

# *Can You Become Immune to the Coronavirus?*

It's likely you can, at least for some period of time. That is opening new opportunities for testing and treatment.

**By Apoorva Mandavilli**

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As the number of people infected with the coronavirus surpasses 450,000 worldwide, and more than one billion are locked in their homes, scientists are wrestling with one of the most pressing questions of the pandemic: Do people who survive the infection become immune to the virus?

The answer is a qualified yes, with some significant unknowns. That's important for several reasons.

People who are confirmed to be immune could venture from their homes and help shore up the work force until a vaccine becomes available, for example. In particular, health care workers who are known to be immune could continue to care for the severely ill.

Growing immunity in the community also is the way the epidemic ends: With fewer and fewer people to infect, the coronavirus will lose its toehold and even the most vulnerable citizens become more insulated from the threat.

Immunity may also bring an early treatment. Antibodies gathered from the bodies of those who have recovered may be used to aid those struggling with the illness caused by the coronavirus, called Covid-19.

On Tuesday, the Food and Drug Administration approved the use of plasma from recovered patients to treat some severe cases. A day earlier, Gov. Andrew M. Cuomo announced that New York would become the first state to begin testing serum from people who have recovered from Covid-19 to treat those who are seriously ill.

“It’s a trial for people who are in serious condition, but the New York State Department of Health has been working on this with some of New York’s best health care agencies, and we think it shows promise,” Mr. Cuomo said.

The body’s first line of defense against an infectious virus is an antibody called immunoglobulin M, whose job is to stay vigilant in the body and alert the rest of the immune system to intruders like viruses and bacteria.

Days into an infection, the immune system refines this antibody into a second type, called immunoglobulin G, exquisitely designed to recognize and neutralize a specific virus.

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The refinement may take as long as a week; both the process and the potency of the final antibodies can vary. Some people make powerful neutralizing antibodies to an infection, while others mount a milder response.

The antibodies generated in response to infection with some viruses — polio or measles, for example — bestow a lifetime of immunity. But antibodies to the coronaviruses that cause the common cold persist for just one to three years — and that may be true of their new cousin as well.

A study in macaques infected with the new coronavirus suggested that once infected, the monkeys produce neutralizing antibodies and resist further infection. But it is unclear how long the monkeys, or people infected with the virus, will remain immune.

Most people who became infected during the SARS epidemic — that virus is a close cousin of the new coronavirus, called SARS-CoV-2 — had long-term immunity lasting eight to 10 years, said Vineet D. Menachery, a virologist at the University of Texas Medical Branch at Galveston.

Those who recovered from MERS, another coronavirus, saw much shorter-term protection, Dr. Menachery said. People who have been infected with the new coronavirus may have immunity lasting at least one to two years, he added: “Beyond that, we can’t predict.”

Still, even if antibody protection were short-lasting and people became reinfected, the second bout with the coronavirus would likely be much milder than the first, said Florian Krammer, a microbiologist at the Icahn School of Medicine at Mount Sinai in New York.

Even after the body stops producing neutralizing antibodies, a subset of immune memory cells can reactivate a response effectively, he noted.

“You probably would make a good immune response before you even become symptomatic again and might really blunt the course of the disease,” Dr. Krammer said.

A crucial question is whether children and adults who have only mild symptoms still generate a strong enough response to remain immune to the virus until a vaccine is available.

Dr. Marion Koopmans, a virologist at Erasmus University in Rotterdam, and her team have screened antibody responses in 15 infected patients and health care workers.

The researchers are also using banked blood samples from about 100 people who were known to be infected with one of four coronaviruses known to cause the common cold.

If those samples show some immune response to the new coronavirus, too, Dr. Koopmans said, it might explain why some people — children, for example — have only mild symptoms. They may have antibodies to related coronaviruses that are at least somewhat effective against the new one.

The quickest way to assess immunity is a blood test that looks for protective antibodies in the blood of people who have recovered. But first you have to have the test.

Antibody tests are used in Singapore, China and a handful of other countries. But they are just coming to market in much of the West.

Last week, Dr. Krammer and his colleagues developed one such antibody test that could be scaled up in “days to weeks,” he said.

The team validated the test in blood plasma taken from three patients with Covid-19. The researchers are seeking speedy approval from the F.D.A.

Dozens of other labs are also at work on a dizzying list of tests, although they, too, are mostly based on slim data that has not yet been reviewed by other scientists.

“No matter who makes them, as long as they’re reliable, that’s a super nice tool,” Dr. Krammer said. Because this is a new coronavirus, the test should deliver “basically, a yes or no answer, like an H.I.V. test — you can figure out who was exposed and who wasn’t.”

On Wednesday, officials of Public Health England said they had purchased millions of newly developed antibody tests and were evaluating them for patients to use at home. Citizens who discovered they had been exposed and now had some immunity to the coronavirus might be able to return to normal lives, the officials said.

That would be particularly useful for health care workers. Those who know they have at least some immunity could be placed on the front lines of emergency care, sparing colleagues who have not been exposed.

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“If this really goes on for months at a time, for 18 months as some people have projected, having health care workers who are immune to the virus will be really, really helpful,” said Angela Rasmussen, a virologist at Columbia University in New York.

But tests like these may not be of much use for diagnosis of coronavirus infection as it gets underway, because of the time it takes for the body to begin producing antibodies.

Dr. Krammer's test picks up an antibody response as early as three days after symptoms emerge. Given that people may not show symptoms for as long as 14 days after infection, however, that is too late for the test to be useful as a diagnostic tool.

Finding people with powerful antibody responses might help point the way to new treatments, however. Essentially, antibodies extracted from the blood of recovered patients are injected into those who are ill.

Several teams have already been working on such an effort, following early reports from China of success. A Beijing-based company called AnyGo Technology has provided 50,000 tests to the Chinese Center for Disease Control and Prevention, and to hospitals in Wuhan, Beijing and Shanghai, according to its founder, Dr. Le Sun.

Dr. Shangen Zheng, a doctor with the Chinese military, said his team had treated more than 10 patients so far, and data from many more patients treated with plasma in Hubei Province is being assessed.

This approach is actually "something very old-fashioned," Dr. Krammer said. It was used to save American soldiers infected with the hemorrhagic Hantaan virus during the Korean War, and to treat people in Argentina infected with the hemorrhagic Junin virus.

Before the method can be put into wide use, however, scientists must work out safety issues, such as ensuring that the plasma taken from recovered patients is free of other viruses and toxins.

Pharmaceutical companies like Takeda and Regeneron are hoping to sidestep some of those questions by developing antibodies against the coronavirus in the laboratory.

Ultimately, it is only with these tests that scientists will be able to say when enough of the population has been infected and has become immune — and when the virus has begun to run out of hosts.

### The Coronavirus Outbreak

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Updated March 24, 2020

- **How does coronavirus spread?**

It seems to spread very easily from person to person, especially in homes, hospitals and other confined spaces. The pathogen can be carried on tiny respiratory droplets that fall as they are coughed or sneezed out. It may also be transmitted when we touch a contaminated surface and then touch our face.

- **Is there a vaccine yet?**

No. The first testing in humans of an experimental vaccine began in mid-

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