

mRNA Technology Bolsters America's Innovation Leadership and National Security

AT A GLANCE:



The Big Picture:

Messenger RNA (mRNA) is a transformative platform technology, that once built, can be quickly adapted enabling the rapid development, testing and delivery of vaccines and treatments. It holds potential to address a wide range of challenges—from infectious diseases to cancer to rare conditions—and its speed, adaptability and versatility are reshaping how we prevent and treat illness.



Why It Matters:

U.S. leadership in mRNA drives innovation that saves lives, advances medical progress and strengthens national security. Rapid vaccine development protects Americans from emerging threats, while domestic expertise ensures the country maintains scientific independence and the ability to respond quickly to outbreaks.



What's At Stake:

Other nations, including China, are rapidly expanding mRNA research, scaling manufacturing and building expertise. Without sustained investment and commitment put towards mRNA, the U.S. risks losing its global edge and jeopardizing public health preparedness, economic competitiveness and strategic influence.

Sustaining U.S. leadership in mRNA is not just about prioritizing scientific advancement—it is a matter of national security, economic competitiveness and global health influence, ensuring that the U.S. remains at the forefront of innovation while safeguarding its citizens and strategic interests.

Few innovations carry as much scientific promise—and as much strategic importance—as mRNA. Building on decades of research, we have already seen how mRNA has provided a foundation as a flexible platform technology that can be used to develop, test and deliver lifesaving medicines in record time. Beyond infectious disease, scientists are now harnessing the mRNA platform to help address a wide range of urgent priorities—from preventing emerging bioterrorism threats to developing personalized therapies for cancer and rare conditions—ushering in a new era of medicine with transformative potential for patients and public health.

By unlocking a faster, more adaptable way to prevent and treat diseases, mRNA not only advances scientific discovery but also strengthens the nation's ability to protect its citizens, accelerate medical progress and maintain its position as a global leader in innovation. American leadership in mRNA has enhanced our ability to respond to health threats quickly, effectively and without dependence on other countries. At the same time, this leadership is increasingly challenged, as countries like China accelerate investment, expand manufacturing and seek to claim dominance in biotechnology, while the United States moves to scale back mRNA investment and increasingly faces regulatory hurdles that, in some cases, defy scientific consensus.¹

mRNA: A TRANSFORMATIVE TECHNOLOGY

mRNA is a molecule that provides the body with instructions to make proteins. While mRNA technology is newer to the market, scientists have been researching its innovative power since the 1960s. What makes the technology so unique and promising is that it's not just a single innovation—it's a platform that can harness technology to address new health challenges.² Instead of starting from scratch with every new disease, the "plug-and-play" flexibility of this platform allows researchers to adapt quickly and in turn bring vaccines and treatments to patients much faster than what was previously possible.

With decades of research as a foundation, scientists created a vaccine against COVID-19 that uses mRNA in 2020, rather than a weakened or dead pathogen, to teach the immune system to recognize and fight the virus when exposed.³

mRNA has already been used to protect against serious infections. Billions of mRNA vaccine doses have been given around the world, and the science has been thoroughly tested for safety, with vaccines using the technology having gone through rigorous clinical trials and regulatory review.⁴ Additionally, mRNA vaccine production is a highly controlled process and must comply with current Good Manufacturing Practices.



What makes the technology so unique and promising is that it's not just a single innovation—it's a platform that can harness technology to address new health challenges.²

BEHIND THE SCIENCE OF mRNA VACCINES

1



mRNA delivers temporary instructions to your cells, telling them how to make a harmless viral protein or a part of it.

2



Your immune system sees this protein and remembers it, creating antibodies that will fight off the virus if they encounter it.

3



mRNA breaks down and leaves the body a few days later—but the immunity or protection remains.



PROVIDING IMMUNITY WITH EFFICIENCY:

mRNA vaccines can be developed more rapidly than traditional vaccines. mRNA can be designed and mass produced in a matter of weeks versus months and even years for traditional vaccines—resulting in a technology platform that can be quickly mobilized in the wake of disease outbreaks and adapted to new viruses.

DECADES OF mRNA RESEARCH HAS SHAPED ADVANCES IN HUMAN HEALTH

1960s

Scientists first discovered mRNA.

- 1984 Biologists produce biologically active mRNA in the lab.
- 2005 Researchers publish the first paper demonstrating that modified mRNA can safely deliver instructions to human cells.
- 2013 The first clinical trial of an mRNA vaccine for an infectious disease is conducted (rabies in healthy adults).

2024-present

Scientists are exploring potential mRNA treatments and vaccines for cancers and other diseases and illnesses.

- 2023 Researchers are awarded the Nobel Prize for their work concerning nucleoside base modifications that enabled the development of effective mRNA vaccines against COVID-19.

REALITY CHECK:

mRNA vaccines do not change or interact with your DNA.⁵

The mRNA stays in the outer part of your cells and never enters the nucleus, where DNA lives. Within a matter of days, it quickly breaks down into harmless pieces and leaves the body—without touching or altering your genetic material while leaving behind immune memory protection.

