

Roadmap sets out new global strategy for development of more effective coronavirus vaccines

February 21 2023



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A global strategy is launched today to coordinate the complex research activities necessary for a new approach to coronavirus vaccine development. The aim is to develop more effective, longer lasting

vaccines against continually emerging SARS-CoV-2 variants, and against new coronaviruses that may emerge in the future.

The Coronavirus Vaccines Research and Development Roadmap (CVR) is led by the US Center for Infectious Disease Research and Policy (CIDRAP) at the University of Minnesota. It is the product of an international collaboration of 50 scientific experts from around the world, who forged a unified strategy to make these critically needed vaccines a reality.

"The response of the scientific and medical communities to the development and delivery of COVID-19 vaccines has been incredible, but as new variants emerge and immunity begins to wane we need newer technologies. It's vital that we continue to develop [vaccine](#) candidates to help keep us safe from the next virus threats," said Professor Jonathan Heeney, Head of the Lab of Viral Zoonotics at the University of Cambridge and advisor on the international CVR Taskforce.

Heeney, who is also a Fellow at Darwin College, Cambridge, is leading an ongoing clinical trial to evaluate an innovative coronavirus vaccine he developed at the University of Cambridge and spin-out company DIOSynVax. Administered needle-free using a blast of air, the vaccine primes the [immune system](#) to give a broader protective response to coronaviruses and is a step towards developing a future-proofed coronavirus vaccine.

"The COVID-19 pandemic marks the third time in just twenty years that a coronavirus has emerged to cause a public health crisis," said Michael T. Osterholm, Ph.D., MPH, CIDRAP director, University of Minnesota Regents Professor and McKnight Presidential Endowed Chair in Public Health.

He added, "The COVID-19 pandemic taught us the hard lesson that we

must be better prepared. Rather than waiting for a fourth coronavirus to emerge—or for the arrival of an especially dangerous SARS-CoV-2 variant—we must act now to develop better, longer lasting and more broadly protective vaccines. If we wait for the next event to happen before we act, we will be too late."

The emergence of SARS-CoV-2 in 2019 was preceded by an epidemic in 2003 caused by a different coronavirus called SARS-CoV. Then, in 2012, the Middle East respiratory syndrome coronavirus, or MERS-CoV, emerged. Coronaviruses can carry a high risk of death: for MERS-CoV, about one third of infections result in death, and approximately one in ten for SARS-CoV, although neither spreads easily from person to person.

In contrast, SARS-CoV-2, the virus that caused the COVID-19 pandemic, has a much lower fatality rate, but because it is so highly infectious between people, it had caused worldwide more than 650 million confirmed cases and 6.6 million deaths by the end of 2022. Even more concerning is the threat of a new coronavirus in the future that could be both highly transmissible and highly lethal. In addition, the emergence of new SARS-CoV-2 variants may further jeopardize the significant protection provided by current vaccines against severe disease and death.

The CVR confronts these extraordinary threats with a detailed, comprehensive and coordinated plan to accelerate the development of long-lasting, broadly protective coronavirus vaccines capable of preventing severe disease and death, and potentially protect against infection and transmission. The CVR further emphasizes the goal that future broadly protective vaccines must be suitable for all regions worldwide, including remote areas and low- and middle-income countries.

The report highlights different paths to success. One approach could involve a stepwise process, starting with vaccines to protect against variants of SARS-CoV-2. Another approach could focus on vaccines capable of protecting against multiple types of coronaviruses, including those likely to spill over from animals to humans in the future.

The CVR summarizes key barriers and gaps and outlines specific goals and milestones for advancing broadly protective coronavirus vaccines. The work is organized into five topic areas:

- **Virology.** Developing broadly protective coronavirus vaccines requires learning more about the global distribution of coronaviruses circulating in animal reservoirs that have the potential to spill over to humans.
- **Immunology.** Scientists need to learn more about human immunology, including research that will expand the breadth and durability of immune protection from vaccines and natural infection. Improved understanding of mucosal immunity may unlock new strategies to block infection.
- **Vaccinology.** Identifying key preferred product characteristics will inform priorities and strategies for vaccine R&D and accelerate discovery. Leveraging new technologies and identifying the best methods to assess vaccine efficacy will further catalyze critical advancements.
- **Animal and human infection models for vaccine research.** The limited availability of a range suitable animal models is a key barrier to developing broadly protective coronavirus vaccines. Additionally, work is needed to explore the potential role for the safe and effective use of controlled human infection models in coronavirus vaccine research.
- **Policy and financing.** The successful development and global distribution of broadly protective coronavirus vaccines will require reinvigorating and sustaining a high level of political

commitment and long-term investment in vaccine R&D and manufacturing.

"The vaccines that we currently have for COVID-19 are the most important tool that we have in our battle against the pandemic," said Charlie Weller, Ph.D., Head of Prevention, Infectious Diseases, at the Wellcome Trust.

"But we can do better—by developing vaccines that give us broader protection—protection against new variants, protection from coronaviruses that have not yet emerged but might cause the next pandemic. We can discover new ways to deliver vaccines, such as skin patches or intranasal vaccines—and maybe even vaccines that could block transmission. This roadmap creates the structured plan that will give us the tools we need to better protect ourselves, our families and our communities around the world."

The study is published in the journal *Vaccine*.

More information: Kristine A. Moore et al, A Research and Development (R&D) Roadmap for Broadly Protective Coronavirus Vaccines: A Pandemic Preparedness Strategy, *Vaccine* (2023). [DOI: 10.1016/j.vaccine.2023.02.032](https://doi.org/10.1016/j.vaccine.2023.02.032)

Provided by University of Cambridge

Citation: Roadmap sets out new global strategy for development of more effective coronavirus vaccines (2023, February 21) retrieved 26 April 2024 from <https://medicalxpress.com/news/2023-02-roadmap-global-strategy-effective-coronavirus.html>

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