

**Academic Prespective on the Urgent COVID-19 Vaccine Research, Development and Delivery.**Reza Jafari^{1,2}, Naime Majidi Zolbanin³, Reza Nassiri^{4*}⁴Departments of Pharmacology and Community Medicine, Michigan State University, East Lansing, Michigan, USA.

ABSTRACT : Vaccine researchers and developers worldwide are intensely working toward a common global health goal to develop a safe and effective vaccine(s) protecting the global population from SARS-CoV-2 (COVID-19; the WHO nomenclature). An ideal vaccine profile must prove to be both effective and safe when administered in the general population. To date, there are a few vaccine candidates that show optimistic grounds for clinical trials, and thus, the promise of a vaccine is on the horizon (<https://clinicaltrials.gov>). There is an accelerated effort worldwide to deliver such a promise, a global marathon to also gain the market share of vaccine delivery. The nucleic acid vaccines such as DNA or mRNA vaccines are new-generation gene vaccines. Selection of a specific target as an antigenic determinant in the molecular structure of SARS-CoV-2 is the most important step in vaccine research and design. It can be packaged as a recombinant protein eliciting neutralizing antibody production. Accordingly, the precise conformation of the protein is consequential in humoral immune responses in which the spike protein plays a central role.

This viral receptor binds to the host cells at least 10 times as tightly as has been reported for COVID-19. Precise mapping of this protein is a critical step toward vaccine discovery because the spike protein is one essential element of the virus that the immune system can potentially identify as non-self. Once the introduction of this step is established to the immune cells, such cells are likely to trigger an immune response and subsequent production of antibodies. Therefore, such a concept eventually needs a clinical trial challenge. Gene vaccines such as the mRNA vaccine are an unprecedented approach which recently have been focused by pharmaceutical companies. The mRNA sequence can encode the immunogenic domain of spike protein, and in addition to the neutralizing antibodies response, it induces strong T cytotoxic lymphocytes. Choosing a proper carrier for mRNA delivery has been considered in many research phases and lipid nanoparticles might be applicable carriers of mRNA vaccines. Another major hurdle in COVID-19 vaccine development is the obscure nature of a viral enzyme nsp16, its camouflage role has most recently been reported. This viral enzyme can fool the host cell recognizing it as "self". This in turn might pose a further challenge for vaccine research and development. However, the principles of vaccine basic science will eventually prevail to deliver an ideal vaccine overcoming the prevention aspect of COVID-19 and other zoonotic infections that may threaten our global health stability in the future.



Biography Nassiri is hematologist with a fellowship training in clinical pharmacology. He has expertise in Infectious Diseases and Tropical Medicine. He is currently Professor of Pharmacology and Toxicology, and, Family and Community Medicine, lecturer in Global Health, Infectious Diseases and Tropical Medicine at Michigan State University in Michigan, USA. He has served as Director of the MSU Institute of International Health and as a former Associate Dean of Global Health. He currently works on global health issues such as SARS-Cov-2 (COVID-19), antibiotic resistance, and viruses without borders. He has made significant contributions in various fields of medical sciences including clinical investigation, academic medicine, global health, and medical curriculum. Based on his extensive experience and expertise in chronic infectious diseases including HIV/AIDS and diseases of the tropics, he had previously developed clinical research programs in Brazil, South Africa, Haiti, Dominican Republic, and Mexico. He had served as editorial board member for the journal of HIV and AIDS Review

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