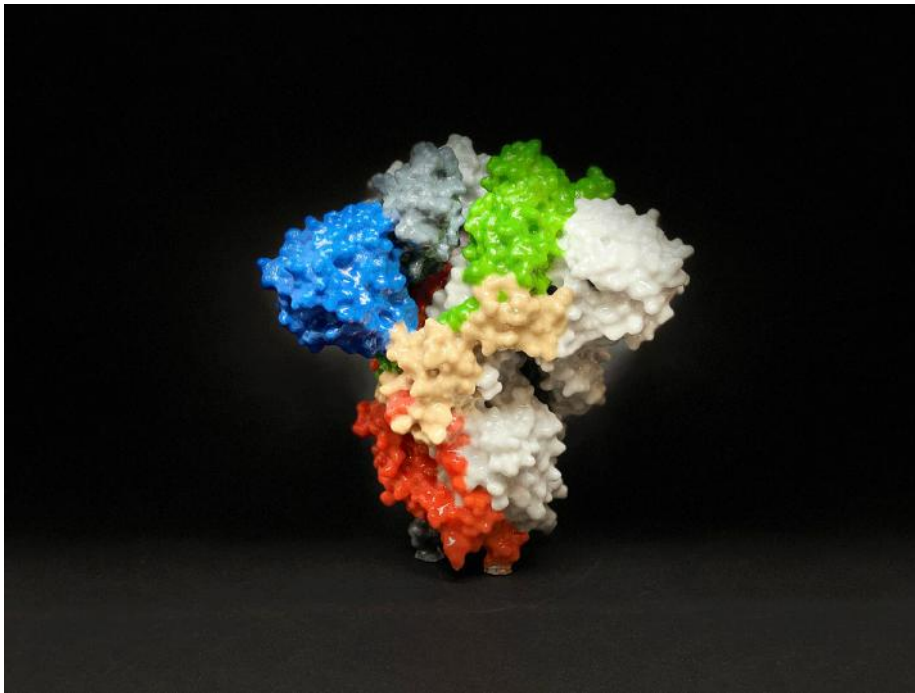


BioWorld

Chinese researchers develop fast, sensitive COVID-19 antibody test



3D print of a spike protein on the surface of SARS-CoV-2. Spike proteins cover the surface of SARS-CoV-2 and enable the virus to enter and infect human cells. Credit: NIH

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By [Annette Boyle](#)

Researchers in Guangzhou, China, have developed a nanoparticle-based lateral flow immunoassay (LFIA) that quickly and accurately detects antibodies to the SARS-CoV-2 virus that causes COVID-19. The current test, which works in a similar manner to a pregnancy test, detects IgG antibodies in blood in less than 10 minutes. A proof-of-concept [study](#) appeared in *Analytical Chemistry* this week.

“There is no doubt that IgM is a more preferable target for early diagnosis and we are also developing the anti-SARS-CoV-2 IgM and IgG dual detection LFIA,” co-author Guan-feng Lin of the School of Laboratory Medicine and biotechnology at Southern Medical University in Guangzhou told *BioWorld*.

“Specific IgM becomes detectable around three to five days after onset while IgG appears about 10 to 15 days after onset, and a suspected case could be confirmed when serum IgG antibodies to SARS-CoV-2 turn from negative to positive or the IgG antibody titers of the recovery period are four times or more higher than that of the acute phase,” Lin explained.

The LFIA provides a quick positive or negative result. It is easy to use and less challenging to deploy in low-resource settings or in the presence of shortages of the reagents needed for reverse transcription polymerase chain reaction (RT-PCR) tests, such as have plagued American health care. Those qualities would make such a test useful for determining individual exposure to the virus, population-level spread and potentially immunity.

The test



Lateral flow immunoassay

Unlike most LFIAs, the new test uses lanthanide-doped polystyrene nanoparticles to detect antibodies to SARS-CoV-2 in human serum. Conventional LFIAs use colloidal gold, which “provides a qualitative detection of the target with the naked eyes, and has sensitivity lower than that of immunoassays with fluorescent” dyes, Lin noted.

These nanoparticles also overcome both the photobleaching and instability of conventional fluorescent dyes, the researchers said.

A “rapid and quantitative analysis model is the advantage of our method,” said Lin.

To evaluate the test, the researchers attached a viral coat protein to a specific region on a strip of nitrocellulose, then added human serum which flowed from one end of the strip to the other. Antibodies bound to the viral protein were revealed by the fluorescent nanoparticles.

“The experimental results indicate that the R value almost reach the plateau region in four minutes,” Lin said. “Thus, it should be safe to assume that a 10-minute total assay time was preferable for ensuring the accuracy and reliability.”

Applications

The test could be used to confirm RT-PCR tests which have had false negative results of up to 70% as a result of challenges in obtaining quality samples from swabs and reduced presence of virus in oropharyngeal or nasopharyngeal samples later in the infection.

The researchers tested the new assay on seven serum samples from COVID-19-positive patients and 12 samples from people who had tested negative for the disease by RT-PCR. The new assay correctly diagnosed all seven samples as positive and determined that a negative case with suspicious clinical symptoms was actually positive.

The immunoassay’s “IgG quantification would be more valuable in the application of therapy monitoring, hospital discharge evaluation and follow-up visits,” Lin said.

Those qualities would make such a test useful for determining individual exposure to the virus and population-level spread and potentially immunity. It could also identify recovered individuals with high levels of antibodies as potential convalescent plasma donors, according to the research team.

Whether individuals who have had confirmed SARS-CoV-2 infection develop immunity remain. While exposure to a pathogen typically sparks antibody production and provides some immunity from future infection, a preprint, non-peer reviewed [study](#) on medRxiv found that one-third of individuals who had been hospitalized and recovered from RT-PCR-diagnosed SARS-CoV-2 infection produced very low levels of antibodies and some had no detectable antibodies at all.

“Right now, we have no evidence that the use of a serologic test can show that an individual is immune or is protected from reinfection,” cautioned the WHO’s Maria Van Kerkhove at a briefing in mid-April.

Keywords [COVID-19 lateral flow immunoassay](#) [SARS-CoV-2](#)