tumor microenvironment could be a transformative approach for treating hepatocellular carcinoma and other cancers," study co-author Jinjun Shi said in a press release.

"mRNA nanoparticles ... provide the cells with the instructions to build proteins, which, in the case of hepatocellular carcinoma, delayed tumor growth and rendered the tumor more responsive to treatment," said Shi, an associate professor of anesthesia at Harvard Medical School.

Hepatocellular carcinoma is the most common form — and one of the more deadly types — of liver cancer, according to the American Cancer Society.

It is typically treated with immune checkpoint blockers, a class of drugs that enable the body's immune system to recognize and attack cancer cells, though not all patients benefit from the approach, Shi and his colleagues said.

Encouraged by the success of mRNA in COVID-19 vaccines, Shi decided to apply the technology, with some modifications, to cancer cells.

He and his colleagues developed an mRNA nanoparticle strategy designed to restore loss of function of p53, a tumor suppressor gene, they said.

About one-third of patients with hepatocellular carcinoma see the p53 gene lose its function as their cancer develops, according to the researchers.

The experiments revealed that p53 regulates the tumor microenvironment by modulating the interaction of cancer cells with immune cells during immune checkpoint blockade treatment, the researchers said.