
















Cheat Sheet: COVID-19 vaccine pipeline

Primary sponsor(s)	Description	Platform	Funders	Status	Considerations
	Comirnaty <i>mRNA that encodes for SARS-CoV-2 spike protein.</i> 	mRNA 	Pfizer (\$500M) USG (\$1.9M) Warp Speed Finalist COVAX Portfolio	Authorization: EUA in 46 countries and EU; WHO Emergency Validation; Authorized for 12-15 year-olds in US Approval: Bahrain, Brazil, New Zealand, Saudi Arabia, Switzerland Ph. I/II/III (ongoing): US (6 months to 11 years) Ph. I/II (ongoing): Germany Ph. II (ongoing): Various locations and populations Ph. II/III (ongoing): Various locations and populations Ph. III (ongoing): Various locations and populations	Efficacy: Updated analysis shows that the vaccine is highly effective with an efficacy of 91.3% in participants aged 16 and older. The vaccine was also highly effective (100%) in adolescents 12 to 15 years of age based on topline results from a Ph. III trial. Manufacturing/delivery: mRNA vaccines are relatively easy to scale and manufacture. Platform history: No previous mRNA vaccines licensed for use.
	mRNA-1273 <i>Synthetic messenger RNA that encodes for SARS-CoV-2 spike protein.</i> 	mRNA 	USG (\$2.48B) CEPI/GAVI (Undisclosed) Warp Speed Finalist COVAX Portfolio	Authorization: EUA in 21 countries and EU; WHO Emergency Validation Approval: Switzerland Ph. I (ongoing): US Ph. II (ongoing): Various locations Ph. II/III (ongoing): Various populations in the US Ph. III (ongoing): Various populations	Efficacy: Interim analysis shows that the candidate was safe and well-tolerated with an efficacy rate of 94.5%. Manufacturing/delivery: mRNA vaccines are relatively easy to scale and manufacture; likely to require two doses, but a third may be necessary. Platform history: No previous mRNA vaccines licensed for use.
	Vaxzevria <i>Chimpanzee Adeno vector expressing SARS-CoV-2 spike protein.</i> 	Viral vector 	USG (\$1.2B) CEPI/GAVI (\$750M) EU (\$923M) Warp Speed* Finalist COVAX** Portfolio	Authorization: EUA in 76 countries and EU; WHO Emergency Validation, Endorsed by the Africa Regulatory Taskforce Approval: Brazil Ph. I/II (ongoing): Various locations Ph. II/III (ongoing): Various locations Ph. III (ongoing): Various locations	Efficacy: Ph. III interim analysis shows vaccine was safe and well-tolerated, efficacy averaged 70.4% (62 - 90% depending on dose); <25% efficacy against mild to moderate illness in South Africa. Manufacturing/delivery: Adeno vector vaccines can be manufactured quickly and at scale (capacity to produce 2B doses has been secured). Platform history: Vaccine utilizing the Ad26 platform (Ad26.ZEBOV) has been approved for use against Ebola Virus Disease.
	JNJ-78436735 <i>Ad26 vector expressing SARS-CoV-2 spike protein.</i> 	Viral vector 	J&J investment (~\$500M) USG (\$1.45B) Warp Speed Finalist COVAX Portfolio	Authorization: EUA in 17 countries and EU; WHO Emergency Validation, Endorsed by the Africa Regulatory Taskforce Approval: None Stopped use: Denmark, Finland Ph. I (ongoing): Various locations Ph. I/II (ongoing): Various locations Ph. III (ongoing): Various locations (pregnant women)	Efficacy: Initial results show that the vaccine has an efficacy of 72% in the US, 64 percent in South Africa and 61% in Latin America. Manufacturing/delivery: Product does not need to be stored at subzero temperatures, and it may require just a single dose. Platform history: Utilizes the same technology used to make its Ebola vaccine, which was granted European regulatory approval in May 2020.
	BBIBP-CorV x 2 	Whole inactivated 	No Funding Disclosed	Authorization: EUA in 22 countries; WHO Emergency Validation Approval: Bahrain, China, UAE Ph. I/II (ongoing): China Ph. III (ongoing): Various locations	Efficacy: Ph. III interim analysis showed an efficacy of 86%. Manufacturing/delivery: Inactivated vaccines may require booster doses; relatively shelf-stable compared to other platforms. Platform history: Numerous whole inactivated vaccines, including polio, Hep A and rabies.


