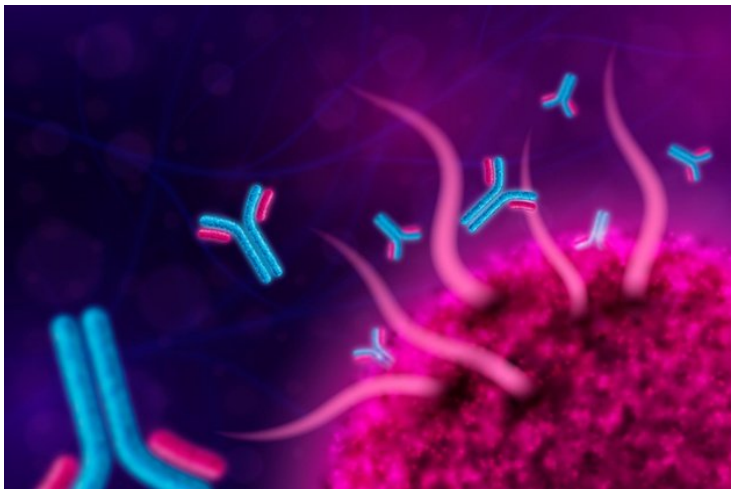
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Singapore identifies critical antibody target site in SARS-CoV-2

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Known as epitopes, these are the specific sites on the virus' surface to which antibodies produced during infection are able to bind and neutralise the virus



The National Centre for Infectious Diseases (NCID) and A*STAR's Singapore Immunology Network (SIgN) have announced research findings that antibodies found in recovered COVID-19 patients are able to limit the spread of SARS-CoV-2 in the body by counteracting ("neutralising") four linear amino acid sequences ("epitopes") **S14P5, S21P2, S20P2,** and **N4P5**.

Epitopes are specific parts of the virus that are recognized by our immune systems' antibodies and bind to them. Epitopes are located on the spike proteins of the "crown" surrounding the coronavirus' body. Of the four epitopes, **N4P5** achieved the highest level of specificity (100%) and sensitivity (>96%) against SARS-CoV-2.

The two studies were published in international scientific journals *Nature Communications* and *EBioMedicine* by The Lancet. NCID formulated the clinical studies, recruited patients, and collected samples and clinical data, while A*STAR's SIgN conceptualized the scientific studies and performed the experiments. The studies were funded by various schemes, including the COVID-19 Research Fund, which is supported by the National Research Foundation Singapore (NRF) and Ministry of Health (MOH), administered by the National Medical Research Council, as well as through A*STAR's core research grants and A*ccelerate's GAP-funding.

"SARS-CoV-2 is the seventh human coronavirus. The internationally leading work by the Singapore research team focuses on a powerful aspect of finding out how humans can generate specific antibodies targeted against SARS-CoV-2," said Professor Leo Yee Sin, Executive Director, NCID.

Key findings of the two studies:

1. Tests on more than 100 convalescent COVID-19 patients showed evidence that S14P5, S21P2, S20P2 and N4P5 are recognised in COVID-19 patients. This means that these epitopes are good detection markers to identify patients who have been exposed to SARS-CoV-2.

2. COVID-19 patients' sera demonstrated the ability to neutralize more than 50 percent of SARS-CoV-2 pseudovirus entry, while SARS patients did not. This is a significant finding, implying that COVID-19 patients' sera, which contains antibodies, are able to prevent SARS-CoV-2 entry into the human body by counteracting S14P5 and S21P2.
3. Using the epitopes to measure antibody responses (Immunoglobulin G) can serve as useful indicators for the degree of immunopathology in COVID-19 patients, and function as highly specific and sensitive sero-immunosurveillance tools. The flexibility of these epitopes to be used alone or in combination will allow for the development of improved point-of-care-tests (POCTs).
4. The findings of these studies demonstrated that epitopes S14P5, S21P2, S20P2 and N4P5 can be deployed for the following purposes:

   - To diagnose SARS-CoV-2 in individuals by using blood samples (serology studies) to identify these epitopes in individuals who might have had negative results with the PCR test.
   - To refine existing studies on the nature of SARS-CoV-2's behaviour after 14 days by narrowing their focus to the antibodies that counter these epitopes.
   - For a survey on community immunity to COVID-19 infection to detect the degree to which the population carries antibodies that can counteract these epitopes.
   - To support the development of therapeutics and vaccines – like monoclonal or polyclonal antibodies targeting the neutralizing epitopes.

These epitopes will be used by A*STAR in a multi-centre collaborative study for the development of the WHO International Standard for COVID-19 antibody and Reference Panel. These antibody targets against similar coronaviruses can address future viral outbreaks. Further studies will be conducted to enable the design of diagnostic tools and the development of vaccines and therapeutics.