Writing Assignment 5

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An mRNA Influenza Vaccine - Could It Deliver?

Article summary

 As part of public health and pandemic preparedness, it has long been a goal to develop a universal influenza vaccine that confers broad and durable protection against a diverse range of circulating and emerging influenza viruses (Neuzil, 2023). Viruses carrying influenza A are zoonotic and can infect a wide range of animals, causing pandemics in humans. Hemagglutinin (HA), a surface glycoprotein critical for virus attachment to the respiratory epithelium, is the major target for protective antibody responses induced by conventional influenza virus vaccines. The influenza A HA subtypes (H1 to H18) and the influenza B HA subtypes are, however, different. There are formidable technical, immunologic, and regulatory challenges associated with developing a vaccine against all 20 subtypes of HA. In addition to three (trivalent) or four (quadrivalent) HA subtypes, conventional inactivated influenza vaccines elicit largely strain-specific immune responses. The seasonal vaccines do not provide adequate protection against new subtypes of influenza, making them unsuitable for pandemic preparation (Neuzil, 2023).

 It is widely agreed upon that there has been a major milestone in the development of mRNA vaccines with the demonstration of clinical efficacy for the COVID-19 vaccine (Chivukula S). Dozens more vaccine candidates are in the clinical stage of development. Under Emergency Use Authorization, COVID-19 mRNA vaccines have been developed and approved with unprecedented speed, and the growing safety database in millions of human populations supports the exploration of the mRNA platform as a potential approach to global pandemics and seasonal viral diseases. Vaccine development has been spurred by the Covid-19 pandemic, and mRNA technology has become a critical public health intervention (Neuzil, 2023). As a result of the delivery of mRNA into a cell, the synthetic mRNA template encodes a specific viral glycoprotein antigen (e.g., SARS-CoV-2) that is translated in the body. Molecularly modified mRNA is encapsulated within lipid nanoparticles (LNPs) in order to increase stability, prevent degradation, and enhance translation during in vivo delivery. With mRNA-based vaccines' rapid scalability, robust immunogenicity, and high efficacy, the Covid-19 pandemic has been able to be quickly addressed. As demonstrated by the bivalent formulations, the platform is capable of quickly incorporating new variants.

References

Chivukula S;Plitnik T;Tibbitts T;Karve S;Dias A;Zhang D;Goldman R;Gopani H;Khanmohammed A;Sarode A;Cooper D;Yoon H;Kim Y;Yan Y;Mundle ST;Groppo R;Beauvais A;Zhang J;Anosova NG;Lai C;Li L;Ulinski G;Piepenhagen P;DiNapoli J;Kalnin KV;Landolfi V;Swearingen R (no date) Development of multivalent mrna vaccine candidates for seasonal or pandemic influenza, NPJ vaccines. U.S. National Library of Medicine. Available at: <https://pubmed.ncbi.nlm.nih.gov/34916519/> (Accessed: April 3, 2023).

Neuzil, K.M. (2023) “An mrna influenza vaccine — could it deliver?,” New England Journal of Medicine, 388(12), pp. 1139–1141. Available at: <https://doi.org/10.1056/nejmcibr2215281>.