

POST VACCINATION COVID ANTIBODY (SEROLOGY) - WHAT WE NEED TO KNOW

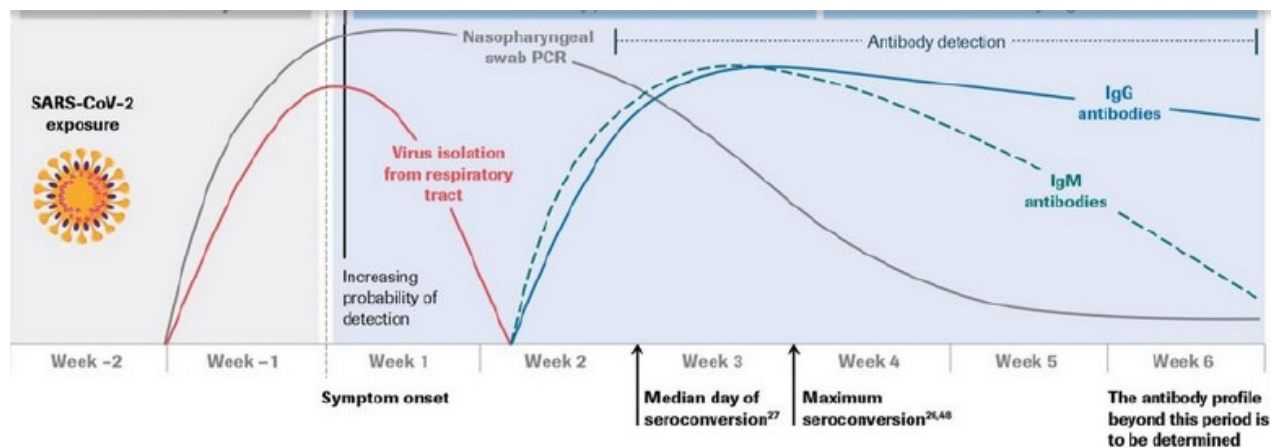
Dr. Milind Bhide (Feb 2021)

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Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) spread, which started in Wuhan in Dec 2019 has caused COVID 19, a pandemic and has affected millions of people across all countries. What makes this disease interesting is that the clinical picture is unpredictable and can range from an asymptomatic patient to severe ARDS requiring ICU admission. As this disease spreads through the community, a need was felt to identify persons who may have suffered from COVID 19, but got away with mild symptoms and did not get tested by a PCR test. If a test is available which can identify such persons, then it was felt that these persons may have some protection from COVID infection in the near future.

What are antibodies ?

Antibody is a protein produced by plasma cells of the body. Antibodies play a role in protecting the individual from infections. Not all antibodies are protective. e.g. Antibody produced in HIV infection is not protective. Antibodies are of several types. IgM and IgG are the common types. In most viral infections IgM antibodies appear first followed by IgG. However this is not the case in COVID 19 infection. In COVID19 infection, both IgM and IgG appear almost simultaneously. So testing individually for IgG and IgM is not useful.



Sethuraman, N. et al. (2020). JAMA. Published online May 06, 2020.

doi:10.1001/jama.2020.8259.

What is the role of antibodies in COVID 19 infection ?

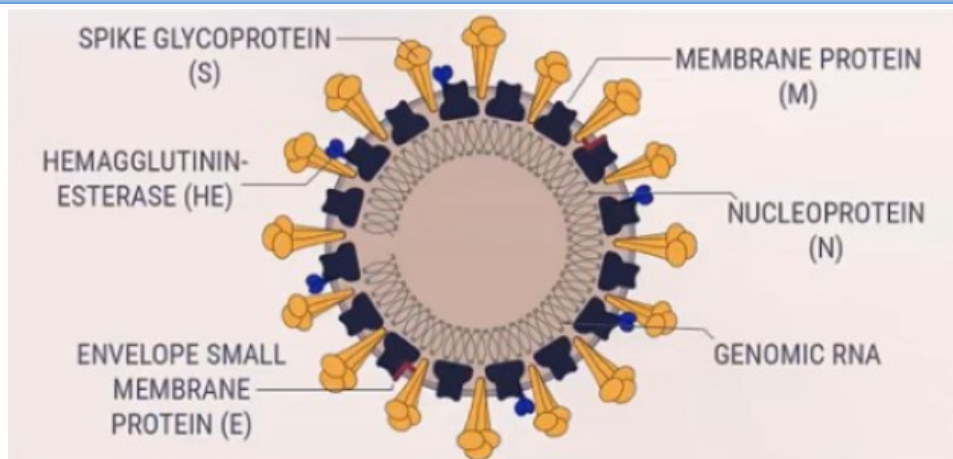
In most viral infections, antibodies are produced by B lymphocytes along with activated T lymphocytes. Infection with SARS CoV-2 is associated with formation of antibodies directed against various proteins of the virus. These antibodies appear by 14-21 days after infection in most persons. There can be a delay or absence of antibodies in immuno compromised or even in some healthy persons. The exact role of antibodies and T lymphocytes in immunity to SARSCoV-2 is still not clear.

