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# Moderna's groundbreaking coronavirus vaccine was designed in just 2 days

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Moderna; Samantha Lee/Business Insider

**The FDA granted emergency authorization to Moderna's coronavirus vaccine on Friday.**

**The vaccine was found to be 94.1% effective at protecting people against COVID-19 in trials.**

**It took less than a year to develop and test the vaccine — years faster than previous vaccines.**

**The company designed its vaccine in just two days. In the past, traditional vaccines have taken years to design.**

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The Food and Drug Administration granted emergency authorization to Moderna's coronavirus vaccine on Friday.

The decision came after an independent expert panel voted overwhelmingly to recommend the authorization on Thursday. Moderna's vaccine candidate was found to be 94.1% effective in preventing COVID-19 in clinical trials.

[94.1% effective in preventing COVID-19 in clinical trials](#), and it doesn't trigger severe side effects in most people.

That's far more effective than expected: The FDA had said it would likely approve a vaccine that showed at least 50% efficacy, and Dr. Anthony Fauci had said he hoped for 70%. The vaccine's development process was also

[unprecedentedly fast](#) — only the Pfizer-BioNTech team beat Moderna to FDA authorization (that vaccine, similarly, was 95% effective in trials).

But perhaps more remarkable is that Moderna [designed its vaccine in just two days in January](#), before some people had even heard of the coronavirus.

That wouldn't have been possible without the [technology Moderna has bet on](#) since its founding: messenger RNA (mRNA) vaccines.

Messenger RNA is genetic material that tells cells how to make proteins. So Moderna's coronavirus vaccine candidate works by injecting a small piece of mRNA from the coronavirus that codes for the virus' spike protein. This protein helps the coronavirus attach to and invade cells, and it's what antibodies target and neutralize. Moderna's mRNA vaccine spurs the body to produce the spike protein internally. That, in turn, triggers an immune response.

Pfizer's candidate also relies on mRNA.

**An infographic showing how mRNA vaccines are developed.** Shayanne Gal/Insider

Utilizing mRNA technology meant that both Pfizer and

Utilizing mRNA technology meant that Moderna only needed the coronavirus' genetic sequence to make a vaccine — no virus had to be cultivated in labs. That's why the companies were able to progress in record time. By contrast, the development of more traditional vaccines [can take years](#).

"What you could probably do is make this a whole new way of making drugs, vaccines, almost anything," Bob Langer, one of Moderna's founders, [previously told Business Insider](#).

Yuqing Liu/Business Insider

**[Read more: How the sprint for a coronavirus vaccine transformed Moderna into a \\$39 billion powerhouse that's poised to reshape biotech](#)**

The FDA has never approved an mRNA-based vaccine or treatment before, so to many, Moderna's bet looked risky. But now that the FDA has given the green light to the shots, mRNA vaccines are poised to set a new industry standard.

## How Moderna got ahead of the coronavirus

On January 6, Moderna CEO Stéphane Bancel emailed Barney Graham, a vaccine researcher at the National Institutes of Health. Bancel was troubled by the mysterious virus outbreak in Wuhan. He then talked with Graham about developing a vaccine.

Moderna had been working with the NIH on vaccines since 2017, but had not yet gotten one approved. Graham signed on to the partnership.

On January 11, researchers from China published the genetic sequence of the coronavirus. Two days later, Moderna's team and NIH scientists had finalized the targeted genetic sequence they would use in the vaccine.

"This is not a complicated virus," Bancel told [The New York](#)

THIS IS NOT A COMPLICATED VIRUS, BARCELONA [THE NEW YORK Times](#).

By February 24, Moderna had shipped its first vaccine batches to NIH scientists in Bethesda, Maryland. Researchers administered the first dose on March 16 in

Seattle, Washington. That launched the first clinical trial of any coronavirus vaccine.

**Nurse Kath Olmstead gives volunteer Melissa Harting an injection as part of Moderna's COVID-19 vaccine trial, July 27, 2020.** Hans Pennink/AP

Moderna's speed has led some to worry that the company sacrificed thoroughness. But that's not the case, according to Albert Rizzo, chief medical officer for the American Lung Association.

"We're not skipping steps — we actually have better technology," Rizzo told Business Insider. "Why did it take two weeks to cross the Atlantic back in the 1800s? Well, we had to go on a boat. Whereas now, you can get across the ocean in several hours."

## The pros and cons of mRNA vaccines

For decades, vaccines contained a dead or weakened version of the virus itself. Then early advances in genetics allowed vaccines to use proteins made by the virus instead. That method was first used [in the 1980s](#) to develop a vaccine for hepatitis B.


Companies like Novavax are relying on that protein-based model to create their coronavirus vaccine candidates. But Moderna's business has revolved around mRNA since it started in 2010.

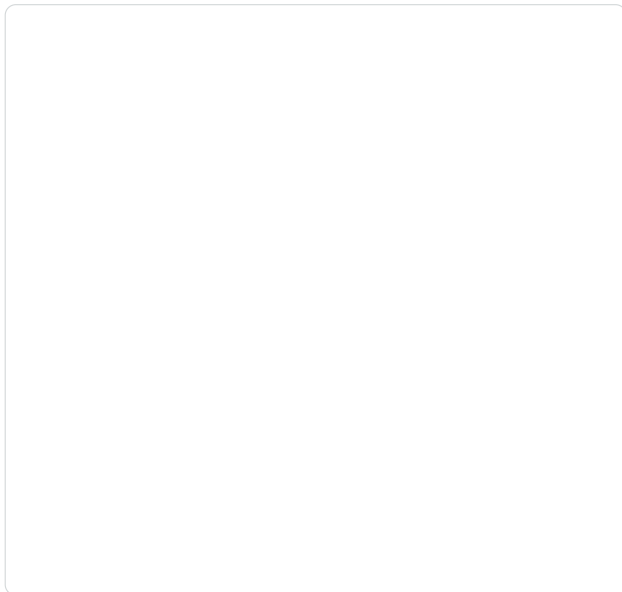
**An illustration of a coronavirus particle. The red, objects are the spike proteins.** CDC

RNA vaccines' big advantage is the speed of development and production. But there are drawbacks. For one, both Pfizer and Moderna's vaccines require two injections. Pfizer is delivering its two shots three weeks apart, while Moderna's are four weeks apart.

The vaccines are also difficult to deliver and store. Pfizer's vaccine needs to be shipped at -94 degrees Fahrenheit, which requires dry ice and special freezers. Moderna's requires a temperature of -4 degrees Fahrenheit.

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