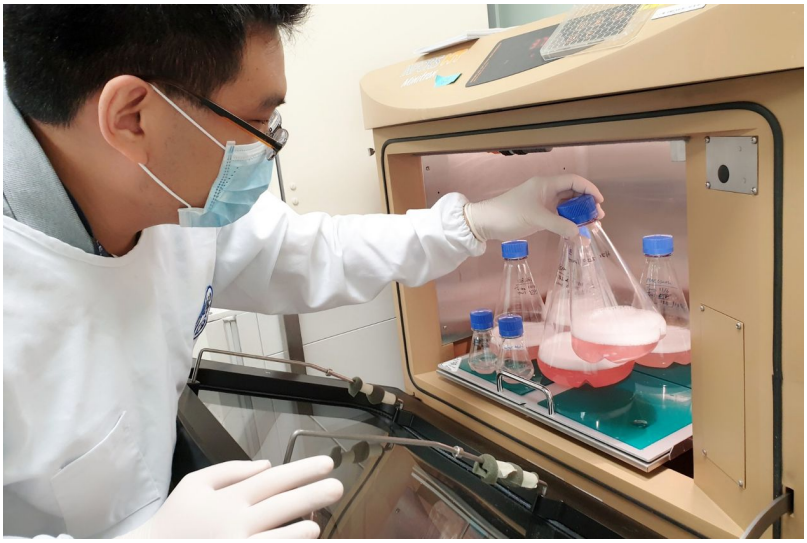
HEALTH

Covid-19 Researchers Hope Monoclonal Antibody Treatments Are a Bridge to Vaccine

Researchers screen blood of recovered Covid-19 patients to isolate the most potent antibodies for use in preventive therapies and treatments



Dr. Conrad Chan is one of the researchers racing to isolate antibodies that fight Covid-19 infections; he prepared cell cultures for antibody production.

PHOTO: DSO NATIONAL LABORATORIES

By Feliz Solomon

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SINGAPORE—Scientist Conrad Chan spent months hunched over trays of test tubes containing coronavirus antibodies, looking for needles in a haystack. By mid-June, he'd

found them: five of the antibodies he believed would be best-suited to neutralize the pathogen that causes Covid-19.

His is one of a few dozen studies under way in the global push to develop monoclonal antibody therapies—drugs known as "mAbs" that can both prevent and fight infection. They are made by screening hundreds of thousands of antibodies found in the blood of recovered patients, isolating the most potent and engineering them into supercharged disease fighters.

Monoclonal antibodies have been used to fight illnesses for decades. The first mAbs treatment was licensed in the U.S. in 1986 to help kidney transplant patients accept their new organ. The method has since been modified to treat cancers including leukemia, as well as autoimmune disorders like rheumatoid arthritis and Crohn's disease.

Scientists are now seeking to apply it to fight Covid-19. Such treatments, they say, could provide a "bridge" of relief until a vaccine is ready.

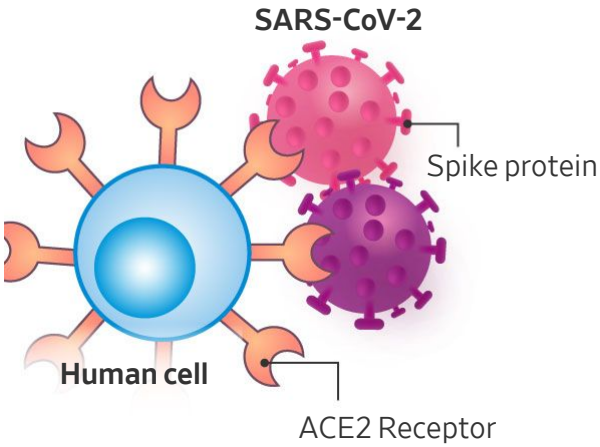
Two drugmakers in the U.S., Eli Lilly and Regeneron, each are advancing mAbs in human trials, while others, mostly in Europe and Asia, are hot on their heels. Dr. Chan's team at DSO National Laboratories in Singapore has cleared a major hurdle, which is finding the right antibodies.

"Ask anyone at any lab, and they'll tell you when something like this happens, we all jump for joy," Dr. Chan said.

