

Severe COVID-19 despite or even due to the strong immunity

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Colorized scanning electron micrograph of a cell (blue) heavily infected with SARS-CoV-2 virus particles (red), isolated from a patient sample. Image captured at the NIAID Integrated Research Facility (IRF) in Fort Detrick, Maryland. Credit: NIAID

The team from Marien Hospital and the department of Virology of Ruhr-Universität Bochum (RUB) as well as the Clinic for Infectious Diseases, the Clinic of Anesthesiology and the Institute for Virology of University Medicine Essen studied specific antibodies and T cells occurring in recovered, seriously ill and deceased COVID-19 patients. The researchers identified comparable immune reactions in clinical follow up. They report their findings in the journal *Cell Reports Medicine* from 29 August 2020.

How the immune system fights viruses

Antibodies and T lymphocytes are among the most important elements of the immune defense against viruses. The antibodies prevent viruses from entering the [host cell](#) by binding to certain virus receptors. They also mark the infected [cells](#) for other players in the [immune system](#), which are able to kill the infected cells. Virus-specific T lymphocytes, on the other hand, can kill [infected cells](#) directly and highly efficiently.

During the last weeks, some studies have been published on the analysis of these cell-killing SARS-Cov-2 specific T cells in patients with COVID-19. The studies demonstrated detection of such cells in patients recovered from COVID-19 suggesting their protective antiviral effect. On the other hand, some studies indicate that an excessive immune response might be the cause of severe COVID-19. The role of SARS-Cov-2 specific T-cells in this exaggerated immune response is unclear.

Critically ill patients have the same or stronger immunity as recovered patients

In the current study, the research team analyzed immune responses in

COVID-19 patients during the disease progress. "This is how we wanted to investigate the role of T cells and antibodies in controlling the infection and the disease," explains Nina Babel, who headed the study. "The novel aspect of our study is that we analyzed SARS-Cov-2 specific T-cells and [antibodies](#) in relation to disease progression and viral clearance. We found that a strong T-cell and antibody response could be detected not only in patients with mild COVID-19 patients who had recovered from the virus infection." Similar or even stronger immunity to SARS-Cov-2 was found in patients who had been critically ill and who suffered COVID-19-related lung failure.

"The total number of specific immune cells as well as their functionality was not better in patients who survived COVID-19 than in those who died from it," says Dr. Ulrik Stervbo, head of laboratory at the Centre for Translational Medicine. There was also no difference in the strength and functionality of the immune response between patients who still suffered from and those who had cleared a SARS-Cov-2 infection.

Excessive immune response plays an important role

"Even though further studies will be necessary to understand the specific mechanism of COVID-19 development, our data suggest that excessive SARS-Cov-2-specific T cell response can cause immunopathogenesis leading to COVID-19-related lung failure," points out Nina Babel. "The results of current studies on the successful application of immunosuppressive therapies in COVID-19 support this hypothesis," concludes Professor Timm Westhoff, Director of Medical Clinic I at Marien Hospital Herne.

More information: Constantin J. Thieme et al, Robust T cell response towards spike, membrane, and nucleocapsid SARS-CoV-2 proteins is not associated with recovery in critical COVID-19 patients, *Cell Reports Medicine* (2020). [DOI: 10.1016/j.xcrm.2020.100092](https://doi.org/10.1016/j.xcrm.2020.100092)

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