Vaccine-induced T cells provide long-lasting immune response to COVID-19

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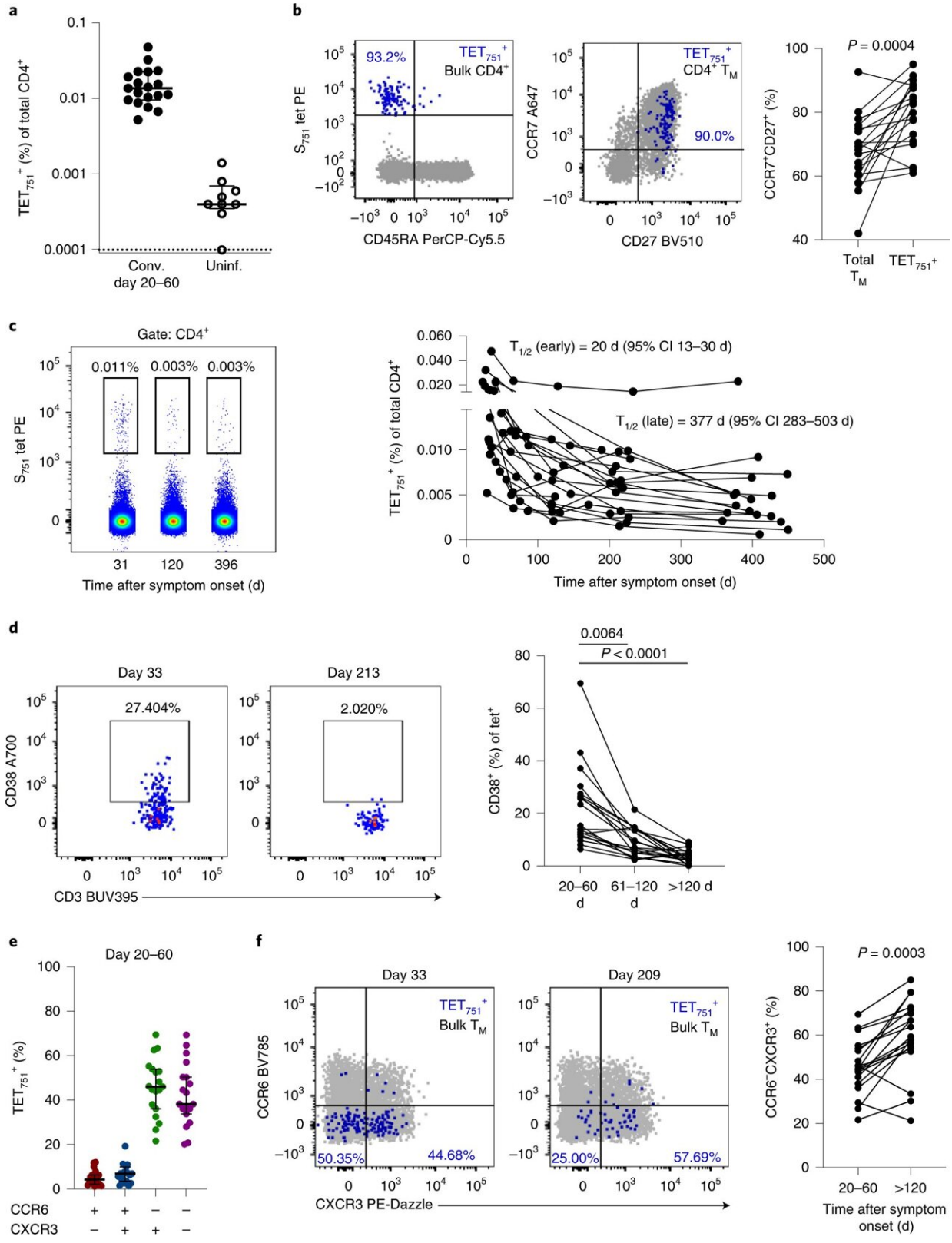

