

COVID-19 Testing: PCR Versus Serology

There are two types of tests available for COVID-19 that can detect whether a person had it in the past (serology testing, which tests for antibodies against SARS-CoV-2, the virus that causes COVID-19), or whether they have it in the present (polymerase chain reaction (PCR) testing, which tests for active infection). This document is designed to explain the differences between PCR and serology testing, and when one test might be used over another. This document was adapted from the Texas Department of State Health Services.

Topic	PCR Test	Serology Test
Why is the test used?	PCR looks for the virus itself in the nose, throat, or other areas in the respiratory tract to determine if there is an active infection with SARS-CoV-2.	Serology looks for antibodies against SARS-CoV-2 in the blood to determine if there has been an infection in the past . Antibodies are formed by the body to fight off infections. IgM is the first antibody that is formed against a germ, so it appears on tests first, usually within 1-2 weeks. The body then forms IgG, which appears on tests about 2 weeks after the illness starts. IgM usually disappears from the blood within a few months, but IgG can last for years. Some antibody tests test for IgM and IgG, and some only test for IgG.
How is the test performed?	In most cases, a nose or throat swab is taken by a healthcare provider, and that swab is sent to the lab for testing.	This test uses a sample of blood.
What does a positive test mean?	A positive PCR test means that the person being tested has an active COVID-19 infection.	A positive antibody test means that the person being tested was infected with COVID-19 in the past and that their immune system developed antibodies to try to fight it off.
When is it helpful?	<ul style="list-style-type: none"> It can be used to determine who has an active infection. It can help identify people who are contagious to others. 	<ul style="list-style-type: none"> It can identify people who had an infection in the past, even if they had no symptoms of the illness. It may be able to help determine who has some level of immunity to COVID-19. This could help with decisions about who could safely work in certain jobs.

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		<ul style="list-style-type: none"> • In some cases, it could help determine when COVID-19 illness occurred, since we know that IgM is formed before IgG and that IgM goes away before IgG. • It can help determine who qualifies to donate convalescent plasma (a blood product that contains antibodies against COVID-19 and can be used as a COVID-19 treatment). • If lots of people take the test in a community, it can help public health leaders and researchers know what percentage of the population has already had COVID-19.
<p>When is it not as helpful?</p>	<ul style="list-style-type: none"> • It only helps determine whether a person has an active infection at the time of testing. <ul style="list-style-type: none"> ○ It does not help determine who had an infection in the past. ○ It also does not help determine which people who have been exposed to COVID-19 will develop active infection during the 2 weeks after exposure. • In some people, the virus can only be found by PCR for a few days at the beginning of the infection, so the test might not find the virus if the swab is taken more than a few days after the illness starts. • In some people, the virus can be found by PCR in the nose 	<ul style="list-style-type: none"> • It may be negative if it is used too close to the beginning of an infection, which is why it should not be used to detect active COVID-19 infection. • Because there have not been too many people with COVID-19 in North Dakota yet, many of the positive test results will actually be false positives (see Positive Predictive Value below). • Some antibody tests have low sensitivity and specificity and so may not produce reliable results. • Some antibody tests may cross-react with other coronaviruses that are not SARS-CoV-2, the virus that causes COVID-19, leading to false test results.

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	<p>and throat for several weeks, even longer than the time that they are actually contagious to other people.</p> <ul style="list-style-type: none"> This test requires certain kinds of swabs that may be in short supply. 	

Other Information to Help Determine Usefulness of a Test

When new tests come out, they are evaluated for how well they work. You may see the following terms used in reports about new tests.

Sensitivity: Sensitivity is sometimes called the “true positive rate.” It measures how frequently the test is positive when the person being tested actually has the disease. For example, when a test has 80% sensitivity, the test detects 80% of patients with the disease (true positives). However, 20% of patients with the disease are not detected (false negatives) by the test.

Specificity: Specificity is sometimes called the “true negative rate.” It measures how frequently the test is negative when the person being tested doesn’t have the disease. For example, when a test has 80% specificity, the test correctly reports 80% of patients without the disease as test negative (true negatives). However, 20% of patients without the disease are incorrectly identified as testing positive (false positives) by the test.

Positive Predictive Value: Positive predictive value is a measure of how likely it is that a positive test is a true positive rather than a false positive. This is dependent on how many people in the population being tested have had the disease. When there are very few people in the population that have had the disease, then there is a higher chance that a positive test is a false positive. When there are many people in a population that have had the disease, then there is a higher chance that a positive test is a true positive.