

# T Cells And COVID-19 Vaccine

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SARS-CoV-2, better known as COVID-19, took the world by surprise in 2020. The respiratory virus brought a worldwide pandemic that infected millions and shut down the world for months. COVID vaccines were developed rapidly and made available to the American public in early 2021. The mechanisms behind the vaccines' success are the source of many studies. Researchers have investigated both the neutralizing antibody responses and T cell responses.

Immunity from diseases can be induced by both infection and vaccination. This immunity is mediated by the adaptive immune system. The adaptive immune system is made up of both cellular and humoral immunity. Cellular immunity is through the use of cytotoxic CD8+ T cells and helper CD4+ T cells. Humoral immunity is mediated by the use of memory B cells and antibodies secreted by B cells. The mechanisms by which they provide immunity are separate. Antibodies will bind to the virus and prevent entry into the host cells and as a result prevent infection. T cells on the other hand do not recognize pathogens until they have entered the host cell. So, T cells do not prevent initial infection. They do however, rapidly respond to infection and shut down viral replication. If COVID-19 breaches neutralizing antibody (NAb) defenses in the upper respiratory tract, severe disease can be avoided if the virus is prevented from spreading to the lower respiratory tract. T cells are suited to this task over antibodies, as T cells are able to eliminate virus-infected cells and stop viral reproduction.

As the pandemic has gone on, expectations regarding the COVID vaccines have changed. The initial goal was to for the vaccines to prevent infection for most people, and as a result the numbers of people being infected would decrease until the pandemic was over. The emergence of more viral variants has changed expectations. Omicron is a more transmissible variant and is able to escape NAb responses which reduces the effectiveness of the vaccine to block infection. While protection against initial infection has waned, the protection the vaccine offers against

severe infection and disease is still very effective. Memory B cells are durable cells that may contribute to disease protection, alongside T cells. T cell response to COVID is also more effective as T cells recognize peptides that are not as common to mutate. T cells are able to recognize COVID and disrupt viral replication.

In conclusion, T cell immunity generated from the COVID-19 vaccines is effective in reducing severe disease from the virus. It does this by stopping viral replication and destroying infected cells. This is important as other more infectious COVID variants have cropped up, like the Omicron variant. Moving forward more research should be done investigating how to optimize T cell immunity with our COVID vaccines.