Study of T cells from COVID-19 convalescents guides vaccine strategies

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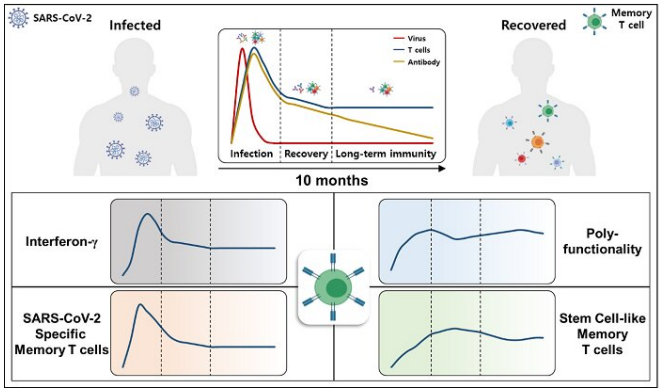

Overview of the SARS-CoV-2-specific immune response kinetics. Memory T cells are maintained after recovery from COVID-19 with the generation of stem cell-like memory T cell. Credit: The Korea Advanced Institute of Science and Technology (KAIST)

A KAIST immunology research team found that most convalescent patients of COVID-19 develop and maintain T cell memory for over 10 months regardless of the severity of their symptoms. In addition, memory T cells proliferate rapidly after encountering their cognate antigen and accomplish their multifunctional roles. This study provides new insights for effective vaccine strategies against COVID-19, considering the self-renewal capacity and multipotency of memory T cells.

COVID-19 is a disease caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection. When patients recover from COVID-19, SARS-CoV-2-specific adaptive immune memory is developed. The adaptive immune system consists of two principal components: B cells that produce antibodies and T cells that eliminate infected cells. The current results suggest that the protective immune function of memory T cells will be implemented upon re-exposure to SARS-CoV-2.

Recently, the role of memory T cells against SARS-CoV-2 has been gaining attention as neutralizing antibodies wane after recovery. Although memory T cells cannot prevent the infection itself, they play a central role in preventing the severe progression of COVID-19. However, the longevity and functional maintenance of SARS-CoV-2-specific memory T cells remain unknown.

Professor Eui-Cheol Shin and his collaborators investigated the characteristics and functions of stem cell-like memory T cells, which are expected to play a crucial role in long-term immunity. Researchers analyzed the generation of stem cell-like memory T cells and multi-cytokine producing polyfunctional memory T cells, using cutting-edge immunological techniques.

This research is significant in that revealing the long-term immunity of COVID-19 convalescent patients provides an indicator regarding the long-term persistence of T cell immunity, one of the main goals of future vaccine development, as well as evaluating the long-term efficacy of currently available COVID-19 vaccines.

The research team is presently conducting a follow-up study to identify the memory T cell formation and functional characteristics of those who received COVID-19 vaccines, and to understand the immunological effect of COVID-19 vaccines by comparing the characteristics of memory T cells from vaccinated individuals with those of COVID-19 convalescent patients.

Ph.D. candidate Jae Hyung Jung and Dr. Min-Seok Rha, a clinical fellow at Yonsei Severance Hospital, who led the study together explained, "Our analysis will enhance the understanding of COVID-19 immunity and establish an index for COVID-19 vaccine-induced memory T cells."

"This study is the world's longest longitudinal study on differentiation and functions of memory T cells

among COVID-19 convalescent patients. The research on the temporal dynamics of immune responses has laid the groundwork for building a strategy for next-generation vaccine development," Professor Shin added. This work was supported by the Samsung Science and Technology Foundation and KAIST, and was published in *Nature Communications* on June 30.

More information: Jae Hyung Jung et al, SARS-CoV-2-specific T cell memory is sustained in COVID-19 convalescent patients for 10 months with successful development of stem cell-like memory T cells, *Nature Communications* (2021). DOI: 10.1038/s41467-021-24377-1