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T-CELL IMMUNITY AND COVID-19

Relevant for: Developmental Issues | Topic: Health & Sanitation and related issues

About 25% of blood donors in 2019, prior to the outbreak of COVID-19 infection in Sweden, had T-cell immunity against it. (Representational image) | Photo Credit: Getty Images

Our immune system responds to virus infections with a first-line defence called ‘innate’ immunity, followed by the second-line called ‘adaptive’ immunity. Innate immunity is like first aid — an immediate response, not strong enough to prevent pathology if the virus is highly virulent or the ‘inoculum’(infecting virus load) is heavy. Innate immunity then passes the baton to adaptive immunity, which takes several days to develop and become effective.

Adaptive immunity has two arms — antibodies and T-cell immunity. Antibodies are protein molecules that recognise and bind to viral antigens. Some among them tend to neutralise viruses from infecting fresh host cells. Some viruses then adopt other mechanisms to infect host cells, and that is when T-cell immunity may come to the rescue. In most viral infections, the presence of antibodies in the blood is sufficient to classify individuals as immune. But unlike them, antibodies for COVID-19 wane fairly soon. In persons with asymptomatic infections or mild COVID-19, nearly half will have no detectable antibodies after two months. This phenomenon of short-lived antibodies and consequent re-infection is also seen in some other respiratory tract viruses. Generally, re-infections are mild or asymptomatic, presumably due to protection afforded by T-cell immunity.

Does disappearance of antibodies for the COVID-19-causing virus mean that protection after one infection does not last? Knowing that reinfection with symptoms has so far been proven in only about ten cases among millions infected, protective immunity after the first infection is probably durable. The observed protection in the face of non-detectable antibodies highlights the need to study T-cell immunity.

In COVID-19 infection, T-cell immunity is more long-lasting than antibodies. It resides in a subset of white blood cells called T-lymphocytes, or T cells. However, the test for assessing T-cell immunity is complicated and expensive. Researchers from Cardiff University have come up with a simplified and rapid T-cell immunity test, called ‘T- SPOT test’, that can be done in many laboratories. Serial evaluation of T-cell immunity can help determine its durability after vaccination. Therefore, it is no surprise that vaccine trials have started testing for T-cell immunity too.

In a recent study from Karolinska Institute, there were many surprises. About 25% of blood donors in 2019, prior to the outbreak of COVID-19 infection in Sweden, had T-cell immunity against it. This increased to 50% in 2020 after the pandemic had entered the country. These observations imply that prior exposure to some other coronavirus(es) had evoked “cross-reacting” T-cell immunity towards the COVID-19 coronavirus. In the same study, many contacts of proven COVID-19 patients had T-cell immunity, even though antibodies were undetectable. This indicates that in those exposed to the COVID-19 virus, T-cell immunity occurs even without a detectable antibody response.

The Karolinska investigators found that the immune T cells had ‘stem-cell’ like characteristics — indicating their long-term survival and potential of quick multiplication. A study from Birmingham confirmed that in COVID-19, T-cell immunity is durable and lasts for more than six months.

Four coronaviruses causing common cold are widely prevalent in human communities. Two of

them are Beta-coronaviruses, the phylogenetic group to which the COVID-19 coronavirus belongs. The prevalence of cross-reacting T-cell immunity from the common cold coronaviruses is likely to vary from country to country, depending partly on population density and the frequency of recurrent viral infections of the respiratory tract. Countries with high population densities, where such infections spread quickly, may be expected to have a higher proportion of the population exposed to them. This may explain the relatively lower impact of COVID-19 (in terms of number of cases and deaths per million population) in countries like India and many low-income countries.

Obviously, T-cell immunity is a better and more durable marker than antibodies of past infection for this novel virus. If India's vaccination policy, when made, recommends that vaccines may be conserved for priority use for non-immune subjects, then, a rapid T-cell immunity test, such as the one developed in Cardiff, will be better than antibody tests. Therefore, developing simple and rapid assays for T-cell immunity should be a priority for Indian scientists to work on, quickly. Those with T-cell immunity may need no vaccine, or only a single dose of a two-dose vaccine regimen.

Dr. M.S. Seshadri retired as Professor of Medicine and Clinical Endocrinology, Christian Medical College (CMC). Dr. T. Jacob John retired as Professor of Clinical Virology, CMC.

Suresh Nambath

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To reassure Indian Muslims, the PM needs to state that the govt. will not conduct an exercise like NRC

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