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**CURRENT STRATEGIES FOR DEVELOPING COVID-19 VACCINES**  
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The SARS-CoV-2 that broke out in Wuhan, China, in December 2019 caused a significant number of morbidity and mortality in the world. Due to the dramatic rise in the number of COVID-19 cases worldwide, COVID-19 vaccines are in immense demand globally. Numerous attempts have been made to develop vaccines against this deadly SARS-CoV-2 virus.

However, the process of developing the most effective vaccines faces unusually difficult challenges. In the case of coronavirus, conventional vaccination methodology based on live attenuated vaccines containing living organisms raises toxicity and safety concern because attenuated pathogens can revert to the original form and cause disease. In addition, attenuated virus vaccines require long cell culturing processes to achieve attenuated strains. Therefore, there was an urgent need to develop novel vaccine technologies to overcome the drawbacks of the conventional vaccines.

One of such approaches is associated with non-replicating viral vector-based vaccines which are constructed from a carrier such as adenovirus. The researchers at the University of Oxford have modified a chimp adenovirus vector that carries genes encoding the spike protein. Infecting human cells with this adenovirus will lead to the production of spike protein and become a target for the immune response. The vaccine has been reported to have a good safety profile, with both cellular and humoral responses produced.

The Sputnik V vaccine works in a similar way to the Oxford/AstraZeneca one. It also uses adenovirus, engineered to be harmless, as a carrier to deliver a small fragment of the coronavirus to the body. Safely exposing the body to part of the virus's genetic code in this way allows it to recognize the threat and learn to fight it off, without the risk of becoming ill. Despite the fact that the development of the Sputnik V vaccine has been criticized for unseemly haste, it has been overviewed in *The Lancet* (worldwide known medical resource) and assessed in a positive manner.

Pfizer-BioNTech's and Moderna's vaccines use bits of genetic code to cause an immune response, and are called mRNA vaccines. They do not alter human cells, but merely present the body with instructions to build immunity to COVID-19. They have passed clinical trials and showed promising efficacy and safety in participants with no previous exposure to SARS-CoV-2.

Safe and effective vaccines are certain to be a breakthrough. However, many issues connected with vaccine development still remain unresolved. The second generation SARS-CoV-2 vaccines are expected to demonstrate the capacity to elicit more robust and longer responses with just one immunization.