

Nobel Prize awarded to pioneering mRNA scientists who helped develop COVID vaccines

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The awarding of the Nobel Prize in Physiology or Medicine jointly to Katalin Karikó and Drew Weissman is justly deserved. Through a years-long collaboration at the University of Pennsylvania beginning in 1997, Karikó and Weissman conducted pioneering research that made possible the rapid creation of anti-COVID mRNA vaccines in 2020, which saved the lives of millions of people globally.

The awarding of the Nobel Prize to these scientists has all the more significance in that it takes place under conditions of a vast right-wing anti-science campaign, targeting mRNA vaccines in particular.

The great breakthrough of Karikó and Weissman was their discovery of the nucleoside modifications in mRNA required to produce a safe immune response. Their findings, initially published in 2005, fundamentally changed the scientific understanding of how cells recognize and respond to different types of mRNA.

In their decades of research, both Karikó and Weissman persevered through numerous challenges and skepticism from peers. Born in Hungary in 1955, Karikó emigrated to the United States in 1985 with her husband and two-year-old daughter. She soon developed a passion for mRNA research, working nights and weekends, but struggled for decades to obtain grants or a tenured position. Weissman, well known in his field as a brilliant scientist, understood the potential of mRNA technology when paired with his own insights into immunology and the role of dendritic cells.

As with all of mankind's scientific and cultural achievements, the work done by Karikó and Weissman is the product of vast collective labors by scientists throughout the globe.

Among the great milestones in this process are included the pioneering work on evolution by Charles Darwin and trait inheritance by Gregor Johann Mendel in the mid-1800s, the isolation of nucleic acid by Swiss chemist Friedrich Miescher in 1869, the description of nucleic acid's organic compounds by German biochemist Albrecht Kossel in 1910, the development of biochemistry by Oswald Avery and Erwin Chargaff in the 1940s, the breakthroughs in the science of DNA by James Watson, Francis Crick and Rosalind Franklin in the 1950s, the discovery of mRNA by multiple groups of scientists in 1961, and the increasingly rapid developments in genetics and biological sciences since the 1970s involving the collective work of thousands of scientists.

Karikó and Weissman's 2005 paper, as well as further critical discoveries they published in 2008 and 2010, were met with near-total silence in the scientific community. In 2013, denied funding from the University of Pennsylvania, Karikó co-founded BioNTech. The company began to pursue an mRNA influenza vaccine in 2019, which

was superseded by the outbreak of the COVID-19 pandemic in China in December that year.

As with many other examples of crises accelerating medical, technological and scientific development, the pandemic emergency created the impulse to act on research that had long been in progress. The old proverb, "Necessity is the mother of invention," was proven once again.

Shortly after the initial spillover of SARS-CoV-2 at a wet market in Wuhan, China, the virus was sequenced and its genome was made publicly available on January 11, 2020. Within days, both Pfizer-BioNTech and Moderna had developed prototype mRNA vaccines that were soon entering clinical trials. These unprecedented speeds were made possible by the prior research of Karikó, Weissman and other scientists.

On December 11, 2020, the Pfizer-BioNTech mRNA vaccine was granted Emergency Use Authorization by the US Food and Drug Administration (FDA), followed by the Moderna mRNA vaccine one week later. In the nearly three years since the approval of these and other vaccines, over 13.4 billion doses have been safely administered worldwide.

The life-saving effects of the vaccines are undeniable, underscoring this historic achievement of modern science. A study published in June 2022 found that from December 8, 2020 to December 8, 2021, COVID-19 vaccines prevented an additional 14.4 to 19.8 million deaths throughout the world. In the subsequent two years, millions more lives have been saved, while tens of millions of people globally have avoided being hospitalized due to COVID-19.

However, the rollout of anti-COVID vaccines was immediately constrained by the anarchic character of the profit-driven capitalist market. Instead of the rapid building of production and distribution networks on each continent, nations were pitted against each other in bidding wars for access to limited supplies of vaccines, while the pharmaceutical monopolies engaged in the most egregious pandemic profiteering. Moderna's NASDAQ share price went from \$20 in January 2020 to a peak of \$484 in August 2021, a 24-fold increase, with top shareholders amassing billions.

To this day, vaccine inequality persists, with billions of people in less developed countries, and even in wealthier countries such as Australia, denied access to the latest updated booster shots. Roughly 2.4 billion people remain entirely unvaccinated, primarily in the world's poorest countries. While 66.4 percent of the population in high-income countries have received at least one booster dose, only 4 percent of the population in low-income countries have been boosted.

Furthermore, the rollout of the vaccines was accompanied by false claims that the vaccines were a “magic bullet” that would end the pandemic by themselves. These claims were quickly upended, first by the Delta variant, then by successive waves of Omicron variants. Detached from a broader strategy utilizing all available public health measures to swiftly eliminate SARS-CoV-2 globally, the vaccines soon became less effective in the face of rampant viral transmission and evolution.

