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# Covid-19 Testing

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## Abstract

The scale and accuracy of ongoing COVID-19 testing in India are in a gradual state of evolution, with new and improved kits developed by biotech companies worldwide coming into existence. Recently, the Indian Council of Medical Research recommended ELISA (short for 'enzyme-linked immunosorbent assay') for labs to test for COVID-19.

**Keywords:** Antigen • Antibody

## Introduction

ELISA falls under one of two broad categories of testing being used by every country around the world to stay on top of their pandemic control:

- Antibody testing (a.k.a serological testing)
- Antigen tests
- Polymerase Chain Reaction-based tests (like RT-PCR and TrueNat)

While some are more reliable than others, no single test is 100 percent accurate. There are key differences between them – in the way they work, but also their advantages and limitations, which are unique to each.

### How antibody or 'serological' tests work

Antibody testing (or serological testing) is an examination of proteins in the bloodstream, to find out whether an individual has been infected with COVID-19. An infected person will have specific antibodies to pathogens they have been exposed to. The immune system produces antibodies as part of a larger process to defend itself from an infection.

That said, antibody tests might not be ready to show whether the virus is currently infecting the body. Unlike a nasal or throat swab test, which looks for genetic signatures of the virus in the body, an antibody test looks for traces of the body's response to the virus.

Antibodies are abundant in the blood, so a sample of blood is collected by either a finger prick or a blood sample drawn with a needle. Two specific antibody types are sought out in an antibody test:

• IgM antibodies against SARS-CoV-2, which develops early on in an infection.

• IgG antibodies against SARS-CoV-2, which are mostly found after someone has recovered from the infection.

### How antigen testing works

Antigen tests hunt down specific proteins only found within the virus, which the body's immune reaction recognises as 'foreign'. Most COVID-19 antigen tests target the 'spike protein' that studs the surface of the coronavirus.

A swab from the nose is collected for this test, where there's a high likelihood of virus particles being present. The swab is then dipped during a solution that inactivates the virus, then transferred onto a test strip. The test strip houses antibodies that bind to coronavirus proteins and hold them in place as the fluid spreads.

### How a PCR test works

If the sample is positive for coronavirus, colored lines will show up on the paper strip in 15-20 minutes.

A PCR test may be a widely-used, sensitive test that seeks out traces of genetic material from a selected pathogen, if the pathogen is present within the body. The technique may be a powerful diagnostic tool which will identify both DNA or RNA from specific microorganisms, regardless of whether or not they are bacteria or viruses.

A PCR can capture a selected gene from genetic material (DNA or RNA) during a swab sample, and multiply it through a series of chemical processes so it are often detected using fluorescent dyes. RT-PCR, a variation of the PCR test

### RT-PCR, a variation of the PCR test

The version of PCR testing wont to detect viruses just like the COVID-19-causing SARS-CoV-2 is named RT-PCR (reverse-transcription PCR).

While some viruses have only DNA, others like SARS-CoV-2, only contain RNA. Viruses infect a healthy cell and hack into the natural machinery that cells use to process our own RNA, therefore the virus particle can multiply and survive. Once inside a cell, the virus uses its RNA to take control of the cell's machinery and 'reprogramme' the cell into a virus-making factory.

To detect an RNA virus like SARS-CoV-2, scientists use an enzyme (reverse transcriptase) to convert the virus's RNA into DNA, in a simple and widely-used one-step process called 'reverse transcription'. This allows a single molecule of DNA to be amplified exponentially (millions of times), which is the main goal of the PCR process, so even virus particles in single digits can be detected in the final result.

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An RT-PCR test is taken into account very reliable because it can detect even one virus particle in swabs taken from inside the mouth or nose, where the virus particles are most prevalent.

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