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Press Release

Investigation of long-term immunity to SARS-CoV-2 provides the basis for vaccine development

Results of the study published in *Science Translational Medicine*

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T cells play a major role in the formation of long-lasting immunity against the coronavirus SARS-CoV-2. This is shown by a new study from the Clinical Collaboration Unit Translational Immunology at the University Hospital Tübingen and the Robert Bosch Center for Tumor Diseases (RBCT) in Stuttgart. The newly gained insights also provide important information for the development of vaccines against the virus. The results of the study have currently been published in *Science Translational Medicine*.

The development of long-lasting immunity after both natural infection with SARS-CoV-2 and prophylactic vaccination is essential for long-term protection against COVID-19 and ultimately for the development of herd immunity. Two components of the immune system play a crucial role in the development of this long-term immunity. The B cells, which form antibodies that can neutralize the virus, and the T cells, which destroy virus-infected cells and further can support the formation of antibodies.

In a recent study published in *Science Translational Medicine*, the research group of PD Dr. Juliane Walz of the Clinical Collaboration Unit Translational Immunology at the University Hospital and the Medical Faculty Tübingen, and the Robert Bosch Center for Tumor Diseases in Stuttgart has now examined the immune responses following an infection with SARS-CoV-2 in a long-term follow-up. For this purpose, volunteers were analyzed four weeks as well as six months after SARS-CoV-2 infection. The results showed that a strong T cell response against the virus was still detectable six months after the infection. In stark contrast, a marked decrease in antibody responses, particularly against the spike protein, was detected after this period.

"T cells recognize virus-infected cells based on specific viral components (epitopes) presented on the cell surface," Dr. Walz explained. "Interestingly, it has been shown that only very specific epitopes of SARS-CoV-2mediate long-term T-cell immunity, whereas others are unable to do so, and T cells targeting these epitopes, consequently, disappear over the course of six months."

Based on these findings the Clinical Collaboration Unit Translational Immunology (headed by Prof. Dr. Helmut Salih) together with the Department of Immunology (headed by Prof. Dr. Hans-Georg Rammensee) is evaluating a SARS-CoV-2 vaccine candidate, consisting of the T cell epitopes that were identified to confer long-term immunity, within a first clinical trial. Preliminary results of the study show that the vaccine candidate CoVac-1 is able to induce strong SARS-CoV-2 specific T cell

responses in healthy volunteers. Based on this, an evaluation of CoVac-1 is now also planned in patients with congenital and acquired B-cell defects, such as cancer patients, who are unable to develop sufficient antibody immunity against SARS-CoV-2.

Title of original publication:

Differential T cell and antibody kinetics delineate SARS-CoV-2 peptides mediating long-term immune response after COVID-19; DOI: 10.1126/scitranslmed.abf7517

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