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The COVID-19 vaccine pipeline 'Cheat Sheet' reflects front-runner candidates along with products with significant investments from the USG, CEPI and the ACT-A COVAX pillar.

Cold Chain Considerations




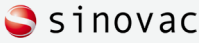

















 Refrigeration (2-80 C)
  Freezer (-20 C)
  Deep Freeze (-70 C)

Doses










 Anticipated number of doses

Emergency Use Authorization:







A regulatory mechanism to facilitate the availability and use of unapproved medical products, including vaccines, during public health emergencies.

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Gamaleya Research Institute 	Sputnik V Combination Ad5 and Ad26 vector expressing the SARS-CoV-2 spike glycoprotein 	Viral vector 	Ministry of Health- Russia	Authorization: EUA in 69 countries; Early/limited use in Belarus, Russia Approval: None Ph. I/II (complete): Russia Ph. II/III (ongoing): India Ph. III (ongoing): Russia Ph. III (planned): Various locations	Efficacy: Ph. III analysis shows vaccine was safe and well-tolerated; efficacy averaged 91.4% and >90% in individuals over 60. Manufacturing/delivery: Adeno vector vaccines can be manufactured quickly and at scale (Russia has orders for 1.2 billion doses from 50 countries). Platform history: Vaccine utilizing the Ad26 platform (Ad26.ZEBOV) has been approved for use against Ebola Virus Disease.
Sinovac Biotech 	CoronaVac 	Whole inactivated 	No Funding Disclosed	Authorization: Brazil, Colombia, +21 Approval: China Ph. I/II (ongoing): China Ph. III (ongoing): Various locations and populations	Efficacy: Varying reports of efficacy reported, ranging from just over 50 percent in Brazil to 91 percent in Turkey. Manufacturing/delivery: Inactivated vaccines may require booster doses; relatively shelf-stable compared to other platforms. Platform history: Numerous whole inactivated vaccines, including polio, Hep A, and rabies.
Bharat Biotech/ Indian Council of Medical Research 	Covaxin 	Whole inactivated 	No funding disclosed	Authorization: EUA in India, Iran, Mauritius, +9 Approval: None Ph. I/II (ongoing): India Ph. III (ongoing): India	Efficacy: Early analysis of Ph. III data show that the vaccine is safe, with an efficacy of 80.6%. Manufacturing/delivery: Inactivated vaccines may require booster doses; relatively shelf-stable compared to other platforms. Covaxin is stable at room temperature for at least a week. Platform history: Numerous whole inactivated vaccines, including polio, Hep A and rabies.
CanSino Biologics 	Convidecia Ad5 vector expressing SARS-CoV-2 spike glycoprotein. 	Viral vector 	No funding disclosed.	Authorization: Chile, Mexico, +3 Approval: China Ph. I (complete): China Ph. II (ongoing): China Ph. III (ongoing): Various locations	Efficacy: Early analysis of Ph. III data show that the vaccine is safe, with an efficacy of 80.6%. Manufacturing/delivery: TBC. Platform history: Vaccine utilizing the Ad26 platform (Ad26.ZEBOV) has been approved for use against Ebola Virus Disease.
Novavax 	NVX-COV2373 Full-length recombinant SARS-CoV-2 glycoprotein nanoparticle vaccine adjuvanted with Matrix M. 	Protein Subunit 	CEPI (\$388M) USG (\$1.6B) Warp Speed Finalist COVAX Portfolio	Ph. I (ongoing): Australia Ph. II (ongoing): South Africa Ph. III (ongoing): Various locations	Efficacy: Interim analysis shows that the candidate had an efficacy of nearly 90% in the UK, but only 50% in South Africa against the variant B.1.351. Manufacturing/delivery: GMP production initiated with capacity for large-scale manufacturing (est. 1B doses by end of 2021). Platform history: The same nanoparticle platform succeeded in a Ph. III trial for NanoFlu, an influenza vaccine for older adults.
Inovio 	INO-4800 DNA plasmid vaccine with electroporation. 	DNA 	CEPI (\$17.2M) BMGF (\$5M) USG (\$83M) COVAX Portfolio	Ph. I (ongoing): US Ph. II/III (ongoing): Various locations	Immunogenicity: Preliminary Ph. I data shows antibody and cellular immune responses. Manufacturing/delivery: INO-4800 is stable at room temperature for more than a year and is not required to be frozen in transport or storage. Platform history: No licensed DNA vaccines for use in humans.
CureVac 	CVnCoV mRNA vaccine that encodes for the spike protein formulated with lipid nanoparticles. 	mRNA 	CEPI (\$8.3M) EU (\$421M) USG. (Undisclosed) COVAX Portfolio	Ph. I (ongoing): Various locations Ph. II (ongoing): Various locations Ph. II/III (ongoing): Germany Ph. III (ongoing): Germany	Immunogenicity: TBC. Manufacturing/delivery: mRNA vaccines are relatively easy to scale and manufacture. Platform history: No previously licensed mRNA vaccines.