The “vaccine-only” strategy, official policy throughout the world since 2021, has resolutely failed. There are now an estimated 28 million excess deaths attributable to the pandemic, while hundreds of millions of people are suffering from Long COVID throughout the world.

The primary benefits of the mRNA vaccines are that they are scalable, fast to produce, and flexible, but this potential to match new variants of SARS-CoV-2 has in no way been realized. Nearly three years after the initial vaccines were designed, during which most countries have experienced mass infection with eight or more different variants that have become dominant, the mRNA vaccines have only been updated twice and made available long after the variants for which they were designed have receded from the viral landscape.

The sluggish rollout of updated boosters is solely the product of the capitalist market, as the manufacturers have calculated that no additional profits could be made.

At the same time, significant sections of the ruling class have utilized the social and economic crisis triggered by the pandemic to unleash savage anti-vaccine disinformation campaigns aimed at cultivating far-right and fascist forces. These have been propagated *en masse* through social media, with the support of billionaires like Elon Musk.

Much of this propaganda has centered on mRNA vaccines, which have become the fixation of right-wing populist and anti-science fear-mongering. Millions of people have been misled into believing that a vast conspiracy exists to kill them and their children with mRNA vaccines, which supposedly involve “gene therapy,” and that quack cures like hydroxychloroquine and ivermectin are all they need.

This anti-vaccine pseudoscience has been thrust from obscurity into mainstream politics. Robert F. Kennedy, Jr., long derided as a fringe conspiracy theorist peddling the lie that vaccines cause autism, is now a contender for US president in the 2024 elections. Funding for his anti-vaccine organization, Children’s Health Defense, skyrocketed from \$1.1 million in 2018 to \$15.7 million in 2021, while similar anti-vaccine groups have seen massive infusions of cash.

In the US, Germany and countries throughout the world, this has been closely associated with a resurgence of antisemitism and other forms of reactionary politics. These fascist forces have been whipped into a frenzy, targeting principled scientists like Drs. Peter Hotez, Peter Daszak and many others, always with a vicious antisemitic and anti-socialist subtext.

In fact, the COVID denial and anti-vaccine movement plays as large a role in contemporary fascist politics as antisemitism did in the 1920s and 1930s, with striking similarities to the Nazi campaign against “Jewish physics.”

In June 1933, just months after Hitler’s rise to power in Germany, Leon Trotsky, the great co-leader of the Russian Revolution, called attention to the fact that even in an age of rapid technological development, the most backward conceptions can flourish. Commenting on this contradiction between scientific advance and social backwardness amid the death agony of capitalism, Trotsky

wrote:

Today, not only in peasant homes but also in city skyscrapers, there lives alongside of the twentieth century the tenth or the thirteenth. A hundred million people use electricity and still believe in the magic power of signs and exorcisms. The Pope of Rome broadcasts over the radio about the miraculous transformation of water into wine. Movie stars go to mediums. Aviators who pilot miraculous mechanisms created by man’s genius wear amulets on their sweaters. What inexhaustible reserves they possess of darkness, ignorance, and savagery!

One of the peculiar elements of the present period is that mankind’s vast technological advances are not understood by a significant section of the population, who have been deprived of an elementary understanding of the scientific method. The capitalist ruling elites prey upon and cultivate fear and ignorance.

Nevertheless, the force of human progress is far greater, to the extent that science becomes rooted in the working class. Mankind’s scientific achievements are inexhaustible and all of the problems we confront can be overcome. The great barrier is the existing social relations, based on private ownership of the means of production and the division of the world into rival nation-states.

The conflict with anti-vaccine elements is not a debate within the scientific community. It is a struggle of genuine scientists and all representatives of progressive thought against ignorance, fear, cultural backwardness and the most dangerous forms of contemporary political reaction.

The Marxist attitude to scientific advance and innovation is infused with confidence in human progress. The vast potential of mRNA technology itself is only beginning to emerge. A May 2022 report in *Nature* noted, “mRNA-based therapeutics are expected to become a powerful therapy for a variety of refractory diseases, including infectious diseases, metabolic genetic diseases, cancer, cardiovascular and cerebrovascular diseases, and other diseases.”

The full blossoming of this potential, alongside the flowering of every scientific discipline, requires the socialist reorganization of the global economy and society as a whole. Pfizer, Moderna and all other pharmaceutical giants must be internationalized and retooled to provide free treatments for all. The trillions squandered on war and the financial oligarchy must be seized and reallocated to provide for social needs--above all, public health, reversing climate change and guaranteeing high quality education and living standards to all of humanity.



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