Journal of Pharmaceutical Care & Health Systems

OPEN ACCESS Freely available online

Editorial

Editorial on Protein-based COVID Vaccines

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DESCRIPTION

People around the world are given multiple safe and effective COVID-19 vaccines; scientists are investigating various vaccine strategies that can provide stronger or longer-lasting immunity to SARSCoV2 and its variants. We are working hard on development. Researchers at ACS Central Science are now immunizing mice with nanoparticles that mimic SARSCoV2 by displaying multiple copies of the Receptor-Binding Domain (RBD) antigen, and the vaccine provides a potent antibody and T cell response.

The first vaccine to receive urgent approval from the US Food and Drug Administration was based on mRNA, but more conventional protein-based vaccines have shown promise in clinical trials. In most cases, the immune system is trained to recognize RBD, a peptide that is part of the SARSCoV2 palmer that binds to ACE2 receptors on the surface of host cells. However, not all of these vaccines elicit both antibody and T cell responses, both of which are thought to be important for long-lasting immunity. Melody Swartz, Jeffrey Hubbell, et al. have previously developed a vaccine delivery tool called polymerases. It is a self-assembled spherical nanoparticles that can encapsulate antigens and adjuvants (helper molecules that enhance the immune response) and release them into immune cells. Whether polymerases induce strong T-cell immunity and researchers can further improve antibody response by displaying multiple copies of RBD on the surface by modifying nanoparticles to mimic the virus.

So the team created polymerases of the same size as SARSCoV2 and decorated them with many RBDs. After characterizing the nanoparticles in vitro, they injected them into mice with separate polymerases containing an adjuvant in two doses at 3-week intervals. For comparison, they immunized another group of mice with RBD-encapsulated polymerases, along with nanoparticles containing an adjuvant. Both groups of mice produced high levels of RBD-specific antibodies, but only surface-decorated polymerases produced neutralizing antibodies that prevented intracellular SARSCoV2 infection. Both surface-decorated RBDs and encapsulated RBDs elicited robust T cell responses. The new vaccine has not yet been tested for safety and efficacy in humans, but researchers say it may be superior to the mRNA vaccine in that it is widely used in the field of limited resources. This is because, unlike mRNA vaccines that require storage at sub-zero temperatures, surface-decorated polymerases are stable and active for at least 6 months when refrigerated.

The authors would like to thank the Chicago Center for Immunotechnology Innovation, University of Chicago, the Chicago Biomedical Consortium COVID19 Response Award, the National Institutes of Health, the Canadian Institute of Health, and the University of Chicago Comprehensive Cancer Center.

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Received: October 04, 2021, **Accepted:** October 18, 2021, **Published:** October 25, 2021

Citation: Lima R (2021) Editorial on Protein-based COVID Vaccines. J Pharma Care Health Sys. S9:e001.