Are these antibodies protective ?

The Corona virus enters the body by attaching itself to the ACE2 receptor on the cell surface. The ACE receptor is present in the respiratory tract and hence this is the primary mode of entry of the virus into the body. The virus has a Spike protein (S protein) which does the work of attaching itself to the ACE receptor. Actually the spike protein is a very large glycoprotein molecule. A small part of this protein called as RECEPTOR BINDING DOMAIN (RBD) is responsible for this attachment. It has been postulated that antibody to this RBD will neutralize the virus and offer protection.

Vaccine development is aimed at producing Cell mediated immunity and Humoral (Antibody) based immunity against the Spike protein and RBD in particular so that the entry of the virus into the cell can be prevented. This is the basis on which most vaccines have been designed.

In the body antibodies along with activated T lymphocytes (Cellular immunity) play a role in fighting the virus.



The RBD protein and S2 region of the Spike protein are critical for entry of the virus into the cell. Currently available vaccine and those under development have targeted the RBD and S2 region of the spike protein.

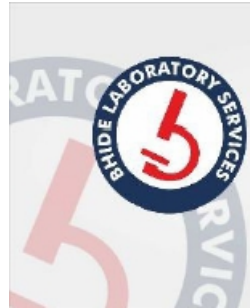
What is the COVID antibody tests and what does it detect ?

Antibodies may be directed against the following proteins of the virus.

NUCLEOPROTEIN (N)

SPIKE PROTEIN (S)

MEMBRANE PROTEIN (M)



Antibody directed against RBD (receptor binding domain) a small part of the Spike protein are presumed to be protective

Antibody to N protein	Detected after Natural infection <u>Antibody to N protein will be absent after vaccination with Covishield or Pfizer vaccine</u>
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Antibody to S protein	Detected after natural infection Detected after Covishield , Pfizer Vaccine
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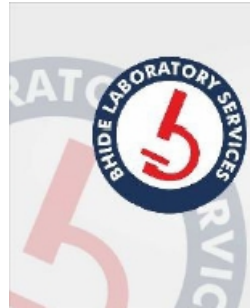
What is the ideal time to do COVID SPIKE antibody tests after vaccination ?

A small study that we have done in our staff members who took vaccine we found that antibodies were detectable in some individuals 15 days after Covishield vaccine. However as the vaccine is supposed to be taken in 2 doses, the recommendation is testing for Spike antibody 3-4 weeks after the second dose.

Antibody response will differ between individuals. Some having low titres to some having very high titres.

Does a positive antibody test mean that the person is immune to infection ?

We have only experimental data as of now (Feb2021). Samples having Spike antibody levels in high titre have shown inhibition of the virus in the lab. Whether this translates into immunity and protection in the patient is not yet known. Initial reports have shown that vaccines decrease incidence of hospitalization and severe disease.



Is there any difference between different test methodologies ?

Unfortunately Yes. Different kits target different antigens of the virus. Antibody detected are also different. The levels reported are also different. We cannot compare readings between 2 methods/kits. However WHO has released an international reference against (1) which eventually all kits will be calibrated. So in the coming few months hopefully results from different kits will match.

Summary :

1. COVID antibody tests are most useful for surveillance and epidemiological studies.
2. Post Vaccination antibody study will tell us about the antibody response.
3. No claim of protection can be made at this point (Feb 2021) as the scientific data available is limited.
4. Please note that Cell Mediated immunity is very important in protection against viral infection. Currently there is no test that a routine lab can offer to measure this.

References :

1. [Who Reference material](#)
2. [Roche Anti_Sars-CoV-2 S assay details](#)
3. Sethuraman, N. et al. (2020). JAMA. Published online May 06, 2020.
doi:10.1001/jama.2020.8259.

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