Summary of T Cell immunity to COVID-19 Vaccines

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In the journal article T Cell Immunity to COVID-19 vaccines, authors E. John Wherry and Dan H. Barouch explain how the development of various COVID-19 vaccines in a short timeframe have contributed to advances in biomedical studies and protection against infectious diseases as such. Although these advancements are beneficial, the correlation between cellular immunity and vaccine protection is understudied and lacks understanding. The research already gathered does imply that T cells do play a major role in vaccine protection by preventing severe disease and identifying variants of the virus that escape antibody responses. Antibodies can prevent viral agents from entering host cells by chemically binding to it and eliminating infection before it occurs. T Cells are not able to prevent a virus from entering the host cell but can recognize the viral mechanism after infections and respond expeditiously to prevent further replication and controlling the spread.

T Cells protect against severe disease from COVID-19 by inhibiting replication of the virus and killing any infected host cells off. They are able to recognize remnants of viral agents from previous infection or administration of mRNA vaccination against COVID-19. T cell's ability to quickly control SARS CoV-2 viral replication prevents disease progression and contributes to a less severe infection from COVID-19. The primary goals of the COVID-19 vaccines were to prevent infection, prevent transmission, protect from severe disease and prevent Long COVID, which is infection that can last for months. After many trials, it was determined that the vaccine's efficacy decreases as time progresses and it does not prevent infection but does protect against the development of acute disease. Scientist have recognized that antibody responses are not enough to combat against the extremely resilient and contagious SARS CoV-2 virus.

Cellular immunity is not protected with the vaccine especially against viral variants such as Omicron, which is highly contagious, more harmful, and more likely to cause severe disease if an individual is unvaccinated. T Cells have proven to identify short amino acid peptides present in variants such as omicron preventing further infection and hospitalization. If other variants are able to escape T cell activities, they are still neutralized in a sense that the variant cannot be transmitted to another person. Antibodies and T cells both contribute to immunological memory and play a role in identifying and recognizing threat, neutralizing the infected cells, and protect against future infection. After analyzing cancer patients who presented deficiencies in B cell activity and were also diagnosed with COVID-19, they demonstrated $CD8^+$ T cell protection against SARS-Cov-2. Although the Omicron variant produced an additional spike of COVID-19 cases, the contribution on T-cells along with the vaccine has drastically decreased the number in hospitalizations and COVID death related cases. The number of severe disease cases has also plummeted due to population and memory immunity. There are still unanswered questions regarding booster shots and its effect on cellular immunity and the mechanism T cells take to improve vaccine efficacy, however, they are crucial in immune support.

References

[1] E. J. Wherry and D. H. Barouch, "T cell immunity to COVID-19 vaccines," *SCIENCE,* pp. 821-822, 2022.