

ASPR TRACIE Technical Assistance Request

Request Receipt Date (by ASPR TRACIE): June 1, 2020

Response Date: June 18, 2020

Type of TA Request: Complex

Request:

ASPR TRACIE received a request for information on COVID-19 testing.

Response:

ASPR TRACIE compiled and synthesized information on testing for COVID-19 from the U.S. Department of Health and Human Services (HHS), including the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration (FDA), and other open sources.

Please refer to CDC's [Coronavirus Disease 2019 webpage](#) for the most up-to-date clinical guidance on COVID-19 outbreak management.

Overview of COVID-19 Testing

The [declaration of a Public Health Emergency](#) on February 4, 2020 by the Secretary of HHS allowed the FDA to issue emergency use authorizations (EUAs) for tests for the detection and diagnosis of SARS-CoV-2 (the virus that causes COVID-19). On February 29, FDA issued [guidance](#) (since updated multiple times) on the development of in vitro diagnostic tests. On March 31, FDA [authorized](#) the use of [molecular laboratory developed tests](#). On April 28, FDA [authorized](#) the use of [antibody tests](#). On May 9, the FDA [authorized](#) the first antigen test.

- **Diagnostic Tests (*Testing for current infections*):** Currently, two main types of diagnostic tests are being used via FDA approval. A **molecular (RT-PCR)** test for identification of viral genetic material and an **antigen test** to detect fragments of viral surface proteins. Sampling includes collection with nasal or throat swab, or saliva. While positive results from antigen tests are highly accurate and more rapid than molecular tests, they also have a greater chance of false negatives than molecular tests. [Negative results from an antigen test should be confirmed](#) via an additional RT-PCR test to fully rule out SARS-CoV-2 infection. Diagnostic testing can be performed at the [point-of-care](#) using various platforms. FDA has also issued EUAs for some provider-prescribed [home collection kits](#). Diagnostic tests are helpful in identifying communities with current high infection rates.
- **Antibody Tests (*Testing for previous infections*):** “Serological or “antibody” tests detect antibodies to the SARS-CoV-2 virus, indicating recent or prior infection. Antibody tests are intended to aid in identification of individuals with an adaptive immune response to SARS-CoV-2, but they [cannot be used for diagnosis of COVID-19 infection](#). It is also unknown whether antibodies confer immunity to future COVID-19 infection or, if so, how long such protection lasts. Antibody tests are helpful in determining the proportion of a community’s population that has already been infected.

Since the start of the COVID-19 pandemic, FDA issued [more than 100](#) EUAs for diagnostic and antibody testing for SARS-CoV-2. Figure 1 provides an overview of molecular, antigen, and antibody tests. Additional comparisons of the testing types are included in the [Resources](#) section.

