Coronavirus testing, immunity: What we know

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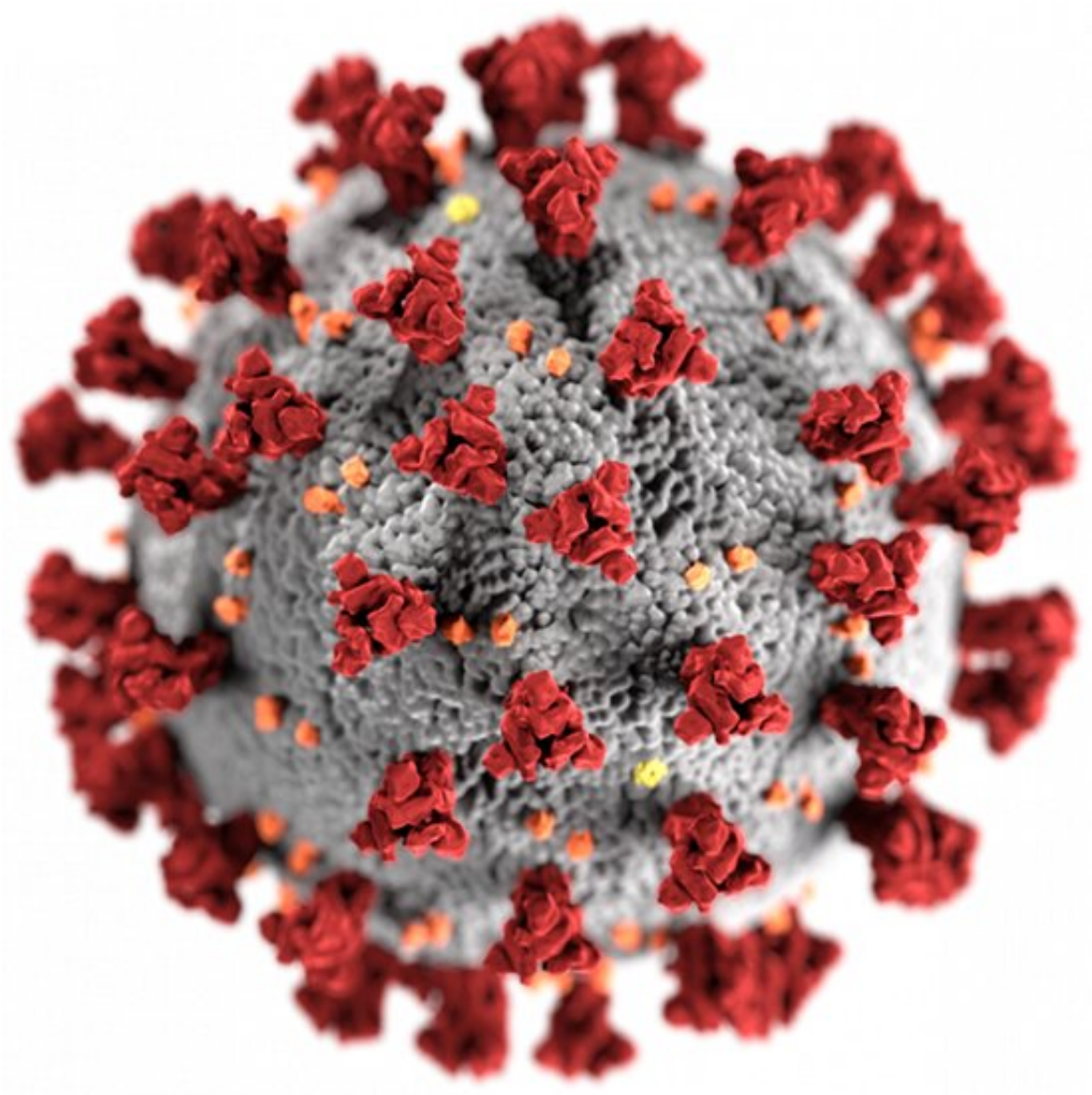

Image of the ultrastructural morphology exhibited by the 2019 Novel Coronavirus (2019-nCoV). Credit: CDC

Questions around coronavirus testing and immunity are top of mind as the pandemic continues to spread and potential vaccines undergo trials.

Emily Toth Martin, associate professor of epidemiology at the University of Michigan School of Public Health, breaks down the basics of coronavirus testing and what the current data show are the potential next steps for the United States as we head toward fall and flu season.

What are the different types of testing one can receive for COVID-19?

There are two major types of tests that someone may receive related to the coronavirus:

1. Virus testing: This is a test that uses a swab from your nose—or sometimes saliva—that looks for whether or not the virus is present in your body at that particular moment in time. Most often when someone is talking about getting a COVID-19 test, this is the test that they are referring to.
2. Serology testing: This test looks to see if you were infected with the virus in the past by looking for the presence of antibodies. A serology test is useful after you have recovered from the infection.

What advancements have we seen in testing for the coronavirus and where do you think the future of testing is going?

There are a lot of changes and advancements happening for coronavirus testing. One of the biggest advancements that would be extremely

valuable in the future is the development of an at-home virus test, similar to what is currently on the market for pregnancy tests. Some at-home tests have recently become available; however, the sample needs to be mailed to the testing company to be evaluated, which adds additional wait time for results.

Current testing turnaround times seem to vary across state, county and city levels. Why is this?

