mRNA Vaccines for Cancer

COVID-19 vaccine's mRNA technology could one day help treat cancer.

March 15, 2021 By Liz Highleyman

The same messenger RNA (mRNA) technology used in the Moderna and Pfizer/BioNTech COVID-19 vaccines could potentially be used to prevent or treat a wide variety of other diseases, including cancer and HIV. In fact, the technology was first developed for cancer.

The mRNA vaccine approach uses lipid nanoparticles, or fat bubbles, to deliver bits of genetic material that encode instructions for making proteins. The COVID-19 vaccines, for example, deliver blueprints for making the coronavirus spike protein. Cancer vaccines contain instructions for tumor antigens; personalized vaccines incorporate selected antigens from an individual patient's tumor. When an mRNA vaccine is injected, human cells produce these proteins, triggering an immune response.

Moderna's experimental cancer vaccine known as mRNA-4157 shrank tumors in people with head and neck cancer when given with the checkpoint inhibitor Keytruda (pembrolizumab), which unleashes T-cell activity. The overall response rate was 50%, including two complete responses. Another Moderna vaccine candidate targets cancers with KRAS mutations.

BioNTech is also working on cancer vaccines. In a study of 25 people with advanced melanoma who received the experimental BNT111 vaccine, one had complete remission, three had partial responses and seven had stable disease. The response rate was higher when the vaccine was combined with a checkpoint inhibitor. What's more, among people vaccinated once monthly, memory T cells that recognize the cancer antigens in the vaccine persisted for more than a year.
