

**Coronavirus 2019 (COVID-19): PCR, Antigen, and Antibody Tests**

There are three types of tests available for SARS-CoV-2, the virus that causes COVID-19: polymerase chain reaction (PCR), antigen, and antibody (serology) testing. PCR and antigen tests detect whether a person is currently infected, and serology detects whether a person had an infection in the past. All positive and negative test results for SARS-CoV2 are reportable in the District of Columbia. This document provides information about each type of test.

Topic	PCR Test	Antigen Test	Antibody (Serology) Test
<b>Why is the test used?</b>	PCR tests look for pieces of genetic material of SARS-CoV-2, the virus that causes COVID-19, in the nose, throat, or other areas in the respiratory tract to determine if the person has an active (i.e., current) infection.	Antigen tests look for pieces of proteins that make up the SARS-CoV-2 virus, the virus that causes COVID-19, to determine if the person has an active (i.e., current) infection.	Serology looks for antibodies <sup>1</sup> against SARS-CoV-2, the virus that causes COVID-19, in the blood to determine if there was a past infection.
<b>How is the test performed?</b>	In most cases, a nasopharyngeal or nasal swab is taken by a healthcare provider and tested; however, oral swabs and saliva can be used. Sometimes the test can be run while you wait, but most commonly the swab needs to be sent to a lab for testing.	In most cases, a nasopharyngeal nasal swab is taken by a healthcare provider and tested. Most often the test can be run while you wait, and occasionally the swab needs to be sent to a lab for testing.	In most cases, a blood sample is taken and sent to a lab for testing.

<sup>1</sup> **Antibodies** are formed by the body to fight off infections. Immunoglobulin M (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 immunoglobulin G (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.

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<b>When is it helpful?</b>	<ul style="list-style-type: none"> <li>It can be used to determine who has an active infection, regardless of a person's symptoms.</li> <li>It can help identify people who are contagious to others.</li> <li>In communities where transmission rates are low and mitigation efforts are effective, PCR testing is a more reliable at detecting active infection.</li> <li>It accurately identifies people who are and are not infected with SARS-CoV-2.</li> </ul>	<ul style="list-style-type: none"> <li>For someone with symptoms, it can be used as a point-of-care test to quickly determine who has an active infection.</li> <li>It can help identify people who are contagious to others.</li> <li>It is a less expensive test than PCR.</li> <li>It performs best 5-7 days after symptoms start, in the early stages of infection with SARS-CoV-2.</li> </ul>	<ul style="list-style-type: none"> <li>It can identify people who had an infection in the past, even if they had no symptoms of the illness.</li> <li>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.</li> <li>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).</li> <li>If many people take the test in a community, it can help public health leaders and researchers know what percentage of the population already had COVID-19.</li> </ul>
<b>When is it not as helpful?</b>	<ul style="list-style-type: none"> <li>It does not help determine who had an infection in the past.</li> <li>It also gives you a result for the point and time when the specimen was collected, and cannot predict if you will remain negative. For example, if you are quarantining after an exposure, a negative test does</li> </ul>	<ul style="list-style-type: none"> <li>With the current evidence, DC Health does not recommend that antigen tests be used for screening people with no symptoms or known exposures.</li> <li>Antigen tests have lower sensitivity<sup>3</sup> than PCR tests, so there may be false negative results.</li> </ul>	<ul style="list-style-type: none"> <li>It may be negative if it is used too close to the beginning of an infection, which is why it must not be used to detect active COVID-19 infection.</li> <li>In areas where there have not been many cases of COVID-19, many of the positive test results will actually be false positives (see Positive Predictive Value<sup>2</sup>). Some</li> </ul>

<sup>2</sup> **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.

