

Universal vaccine targets coronaviruses to prevent future pandemics

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David Martinez, PhD., in the lab at the University of North Carolina at Chapel Hill Gillings School of Global Public Health, studies a new universal vaccine that's effective against a group of coronaviruses. Credit: Jon Gardiner/UNC-Chapel Hill

Scientists at the University of North Carolina Gillings School of Global

Public Health have developed a universal vaccine that protected mice not just against COVID-19 but also other coronaviruses and triggered the immune system to fight off a dangerous variant.

While no one knows which virus may cause the next outbreak, coronaviruses remain a threat after causing the SARS outbreak in 2003 and the global COVID-19 pandemic.

To prevent a future coronavirus pandemic, UNC-Chapel Hill researchers designed the [vaccine](#) to provide protection from the current SARS-CoV-2 coronavirus and a group of coronaviruses known to make the jump from animals to humans.

The findings were published in *Science* by lead authors David Martinez, a postdoctoral researcher at UNC Gillings School of Global Public Health and a Hanna H. Gray Fellow at the Howard Hughes Medical Institute, and Ralph Baric, an epidemiologist at UNC Gillings School of Global Public Health and professor of immunology and microbiology at the UNC School of Medicine, whose research has sparked new therapies to fight emerging infectious diseases.

The lead authors worked with a team of scientists from UNC-Chapel Hill, Duke University School of Medicine, and the University of Pennsylvania Perelman School of Medicine.

Researchers at UNC-Chapel Hill are playing a key role in coronavirus [vaccine development](#). After testing the effectiveness of the first generation of COVID-19 vaccines, they pivoted to look at a second-generation vaccine: one that targets sarbecoviruses, Baric said.

Sarbecoviruses, part of the large family of coronaviruses, are a priority for virologists after two caused devastating disease in the past two decades: SARS and COVID-19.

The team's approach started with mRNA, which is similar to the Pfizer and Moderna vaccines used today. But instead of including the mRNA code for only one virus, they welded together mRNA from multiple coronaviruses.

When given to mice, the hybrid vaccine effectively generated neutralizing antibodies against multiple spike proteins—which viruses use to latch onto [healthy cells](#), including one associated with B.1.351, known as the South African variant.

"The vaccine has the potential to prevent outbreaks when used as a new variant is detected," said Baric, a trailblazer in pandemic preparedness.

The paper includes data from mice infected with SARS-CoV and related coronaviruses and the vaccine prevented infection and lung damage in mice. Additional testing could lead to human clinical trials next year.

"Our findings look bright for the future because they suggest we can design more universal pan coronavirus vaccines to proactively guard against viruses we know are at risk for emerging in humans," Martinez said. "With this strategy, perhaps we can prevent a SARS-CoV-3."

More information: "Chimeric spike mRNA vaccines protect against Sarbecovirus challenge in mice," by Martinez et al. *Science* (2021).
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