mRNA vaccine

The mRNA vaccine represents a groundbreaking innovation in vaccination technology, offering a novel approach to immunization against infectious diseases. Unlike traditional vaccines, which often use weakened or inactivated forms of viruses, mRNA vaccines utilize a small piece of genetic material called messenger RNA (mRNA) to instruct cells in the body to produce a protein that triggers an immune response.

mRNA vaccines have gained prominence due to their rapid development, industrial adaptability, simplicity, and responsiveness to new variants. Notably, the 2023 Nobel Prize in Physiology or Medicine recognized significant contributions to mRNA vaccine research.

A study employed a comprehensive bibliometric analysis using the Web of Science Core Collection (WoSCC) database, encompassing 5,512 papers on mRNA vaccines from 2003 to 2023. We generated cooperation maps, co-citation analyses, and keyword clustering to evaluate the field's developmental history and achievements.

Results: The analysis yielded knowledge maps highlighting countries/institutions, influential authors, frequently published and highly cited journals, and seminal references. Ongoing research hotspots encompass immune responses, stability enhancement, applications in cancer prevention and treatment, and combating infectious diseases using mRNA technology.

mRNA vaccines represent a transformative development in infectious disease prevention. This study provides insights into the field's growth and identifies key research priorities, facilitating advancements in vaccine technology and addressing future challenges ¹⁾

Effectiveness

mRNA vaccines have demonstrated high efficacy rates in preventing COVID-19 and other diseases they target. Clinical trials have shown mRNA vaccines to be over 90% effective in preventing symptomatic COVID-19 infection. However, the long-term effectiveness of mRNA vaccines against emerging variants remains a subject of ongoing research and surveillance. Safety:

While mRNA vaccines have been rigorously tested in clinical trials and have undergone thorough safety evaluations, there have been reports of adverse reactions, albeit rare, including allergic reactions and myocarditis. The rapid development and deployment of mRNA vaccines during the COVID-19 pandemic have raised concerns among some regarding potential unknown long-term side effects, although no significant safety issues have been identified to date.

Technology

The mRNA technology offers several advantages, including the ability to rapidly design and produce vaccines against new pathogens, as demonstrated by the swift development of mRNA COVID-19 vaccines. mRNA vaccines do not contain live virus, making them non-infectious and unable to cause

the disease they are designed to prevent. They also do not interact with a person's DNA or alter the genetic makeup of cells. Challenges:

Despite their promise, mRNA vaccines face challenges related to storage and distribution due to their requirement for ultra-cold temperatures, which can pose logistical hurdles, particularly in resourcelimited settings. Vaccine hesitancy and misinformation have also presented challenges to the widespread acceptance and uptake of mRNA vaccines, highlighting the importance of public education and communication efforts. Future Directions:

The success of mRNA vaccines in combating COVID-19 has spurred interest in their application to other infectious diseases, as well as potential use in cancer immunotherapy and other medical fields. Continued research into optimizing mRNA vaccine technology, addressing safety concerns, and expanding access to these vaccines globally will be essential for maximizing their impact on public health. In conclusion, mRNA vaccines represent a significant advancement in vaccination technology with the potential to revolutionize disease prevention and treatment. While their rapid development and deployment during the COVID-19 pandemic have showcased their efficacy, safety, and versatility, ongoing research and surveillance are necessary to address remaining challenges and unlock their full potential.

COVID-19 vaccination

COVID-19 vaccination

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Zhang C, Wang Y, Peng J, Wen X, Zhang Y, Li K, Du H, Hu X. Decoding trends in mRNA vaccine research: A comprehensive bibliometric study. Hum Vaccin Immunother. 2024 Dec 31;20(1):2355037. doi: 10.1080/21645515.2024.2355037. Epub 2024 May 30. PMID: 38813652.

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