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Antibodies of COVID-19 patients may teach scientists how to protect others

23 April 2020 | News

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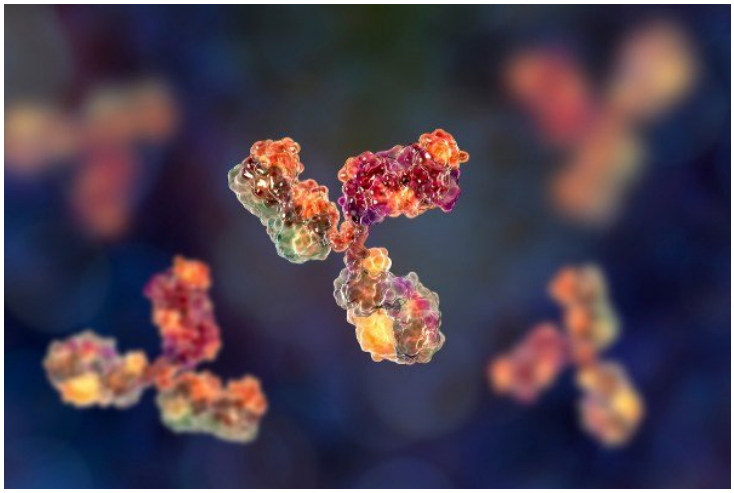

Dr. Ziv Shulman of the Department of Immunology at the Weizmann Institute of Science says that the blood of coronavirus patients who have fully recovered from the disease contains a blueprint for building a molecule that may accelerate others' recovery, or possibly form the basis of a vaccine.

Some severely ill coronavirus patients have already been treated on an experimental basis with the blood plasma of recovered patients, which is teeming with antibodies against the virus. But this method is unlikely to offer a large-scale method of treatment or prevention, as it depends on plasma donations from recovered patients, alone. In contrast, synthetic antibodies could be produced in large amounts by pharmaceutical companies and they are relatively safe.

Dr. Shulman is an expert in the part of the immune response in which certain antibodies – the body's "memory" of infection and protection against reinfection – are produced and processed. This is the adaptive immune response—the mechanism by which the body's immune system recognizes specific invading microbes and reacts with both short-term and long-term antibodies.

He and his lab were the first in the world to visualize all of the antibody-forming cells in intact lymph nodes—the organs where immune cells improve antibody efficiency through a series of mutations. This achievement, which shed new light on the "how, what, when, and where" of the production of protective antibodies, revealed the lymph node niches—pockets in which antibodies undergo rigorous selection, so that only the most fit are sent off to target and bind to invading pathogens.

This and other research in Shulman's lab has identified and characterized the "training" process that immune cells undergo, providing an unprecedented level of detail about the step-by-step process by which the body's immune system optimizes its adaptive, protective response.

These findings and the expertise they have gained will now be directed toward the production and optimization of antibodies that will target one invader in particular: the COVID-19 virus.

Fully trained and certified in biosafety procedures—a must for coronavirus research—Dr. Shulman and his team are in the process of establishing an experimental platform for handling samples from convalescent coronavirus patients.

Telltale signs

Together with Dr. Ron Diskin from the Department of Structural Biology, and clinicians, Dr. Shulman has obtained access to patients who have fully recovered from the coronavirus. These patients have volunteered to let the scientists examine their blood for telltale signs of antibodies generated in response to the coronavirus.

The Shulman team plans to use DNA sequencing and other techniques to clone the patients' antibody-encoding genes and then reproduce them in the lab. This will allow them to identify the antibodies that are most effective in binding and neutralizing the viral proteins.

Dr. Shulman says, "Patients who have been infected by the coronavirus and recovered hold the cure for the disease. By reproducing antibodies that target and neutralize viral proteins, it may be possible to use them to treat patients who suffer from severe symptoms. In addition, antibody injections might be used as a prophylactic treatment—a passive vaccine—that would protect medical staff from coronavirus infection."

Dr. Shulman is supported by the Azrieli Foundation, the Sir Charles Clore Research Prize, the Comisaroff Family Trust, the Lowy Foundation, the Morris Kahn Institute for Human Immunology, the Gerald O. Mann Charitable Foundation, the Moross Integrated Cancer Center, the David M. Polen Charitable Trust, and Rising Tide Foundation