UNLOCKING PROMISE THROUGH mRNA INNOVATION AND AMERICAN LEADERSHIP

For decades, U.S. scientists and researchers have been at the cutting-edge of mRNA research and development, shaping one of the most transformative breakthroughs in modern medicine. American-led innovation has consistently turned scientific promise into next-generation medicines.

mRNA helped change the trajectory of a major global health crisis—and its promise does not stop there. Because mRNA is an efficient and adaptable platform technology, it holds the potential to address some of the most serious—and in some cases, life-threatening—diseases and major public health challenges of our time. The platform can be rapidly adapted to address evolving health needs, whether that means tailoring a treatment to an individual patient or developing a vaccine to protect an entire population.⁶

Where mRNA Is Making a Difference



Genetic & Rare Diseases:

Cystic fibrosis, glycogen storage disease, primary ciliary dyskinesia



Cancer:

Lung cancer, melanoma, and solid tumors



Infectious Diseases:

Influenza, Epstein-Barr virus, Lyme disease, Mpx, RSV

mRNA POTENTIAL:

- **Next-generation oncology treatment:** Lung cancer is the leading cause of cancer death in the U.S.⁷ Early clinical trials for mRNA lung cancer vaccines have shown promising results for improving patient outcomes but also paving the way for other vaccines that could ultimately prevent cancers.⁸
- **Redefining rare disease:** In a phase 1/2 trial, an mRNA therapy has been shown to contribute to a 66% relative reduction in life-threatening events for patients with propionic acidemia, a rare inherited metabolic disease that can lead to challenges with eating and seizures, among other symptoms. Currently, the disease has limited treatment options.^{9,10}

Without sustained commitment to mRNA research, we risk leaving critical medical breakthroughs on the table.

mRNA LEADERSHIP STRENGTHENS NATIONAL SECURITY AND PREPAREDNESS

U.S. leadership in mRNA innovation is critical not only for advancing medical progress and public health, but also for bolstering national security. The United States has long been a global leader in scientific research and continued investment into breakthroughs—like mRNA technologies—is essential to maintaining that position. With competitors like China rapidly scaling mRNA research and development, the U.S. risks losing both scientific leadership and the strategic benefits of early innovation.

U.S. leadership in mRNA research and development is at risk.

- China's biotech sector is advancing rapidly, launching dozens of homegrown companies, investing significantly in new drug and technology development and the government has placed biotechnology as a strategic priority for the past 20 years.¹¹
- China now rivals the U.S. in clinical trial activity, leads the world in new patent filings and accounts for one-third of global licensing deal dollars—up from single digits just a few years ago.^{12,13}
- China is currently developing its own mRNA technologies and vaccines for non-COVID diseases including RSV, lymphoma and liver cancer.^{14,15,16}

Maintaining leadership in mRNA strengthens America's ability to protect its population and safeguard strategic interests in several key ways:

- **Enables rapid response to emerging threats.** The mRNA platform's adaptability allows vaccines and treatments to be developed and deployed efficiently, helping the U.S. contain outbreaks early, save lives and protect the economy and national security.¹⁷
- **Reduces dependence on foreign supply chains.** Strong domestic capacity in mRNA research, development and manufacturing helps ensure the U.S. can meet American health and security needs. It also reinforces the U.S. health care system, supports American jobs and enables the nation to scale production rapidly if demand increases.
- **Supports comprehensive public health preparedness.** mRNA can be applied to a wide range of health threats—from seasonal viruses to pandemics—providing the U.S. with unmatched ability to respond to emerging threats and ensuring the nation is best prepared to protect American public health and security.

Importantly, while the U.S. has demonstrated strong leadership in mRNA research, maintaining this advantage requires continued commitment, as other countries increasingly prioritize biotech innovation. China, in particular, has rapidly scaled its mRNA research in recent years, invested heavily in domestic manufacturing and pursued access to global scientific expertise—and other nations are following suit.¹⁸

Without sustained investment and dedicated focus and resources, the U.S. risks ceding its leadership, along with the public health, economic and national security advantages that come with it.

¹ <https://www.marketdataforecast.com/market-reports/mrna-market>

² <https://washingtondc.jhu.edu/news/5-things-to-know-about-mrna/>

³ <https://stories.tamu.edu/news/2021/04/12/what-is-mrna/>

⁴ <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines/advice>

⁵ <https://www.genome.gov/about-genomics/fact-sheets/Understanding-COVID-19-mRNA-Vaccines>

⁶ <https://washingtondc.jhu.edu/news/5-things-to-know-about-mrna/>

⁷ <https://www.cancer.org/cancer/types/lung-cancer/about/key-statistics.html>

⁸ <https://pubmed.ncbi.nlm.nih.gov/39957693/>

⁹ <https://www.fiercebiotech.com/biotech/moderna-looking-past-vaccines-guides-first-mrna-protein-replacement-therapy-past-early>

¹⁰ <https://rarediseases.org/rare-diseases/propionic-acidemia/>

¹¹ <https://itif.org/publications/2024/07/30/how-innovative-is-china-in-biotechnology/>

¹² <https://www.biopharmadive.com/news/china-biotech-drug-deals-pfizer-bourla-comments/756880/>

¹³ <https://ourworldindata.org/data-insights/china-is-the-largest-contributor-to-global-patent-applications-substantially-ahead-of-other-countries>

¹⁴ <https://firstwordpharma.com/story/6060834>

¹⁵ <https://www.clinicaltrials.gov/study/NCT06788600>

¹⁶ <https://clinicaltrials.gov/study/NCT07053072>

¹⁷ <https://washingtondc.jhu.edu/news/5-things-to-know-about-mrna/>

¹⁸ <https://www.marketdataforecast.com/market-reports/mrna-market>