

We Have Cutting-Edge Science to Make Vaccines, but Will Everyone Benefit?

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By Barney Graham

Dr. Graham helped develop the Covid-19 vaccines while at the National Institutes of Health.

As a physician-scientist who has spent nearly 40 years studying viruses and immunity, I can speak to the scientific advances that made rapid Covid-19 vaccine development possible. I oversaw the work at the National Institutes of Health's Vaccine Research Center that provided the basis for designing and evaluating the initial Covid-19 vaccines and antibodies.

If anything about the pandemic is remembered as positive, it will be how science was applied to rapidly produce medical countermeasures.

But despite the scientific successes, I have doubts about our ability to deal with the next pandemic threat as readily as we dealt with Covid-19 — even if it is a better-known virus like influenza. Case in point, we had a monkeypox vaccine and antiviral drug before that recent outbreak, but by the time they were deployed, thousands of people were infected.

We have entered a new era of vaccine science, but can we apply our extraordinary technical capabilities toward the goal of improving public health?

My time as a researcher has encompassed both the long history of vaccine research and the race to develop a vaccine for Covid-19. Some people expressed concern that the Covid-19 vaccine development process was too fast, but the story can be told as either a one-year sprint or a 40-year story of scientific advances.

The scientific process is, after all, incremental, and new advances build on many prior discoveries. Ultimately, the process is intended to achieve a better approximation of the truth. In biology, I think of it as looking through a dark glass and peeling back layer after layer, gradually revealing the underlying reality. In that sense, science is a faith exercise because it is searching for evidence of things unseen. Scientists imagine what could be true and then invent approaches to show whether what we envisioned is right.

Over the past 15 years, technologies have emerged that have taken us through several more of these layers of understanding in biology, vaccines and immunity. The precision with which we can see structures of proteins — the building blocks that allow cells and viruses to function — and measure immune responses is stunning.

The time from when the SARS-CoV-2 genome sequences were available to when the first vaccines were authorized and injected into humans was about 11 months. Typically, vaccine development is measured in decades.

Forty years of research into how to make an H.I.V. vaccine helped make rapid Covid-19 vaccine development feasible. These tools and others led to breakthroughs that directly informed Covid-19 vaccine development in 2020.

Still, I am concerned that our social order and national and global governance systems are not keeping pace. Having next-generation vaccine technology without adequate systems for implementation and distribution to all people is a waste.

We can be much more prepared to predict or avoid future pandemics, but we must be more intentional. This includes building better systems for local and global pandemic response coordination and making long-term investment in basic research to generate the information needed to develop vaccines, antivirals and diagnostics. There should be a much more comprehensive global surveillance program in areas with high biodiversity to identify emerging threats earlier.

And leaders of high-income countries must understand that it's in their best interest to facilitate and build the capacity for vaccine research and manufacturing in low- and middle-income countries. There is an opportunity, with the advent of mRNA, to establish the capability for local scientists to find solutions for regional diseases before they become global threats. This would also provide much-needed surge capacity during public health emergencies of international concern.

The global community needs to build the capacity to immunize everyone around the world in six months during a pandemic. Failure to do so in the Covid pandemic is part of the reason we suffered through successive waves of new variants. This will require cooperative effort on the part of governments, philanthropists, academic institutions, nonprofit organizations and privately held companies.

I retired from the federal government in 2021 after more than two decades of service. While my career has been focused on the biology of viruses and immunity, the pandemic revealed disabling problems related to vaccine access and trust. Therefore, I decided to join the faculty at Morehouse School of Medicine in Atlanta to be a senior adviser for global health equity. I chose Morehouse School of Medicine, one of the United States' historically Black medical colleges, because health equity is an integral part of its mission. It's well positioned to influence vaccine access through advocacy, policy reform and the creation of a new generation of global health experts. It's also an ideal place to work on building trust in science by involving more diverse investigators in discovery and achieving a deeper public understanding of biology.

We just lived through the deadliest pandemic in a century. It's prudent to consider what has happened, learn from it and decide how the world — and our part in it — should operate.

Millions of lives and trillions of dollars were lost. Health and wealth disparities widened. Biology became politicized. We are left with the burdens of long Covid and a mental health crisis. I was inspired by the effort and sacrifices made by health care providers and essential workers to keep us going, and I am hopeful because amid the despair and uncertainty I saw many acts of caring and generosity.

In 1896, William Osler, a founder of Johns Hopkins Hospital, wrote, "Humanity has but three great enemies: fever, famine and war; of these by far the greatest, by far the most terrible, is fever." We now have technologies that give us a chance to better prepare, manage and possibly avoid future pandemic threats.

In today's world, infectious diseases can spread around the globe in a matter of hours. A problem anywhere is a potential problem everywhere, and it is in everyone's best interest to recognize and solve regional problems before they become global ones. It will take all of us, using all the talent and resources we have, working together to avert the tragedy of other pandemics.

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Have a question? Reach us at next-pandemic@nytimes.com.