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	<p>not allow you to stop quarantining.</p> <ul style="list-style-type: none"> <li>In some people, the virus can be found by PCR in the nose and throat for several weeks, even longer than their infectious period (the time that they are contagious to other people).</li> <li>This test requires certain kinds of swabs and reagents that may be in short supply.</li> </ul>	<ul style="list-style-type: none"> <li>In persons with symptoms or a known exposure, negative tests must be treated as a preliminary result and confirmed with PCR testing.</li> </ul>	<p>antibody tests have low sensitivity<sup>3</sup> and specificity<sup>4</sup> and thus may not produce reliable results.</p> <ul style="list-style-type: none"> <li>Some antibody tests may cross-react with other coronaviruses that are not SARS-CoV2, the virus that causes COVID-19, leading to false test results.</li> <li>We do not know yet if having antibodies to the virus that causes COVID-19 can protect someone from getting infected again or, if they do, how long this protection might last. Until scientists get more information about whether antibodies protect against reinfection with this virus, everyone must continue to take steps to protect themselves and others, including staying at least 6 feet away from other people (social distancing), even if they have had a positive antibody test.</li> </ul>

<sup>3</sup> **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.

<sup>4</sup> **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.

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<p><b>What does a positive test result mean?</b></p>	<p>A positive PCR test means that the person being tested has an active COVID-19 infection.</p>	<ul style="list-style-type: none"> <li>A positive antigen test means that the person being tested has an active COVID-19 infection.</li> </ul>	<p>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. Until scientists get more information about whether antibodies protect against reinfection with this virus, everyone must continue to take steps to protect themselves and others, including staying at least 6 feet away from other people (social distancing), even if they have had a positive antibody test.</p>
<p><b>What does a negative test result mean?</b></p>	<ul style="list-style-type: none"> <li>A negative PCR test means that person was probably not infected at the time their sample was collected.</li> <li>It doesn't mean that someone won't get sick – it only means that they didn't have COVID-19 at the time of testing.</li> </ul>	<ul style="list-style-type: none"> <li>A negative antigen test means that SARS-CoV-2 viral proteins were not detected.</li> <li>In persons with symptoms or a known exposure, a negative test does not rule out COVID-19. The individual must quarantine until a confirmatory PCR test can be completed.</li> </ul>	<ul style="list-style-type: none"> <li>A negative antibody test means that the person may not have had COVID-19 in the past. However, they could still have a current infection, and the antibody test was collected too soon to give a positive result.</li> </ul>

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<p><b>What public health activities will be conducted?</b></p>	<ul style="list-style-type: none"> <li>• If positive, the DC Health Contact Trace Force will follow up to conduct a case investigation. Contact tracing will be performed to identify individuals who might have been in close contact with the person who tested positive person while they were infectious, or able to spread the virus to others.</li> <li>• The person will be recommended to isolate at home until they are no longer at risk of spreading the virus to others.</li> <li>• If negative, no public health activities will be performed, and the individual should continue to take everyday precautions to prevent the spread of COVID-19.</li> </ul>	<ul style="list-style-type: none"> <li>• If positive, the DC Health Contact Trace Force will follow up to conduct a case investigation. Contact tracing will be performed to identify individuals who might have been in close contact with the person who tested positive person while they were infectious, or able to spread the virus to others.</li> <li>• If negative, the individual must quarantine until a confirmatory PCR test can be completed. If the confirmatory PCR test is positive, the public health activities above will be performed.</li> </ul>	<ul style="list-style-type: none"> <li>• No public health activities are routinely conducted.</li> </ul>

Refer to *Guidance for Persons Who Tested Positive for COVID-19 and Interim Guidance on Discontinuation of Transmission-Based Precautions for Patients with Confirmed or Suspected COVID-19 in Healthcare Settings* at [www.coronavirus.dc.gov/phasetwo](http://www.coronavirus.dc.gov/phasetwo) for more information on isolation and discontinuing isolation.

Additional information for licensed health care providers is available on the DC Health Notices page at [dchealth.dc.gov/page/health-notices](http://dchealth.dc.gov/page/health-notices).

The guidelines above will continue to be updated as the outbreak evolves. Please visit [coronavirus.dc.gov](http://coronavirus.dc.gov) regularly for the most current information.