COVID 19 Vaccine Development: Timelines & Present Status

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A COVID-19 vaccine is a vaccine intended to provide acquired immunity against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes coronavirus disease 2019 (COVID-19).

SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), the virus that causes COVID-19, was isolated in late 2019.[1] Its genetic sequence was published on 11 January 2020, triggering an urgent international response to prepare for an outbreak and has not the development of a preventive COVID-19 vaccine.[2,3] Since 2020, vaccine development has been expedited via unprecedented collaboration in the multinational pharmaceutical industry and between governments. By June 2020, tens of billions of dollars were invested by corporations, governments, international health organizations, and university research groups to develop dozens of vaccine candidates and prepare for global vaccination programs to immunize against COVID-19 infection.[3,4] According to the Coalition for Epidemic Preparedness Innovations (CEPI), the geographic distribution of COVID-19 vaccine development shows North American entities to have about 40% of the activity, compared to 30% in Asia and Australia, 26% in Europe, and a few projects in South America and Africa.[2]

In February 2020, the World Health Organization (WHO) said it did not expect a vaccine against SARS-CoV-2 to become available in less than 18 months.[5] Virologist Paul Off it commented that, in hindsight, the development of a safe and effective vaccine within 11 months was a remarkable feat.[6] The rapidly growing infection rate of COVID-19 worldwide during 2020 stimulated international alliances and government efforts to urgently organize resources to make multiple vaccines on shortened timelines,[7] with four vaccine candidates entering human evaluation in March.[2,8]

On 24 June 2020, China approved the CanSino vaccine for limited use in the military and two inactivated virus vaccines for emergency use in high-risk occupations.[9] On 11 August 2020, Russia announced the approval of its Sputnik V vaccine for emergency use, though one month later only small amounts of the vaccine had been distributed for use outside of the phase 3 trial.[10]

The Pfizer–BioNTech partnership submitted an Emergency Use Authorization (EUA) request to the U.S. Food and Drug Administration (FDA) for the mRNA vaccine on 20 November 2020.[11] On 2 December 2020, the United Kingdom's Medicines and Healthcare products Regulatory Agency (MHRA) gave temporary regulatory approval for the Pfizer–BioNTech vaccine,[12] becoming the first country to approve the vaccine and the first country in the Western world to approve the use of any COVID-19 vaccine.[13] As of 21 December 2020, many countries and the European Union[14] had authorized or approved the Pfizer–BioNTech COVID-19 vaccine. Bahrain and the United Arab Emirates granted emergency marketing authorization for the Sinopharm BIBP vaccine.[15,16] On 11 December 2020, the FDA granted an EUA for the Pfizer–BioNTech COVID-19 vaccine[17]. A week later, they granted an EUA for mRNA-1273 (active ingredient elasomeran), the Moderna vaccine.[18]

On 31 March 2021, the Russian government announced that they had registered the first COVID-19 vaccine for animals.[19] Named Carnivac-Cov, it is an inactivated vaccine for carnivorous animals, including pets, aimed at preventing mutations that occur during the interspecies transmission of SARS-CoV-2.[20]

According to last data from WHO on December 17, 2021, 137 vaccine candidates are undergoing human clinical trials worldwide and 194 vaccine candidates are in the preclinical development stage. Of these, at least six COVID-19 vaccine trials have reported very promising provisional results and a total of 8,387,658,165 vaccine doses have been administered.[21] In this context, a variety of platform technologies have been employed by various research groups to make notable advances in developing vaccines in a short time. These vaccine platforms are ranging from virus-based (live attenuated and inactivated) and protein-based (subunit and virus-like particle) to novel gene-based and nano-based strategies.

Hopefully within short time several effective vaccines will be developed and the devastating pandemic will be under controlled.

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