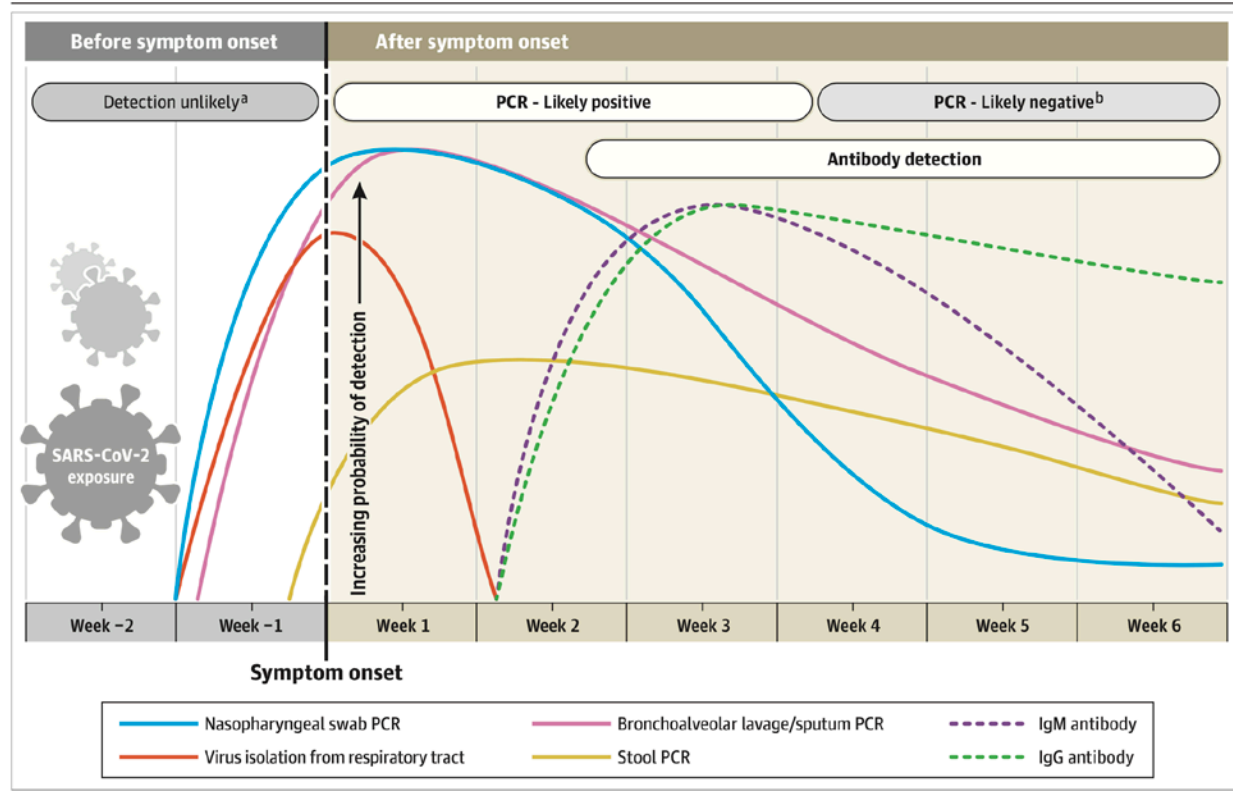
COVID-19 testing overview

	RT-PCR	Serology (Antibody)	Antigen
Method	Amplifies specific fragment of viral RNA	Measures antibody response to viral protein target	Detects fragments of viral proteins
Sample type	Usually nasopharyngeal (NP) or oropharyngeal (OP) swab, although other specimen types possible	Usually blood-based test	Usually NP or nasal swab
Timing	Most likely to be positive 1-2 days before symptom onset and in early days of symptomatic infection; positivity wanes over time but can persist for a number of weeks	Takes at least 7-14 days after symptom onset to develop antibodies, and varies depending on the antibody class being measured	In symptomatic infection, positive as symptoms develop and wanes over time
Performance	Sensitivity varies depending on sampling technique and specimen type (~72% for NP specimens), but test is highly specific (>99%)	Both sensitivity and specificity are highly variable depending on type of test	Antigen tests are very specific for the virus, but are not as sensitive as molecular PCR tests

Figure 1. [COVID-19 Test Types](#).

The ability to accurately diagnose current COVID-19 infection or detect antibodies from an earlier infection varies based on testing type and timing. As shown in Figure 1, the sensitivity (ability to detect a positive case) of diagnostic tests is dependent on the type of test (molecular tests are more sensitive than antigen tests), swabbing location (CDC recommends nasopharyngeal swabs for their higher sensitivity, but improper collection techniques may decrease sensitivity), and timing of testing (greater amounts of virus are expected to be present around the time of symptom onset). Figure 2 depicts estimated time intervals for detecting SARS-CoV-2 using various types of tests.

Figure. Estimated Variation Over Time in Diagnostic Tests for Detection of SARS-CoV-2 Infection Relative to Symptom Onset



Estimated time intervals and rates of viral detection are based on data from several published reports. Because of variability in values among studies, estimated time intervals should be considered approximations and the probability of detection of SARS-CoV-2 infection is presented qualitatively. SARS-CoV-2 indicates severe acute respiratory syndrome coronavirus 2; PCR, polymerase chain reaction.

^a Detection only occurs if patients are followed up proactively from the time of exposure.

^b More likely to register a negative than a positive result by PCR of a nasopharyngeal swab.

Figure 2. [Estimated Time Intervals for Probability of Detecting SARS-CoV-2](#)

Healthcare providers should refer to the [CDC](#) for the latest SARS-CoV-2 testing guidance. The FDA’s [list of EUAs](#) includes instructions for use as well as fact sheets for healthcare providers and patients for each specific test. Many state, local, territorial, and tribal governments issued supplementary guidance about preferred testing types for specific populations or situations based on the current status of COVID-19 in their communities. Additionally, hospitals, outpatient settings, and healthcare systems have developed testing guidance based on the populations they serve and their capacity and capability relative to the current COVID-19 situation.

