

Brought to you by [INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA](#)

Scopus

[Back](#)

# Emerging the Potential of mRNA Technology in Covid-19 Vaccine Manufacturing

[Springer Handbooks](#) • Book Chapter • 2026 • DOI: 10.1007/978-3-032-01636-2\_16

[Taher, Muhammad](#)<sup>a</sup> ; [Muhd Rosdi, Muhammad Imtiaaz Aziman](#)<sup>a</sup>;  
[Mohd Nizam Nur, Muhammad Syahmil Irsyad](#)<sup>a</sup>; [Zainuri, Qurratu Ain](#)<sup>a</sup>;  
[Mohd Nor Shokri, Nur Shafira Izzatie](#)<sup>a</sup>; [+4 authors](#)

<sup>a</sup> Faculty of Pharmacy, Department of Pharmaceutical Technology, International Islamic University Malaysia, Pahang, Kuantan, Malaysia

[Show all information](#)

0

Citations

[Full text](#) [Export](#) [Save to list](#) [Document](#)[Impact](#)[Cited by \(0\)](#)[References \(69\)](#)[Similar documents](#)

## Abstract

The COVID-19 pandemic, originating from SARS-CoV-2 has threatened global health severely. The efforts to combat it involve extensive vaccine development using diverse methods including whole virus, protein-based, and nucleic acid (DNA and RNA) technologies. The mRNA vaccine, a notable advancement, gained emergency approval, signifying a significant milestone in nucleic acid vaccination. These vaccines aim to provide effective immunization against the virus, crucial in facing the pandemic's unprecedented global threat. This chapter reports a comprehensive literature review discussing how new technology of mRNA vaccine can be utilized in the manufacturing process of COVID-19 vaccines. The mRNA COVID-19 vaccines such as Pfizer-BioNTech's BNT162b2 and Moderna's mRNA-1273 have revolutionized the global pandemic response. They employ mRNA to instruct cells to generate immune responses. The mechanism involves mRNA encoding specific antigens, inducing robust immune responses against targeted diseases such as COVID-19. In terms of

formulation, mRNA utilizes lipid nanoparticles to enter the cells, initiating protein synthesis and immune responses, crucial for preventing disease onset. COVID-19 mRNA vaccine development, distribution strategies, production processes, and comparisons with other vaccine's technology were discussed comprehensively. Prioritization of vaccine distribution is generally given to health and social care workers, residents and staff of residential nursing homes for the elderly, and elderly people. In conclusion, mRNA plays an important role in rapidly developing COVID-19 vaccines. The reliability of data obtained to conduct the study was the limitation identified. However, to further develop understanding, research must extend beyond to explore more strategies to improve and optimize the mRNA technology. Adverse events identification should be continuously monitored and evaluated during the post-administration of mRNA vaccines. © The Author(s), under exclusive license to Springer Nature Switzerland AG 2026.

## Author keywords

COVID-19; Immune response; mRNA vaccine; Nucleic acid; Virus

## Corresponding authors

Corresponding  
author

M. Taher

Affiliation

Faculty of Pharmacy, Department of Pharmaceutical Technology,  
International Islamic University Malaysia, Pahang, Kuantan, Malaysia

Email address

mtaher@iium.edu.my

© Copyright 2026 Elsevier B.V., All rights reserved.

### Abstract

Author keywords

Corresponding authors

## About Scopus

[What is Scopus](#)