The time it takes to receive the results of a test varies for several reasons. Not every city has a lab that has the capacity or capability to run the tests. In this case, that swab may have to travel to a lab that is located in a different city—or sometimes a different state—before it can even be tested. This creates a disparity in terms of information access for rural areas or those that don't have testing facilities. Tests from these areas have to travel further to determine the results, leaving people waiting for longer periods of time. Economically, it is very difficult to ask people to self-isolate while they wait for test results. Some may not be in jobs or positions where they can take time off or afford to lose wages during that time, putting people in a position of continuing about their life not knowing whether they have tested positive or negative for COVID-19.

One of the biggest challenges I see with controlling this virus is getting test result information to people quickly so they can isolate themselves and prevent further spread should they test positive for COVID-19. This also presents an opportunity to further support people so they can stay home either when they're not sure if they're infected or once they find out that they might be infected.

As a country, we have to make it palatable for people to stay home when they're sick or think they may have been exposed to the virus. Sick leave policies across the country impact everyone's ability to take care of

themselves when they're sick. Particularly in the United States, we're used to working and going into the office while symptomatic, and going forward that's not going to be acceptable even as we move into the cold and flu season. Societally we need to rethink how we view sickness and our ability to prevent transmission in the workplace.

How many tests does the United States need to conduct to control further spread?

Everybody wants a magic number for how many tests are needed in order to control the pandemic. The problem is there is no specific number. We know that we need more testing than what we are currently doing, but hitting a specific number isn't going to solve the problem at hand. Here's an example. Right now, during the summer, our ability to practice social distancing measures is easier because we can spend time outdoors and have additional space to move around. Looking ahead to the fall and winter, we'll spend more time indoors and will be in closer proximity to one another for longer periods of time. Add in the fact that COVID-19 will contend with other viruses such as the flu during these months, and we'll likely need to conduct more tests because people will present symptoms that can appear with either virus, such as a cough or a fever.

Building a national system with more laboratories, machines and well-trained testing professionals is essential to increase the number of tests that we can conduct and decrease the amount of time it takes for people to receive their results. We are not in a situation where we do not have enough of the physical tests or swabs. It's the capacity at which we can analyze the tests and provide results that needs to increase. I'm hoping we can quickly get to a place where someone could go into a local pharmacy or testing site, receive a test and get their results right away. That would be a huge change in our ability to control the virus.

How could the federal government make sure the supplies needed for testing are available?

I would like to see the federal government approach the response to this like we have approached external threats in the past like wartime threats. We need to be mass producing testing supplies and PPE supplies. More than supplies, we also need to push innovations for better tests that can be done easily at home and at community sites with more rapid results.

What is pooled testing and should we have more of it to increase testing capacity across the U.S.?

Pooled testing is not a new technique, it's a strategy to save testing supplies and possibly time by testing specimens in batches. This can be very useful for surveillance studies in large groups of people, especially people that might not ordinarily be tested. However, pooled testing gets complicated when you want to use the results to treat someone or ask them to isolate. The time it takes to go back into the pool to find out which specific person in the batch was positive can delay the results by multiple days.

What is currently known about immunity to COVID-19?

We know at this point in time that most people who get infected with COVID-19 make antibodies. This seems to be more true for those who were infected with COVID-19 and experienced symptoms than people who were infected and asymptomatic. For most respiratory viruses, antibodies will wear off over time. Because this is a new virus, we're unsure—but currently studying—the duration of antibodies as people get further and further out from infections that happened early on in our

discovery of the virus.

Researchers are also trying to figure out what these antibodies mean in terms of reinfection. Currently, there is no reason to suspect that antibodies won't protect you against a future infection. At this time we're not seeing a pattern of the virus shifting and changing its genetics in the way we do with different strains of influenza for example. That being said, we haven't tried it, and so it's still too early to say how much and what types of antibodies are needed to protect you. This is still an area of development that we're waiting to find out the results for.

For me, the biggest concern right now is we don't know how long antibodies last, which is extremely important for vaccine development and also to look ahead for what to expect a year from now. Can we expect that all the people who are infected now will be immune next year, or do we need to be concerned about them moving back into a population where they could be infected again? That is still being determined.

Some people are testing positive for COVID-19 for several weeks, even after their symptoms have gone away. Can those individuals still infect others?

This is something we've known to be true about respiratory viruses for a long time. Once you have a respiratory virus, sometimes it's possible for a test to pick up the RNA or the DNA from that virus—in the case of coronavirus, it's RNA—for a long time after you're infected. And it's always been a little bit of a debate in the infectious disease field about whether or not those later detections were actually picking up the virus that has the ability to transmit and infect somebody else. It was actually sort of an academic debate that happened for a long time before this current situation. Now it has suddenly become incredibly important.

There have been more studies lately that have found that the further out you get from your initial symptoms, that positive test result—that RNA that's being picked up—is not RNA from a live virus. The test is picking up RNA from either defective or partial viruses that are still hanging around. If you were to take that virus and try to infect a cell culture, it wouldn't grow. Researchers are doing more and more of these studies and finding that—while it can happen in very rare circumstances—very few people are positive with infectious virus weeks after symptoms go away.

On the basis of this and some other data, the CDC recently changed its recommendations that if 10 days has passed from when your symptoms started and your fever has been gone for a few days, that you're OK to go back and interact with people. At that point, any positive test results would just be picking up leftover virus that is no longer infectious.

Provided by University of Michigan