Select Resources

American Medical Association. (2020). [Serological Testing for SARS-CoV-2 Antibodies](#).

This page provides information on the role of serological testing in determining the prevalence of COVID-19, the regulation of testing, limitations of serological tests, and recommendations.

Association of State and Territorial Health Officials. (2020). [Coronavirus Disease 2019 \(COVID-19\) Response Hub](#).

The States & Territories in Action: COVID-19 Response Map includes links to COVID-19 testing information for each state. Users should select the Testing Prioritization Guidance mapping layer and then select their state of interest to generate a pop-up with additional information.

CDC. (2020). [Overview of Testing for SARS-CoV-2](#). U.S. Department of Health and Human Services.

This page provides an overview of considerations for SARS-CoV-2 testing. It includes recommendations for each of the testing types as well as their use for different populations and for different purposes.

CDC. (2020). [Interim Guidelines for Collecting, Handling, and Testing Clinical Specimens for COVID-19](#). U.S. Department of Health and Human Services.

This page provides general information for practitioners and medical facilities on proper specimen collection procedures, storage, and handling.

CDC. (2020). [Interim Guidelines for COVID-19 Antibody Testing](#). U.S. Department of Health and Human Services.

This guidance provides information on optimizing test outcomes as well as strategies, limitations, and recommendations for use. Because antibody production can take one to three weeks, CDC does not recommend the use of antibody tests for active diagnoses of COVID-19 infection.

FDA. (2020). [Emergency Use Authorization](#). U.S. Department of Health and Human Services.

This page includes specific information on each test type that has been approved for use under an EUA by the FDA. EUAs are listed by type of test, date first issued, manufacturer, test name, and authorized settings and each listing includes fact sheets and handouts for patient and healthcare personnel.

FDA. (2020). [EUA Authorized Serology Test Performance](#). U.S. Department of Health and Human Services.

This page provides specific data on performance of serological tests available under FDA EUAs looking at confidence interval data and specificity/sensitivity information. It includes Healthcare Provider and Recipient information as well as Instructions for Use per test.

FDA. (2020). [Reporting Problems to the FDA](#). U.S. Department of Health and Human Services.

This page provides information on reporting issues with diagnostic tests or fraudulent products. It also includes specific lab and manufacturer information.

Kaiser Family Foundation. (2020). [State Data and Policy Actions to Address Coronavirus](#).

The State COVID-19 Health Policy Actions section on this page includes a map and table of state waivers of prior authorization requirements for COVID-19 testing.

Lungevity Foundation. (2020). [Types of COVID-19 Testing and What the Results Mean](#).

This resource page includes a visual comparison chart for test types and optimal use scenarios.

Marson, A., Hsu, P., Bern, C., et al. (2020). [COVID-19 Testing Project FAQ](#).

Included on this frequently asked question page is a summation table comparing rapid serology, ELISA, and RT-PCR swab testing for result output, strengths, and limitations.

Mayo Clinic. (2020). [COVID-19 Navigator](#).

This resource offers one health system's approach to serologic antibody testing with information on antibody testing indications, timing, and results interpretation. It includes [algorithms](#) for pre-procedure COVID-19 antibody testing guidelines for inpatient and outpatient procedures.

National Governors Association. (2020). [Capacity for COVID-19 Testing – Current Status and Considerations](#).

This memo provides background information on current COVID-19 testing constraints and projected need, strategies for governors to consider, an overview of testing types, and links to additional resources.

Ulrich, A., Bartkus, J., Moore, K., et al. (2020). [COVID-19: The CIDRAP Viewpoint – Part 3: Smart Testing for COVID-19 Virus and Antibodies](#). Center for Infectious Disease Research and Policy.

This document outlines the complexities of testing for SARS-CoV-2 (the virus causing COVID-19) and suggests a “smart testing” approach applying the right test to the right population using the right infrastructure to inform actions taken to minimize the effects of the COVID-19 pandemic.

U.S. Department of Health and Human Services. (2020). [Coronavirus \(COVID-19\) Testing](#).

This page provides an overview of the types of testing and their availability.

White House. (2020). [Guidance on Interpreting COVID-19 Test Results](#).

This fact sheet assists practitioners in interpreting the results of diagnostic and antibody tests and provides recommended actions based on the results.