

HOW IS THE IMMUNE RESPONSE TO COVID-19 VACCINES EVALUATED?

There are two ways that researchers are able to determine the strength of the immune response to COVID-19 vaccines:

By Measuring Antibodies

Following either SARS-CoV-2 infection or COVID-19 vaccination, an effective immune response relies on specialized immune cells, called B cells, to produce two types of antibodies that typically become detectable in the blood one to three weeks after the infection:

Binding Antibodies

How do they work?

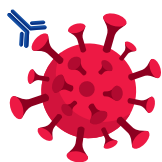
By attaching to SARS-CoV-2, these antibodies mark it for destruction by immune cells.

How are they detected?

Binding antibodies can be detected using fluorescence signals detected from a specialized technique called enzyme-linked immunosorbent assay (ELISA).

How do they determine the immune response to vaccination?

Robust signal reflects higher quantities of SARS-CoV-2-specific antibodies in the sample and stronger immune response to vaccination.



Neutralizing Antibodies

How do they work?

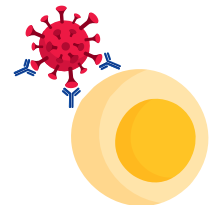
These antibodies directly inhibit the ability of a pathogen, such as SARS-CoV-2, to infect cells in the body.

How are they screened?

Neutralizing antibodies can be screened by imaging techniques known as plaque reduction neutralization test (PRNT) or microneutralization assay.

How do they determine the immune response to vaccination?

Both assays measure quantities of neutralizing antibodies in the blood; PRNT uses nonfluorescence approach and microneutralization assay uses fluorescence dyes. Higher quantity of neutralizing antibodies means stronger response.



By Measuring T Cells

Following exposure to COVID-19, the body may produce different types of T cells, the immune cells that help protect the body from infections:

Helper T Cells

Helper T cells produce molecules, called cytokines, that function as chemical signals to stimulate the immune response by activating other immune cells, including the antibody producing B cells and the cytotoxic T cells.

Cytotoxic T Cells

These specialized immune cells eliminate cells that are infected with the virus.

How are they screened?

The number of T cells can be measured by the enzyme-linked immunospot (ELISPOT) assay.

How do they determine immune response to vaccination?

Change in color of cytokine-specific dyes indicates the presence of SARS-CoV-2-specific T cells in the sample, and the intensity of the change reflects the strength of the immune response.