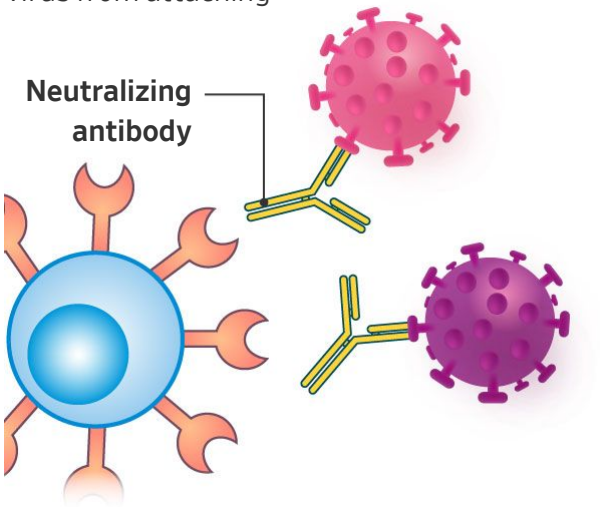
Protection With mAbs

Monoclonal antibody therapies are drugs that could provide a 'bridge' of immunity until vaccines are ready.

Without any antibodies, the coronavirus will bind to the ACE2 receptor on a human cell



The antibody acts as a blocker, preventing the virus from attaching



Source: Siemens

Early studies show a range of potential uses for the drugs in both sick and healthy people. They mimic the immune system and attack infected cells to help patients recover. They also prevent infection by latching onto the virus and blunting its outer surface so it can't adhere to healthy cells.

"The virus is like a sticky ball that loves to grab onto the cells inside the body," said David Lane, chief scientist at A*STAR, the Singapore government's leading scientific research agency, which also is working on developing a therapy. "If you imagine those spikes on the coronavirus cells, we're putting something on them that blocks them so they can't infect anyone."

Dr. Chan's long quest began with small vials of blood drawn from recovered patients. He and his colleagues separated the white blood cells and mixed them with proteins that force them to produce the Y-shaped molecules known as antibodies. Those antibodies were taken from the sample and isolated, each one mixed with a combination of the virus and healthy cells, and set in plastic trays to incubate. Then they waited.

They let the virus and antibodies battle it out for several days before adding a special ingredient that helps them see whether the antibodies work—a bioluminescent chemical, called luciferase and derived from fireflies. If the antibodies work, they protect the healthy cells from infection and keep them alive. The living cells possess an organic compound that reacts to luciferase, glowing like tiny lightbulbs.

This faint shimmer is imperceptible to the naked eye. Dr. Chan and his colleagues found five viable antibodies by scanning the trays with a photometer, similar to the tool used by photographers to gauge exposure. The mixture containing one of the antibodies, AOD01, was brighter than the rest.

They isolated it, cloned it and tested it in the lab. Now, Dr. Chan says, he's ready to try it on people.

"It's one of the exciting things in this field," Prof. Lane said, "when you're looking and the needle in the haystack sort of glows at you."

Monoclonal antibody therapy is similar to—and potentially more potent than—convalescent plasma transfusion, an experimental treatment that involves transferring blood plasma from recovered patients into people with Covid-19 to help them fight the illness.

A plasma sample might contain thousands of antibodies, most of which do little; mAbs isolate specific molecules in a concentrated serum. Because they are synthetic, they can be engineered to be stronger and faster, and to attack the virus at various stages. "You hone the antibody to do what you want it to do," Dr. Brendon Hanson, another scientist at DSO, said.

After they have been tweaked, they can be mass-produced and administered in a single intravenous dose. Further modification could eventually enable doctors to inject them into a patient's muscle tissue, a simpler delivery method.

Scientists expect global demand for the drugs to be so high that it won't matter who finishes first. Researchers at each lab work with the different antibodies they have

discovered and modified to attack the virus in different ways, and doctors might be able to choose from a patchwork of therapies depending on patients' needs.

The immunity the drugs provide won't last very long—probably only about one month per dose, scientists say. But in the absence of a vaccine, the drugs could protect high-risk individuals, like health-care workers or people with immunodeficiency disorders. They could also be used in combination with contact tracing to stop or slow transmission.

DSO and two other labs in Singapore—A*STAR and Tychan—are at various stages in studies that could conclude within months, they said. Their approvals are likely to be fast-tracked if the trials are successful, the scientists said, because similar drugs are already in use treating certain types of cancer and rheumatoid arthritis.

"In case nobody realized this, in a pandemic there's a real need to move fast," Dr. Hanson said. "We just want things to get back to normal. We're all sick of wearing masks."

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