Establishment of S_{751}-specific $CD4^+$ T cell memory following mild COVID-19.

a, Frequency of TET_{751}^+ cells (as a percentage of total $CD4^+$) among uninfected (n = 9) or COVID-19 convalescent individuals sampled 20 to 60 d after symptom onset (n = 19). The lines indicate the median, and bars indicate the IQR. b, Representative plots demonstrating expression of CCR7 and CD27 on TET_{751}^+ or bulk T_M (non-naïve $CD4^+$) cell subsets. Comparison of T_{CM} ($CCR7^+CD27^+$) cell phenotype between TET_{751}^+ or bulk T_M cells assessed using the Wilcoxon test (two-sided, n = 19). c, Representative staining and frequencies of TET_{751}^+ cells 1 to 15 months after symptom onset (n = 21). d, Expression of CD38 on TET_{751}^+ cells during longitudinal follow-up (n = 19 at 20–60 d and >120 d; n = 15 at 61–120 d). Statistics were assessed by Kruskal–Wallis and Dunn's multiple-comparisons tests. e,f, Expression of CCR6 and CXCR3 on TET_{751}^+ or T_M cells during early (e) or late (f) convalescence (n = 19). Lines indicate the median and IQR. Statistics were assessed by Wilcoxon test (two-sided). Credit: *Nature Immunology* (2022). DOI: 10.1038/s41590-022-01175-5

Researchers at the Peter Doherty Institute for Infection and Immunity (Doherty Institute) have shown that the body's T cells provide long-lasting memory against the virus following vaccination or infection from COVID-19.

Published today in *Nature Immunology*, the team utilized new technology to track the T cell responses of people who had recovered from COVID-19 for 15 months and found there was a sustained level of these cells capable of recognizing the SARS-CoV-2 spike protein.

University of Melbourne Dr. Jennifer Juno, a Senior Research Fellow at the Doherty Institute and senior author on the paper, said that despite an initial contraction of the immune response immediately following infection, the T cells stabilized at six months and remained level after 15 months of monitoring.

"Even though some parts of the immune response wane, we can now see

that T cells recognizing the virus are quite stable over time. After more than a year, they were still roughly 10-fold higher than someone who had never been exposed to the spike protein through infection or vaccination," said Dr. Juno.

While B cells are responsible for producing the antibodies that recognize SARS-CoV-2, T cells play a crucial role in supporting the development of the B cell response. Without T cell help, B cells are unable to produce high amounts of antibodies that can bind to the virus and stop infection.

When individuals were re-exposed to the COVID-19 spike protein through vaccination, the part of the virus that enables SARS-CoV-2 to attach and enter cells in humans, the T cells quickly reactivated and increased in number.

"Vaccination boosted the levels of these T cells to be up to 30 times higher than they were before," Dr. Juno said.

The team looked at people who had recovered from mild illness, as well as people who had been vaccinated.

"In general, we saw that the vaccines generate the same amount of T cells as someone who had been infected. We also saw that the third dose does an incredible job at re-activating those T cells and bringing the levels back up again," said Dr. Juno.

The team utilized new technology called tetramers that help identify which T cells recognize the spike protein to undertake the research, resulting in more accurate findings.

"Usually we have to stimulate the cells in the lab before we can measure the T cell response. However, using tetramers, we can look at them straight from the blood samples, meaning we are getting a more accurate

picture of what is happening," said Dr. Juno.

The team are now looking at how these T cells react when breakthrough infections happen.

"We are looking at people who have been vaccinated, but then still catch COVID-19, and trying to understand whether the T cells are still being reactivated in the same way as what we've seen with the vaccines and primary infections."

More information: Kathleen M. Wragg et al, Establishment and recall of SARS-CoV-2 spike epitope-specific CD4+ T cell memory, *Nature Immunology* (2022). DOI: 10.1038/s41590-022-01175-5

Provided by The Peter Doherty Institute for Infection and Immunity