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Primary sponsor(s)	Description	Platform	Funders	Status	Considerations
Imperial College 	<i>Synthetic self-amplifying RNA producing SARS-CoV-2 spike protein.</i> 	Self-amplifying RNA 	UK (\$50.7M) Philanthropies (\$6.2M)	Ph. I/II (ongoing): UK Ph. III (planned): UK PRODUCT BEING REFORMULATED TO ADDRESS VARIANTS	Immunogenicity: TBC. Manufacturing/delivery: Imperial College created a special-purpose company to sell the vaccine (VacEquity) at lowest possible cost in UK and LMICs. Platform history: No licensed self-amplifying RNA vaccines.
Sanofi / GSK 	<i>DNA from the surface protein of the SARS-CoV-2 virus is inserted into insect cells, which express antigen that is then purified and combined with GSK's pandemic AS03 adjuvant.</i> 	Subunit 	USG (\$2.1B) <i>Warp Speed Finalist</i>	Ph. I (ongoing): US Ph. III (planned): Various locations (delayed)	Immunogenicity: Interim results showed insufficient response in older adults; Sanofi refining antigen concentration to address. Manufacturing/delivery: The adjuvant system is designed to boost the immune response and allow less to be used per dose. GSK will manufacture 1B doses of its adjuvant system in 2021. Platform history: Same platform as vaccine candidates for Influenza, SARS-CoV (FDA approve).
Clover BioPharma / GSK 	SCB-2019 <i>A trimeric subunit spike protein developed by China-based Clover, delivered alongside an adjuvant.</i> 	Subunit 	CEPI (\$3.5M)	Ph. I ongoing: 150/Australia Ph. II/III planned	Immunogenicity: In preclinical studies, adjuvanted SCB-2019 induced neutralising antibodies in animals. Manufacturing/delivery: The adjuvant system is designed to boost the immune response and allow less to be used per dose, potentially allowing more doses to be supplied. GSK will manufacture 1B doses of its adjuvant system in 2021. Platform history: TBC.

Refresher on vaccine platforms

Platform	About	Licensed products	Learn more
Inactivated	 <p>Inactivated vaccines consist of the whole virus, which has been killed with heat or chemicals so that it can't cause illness. In general, inactivated virus vaccines do not provide as strong of an immune response as live attenuated vaccines, so additional doses may be needed.</p>	Polio	Inactivated viral vaccines
Live attenuated	 <p>Live attenuated vaccines are made up of whole viruses that have been weakened in a lab (usually through culturing). They tend to elicit a stronger immune response than inactivated vaccines.</p>	MMR Varicella TB	Live attenuated vaccines: historical successes and current challenges
Subunit	 <p>Subunit vaccines introduce a fragment or portion of the virus into the body. This fragment is enough to be recognized by the immune response and stimulate immunity.</p>	Pertussis HPV Hep. B	Subunit Vaccines
Viral vector	 <p>Viral vector vaccines insert a gene for a viral protein into another, harmless virus (replicating or non-replicating). This harmless virus then delivers the viral protein to the vaccine recipient, which triggers an immune response.</p> <ul style="list-style-type: none"> • Replicating viral vectors are able to produce copies of the viral protein, potentially triggering an enhanced immune response. 	Ebola Veterinary vaccines	What are viral vector vaccines?
mRNA	 <p>RNA vaccines work by introducing an mRNA sequence (the molecule that tells cells what to build) coded for a disease-specific antigen. Once this antigen is reproduced within the body, it is recognized and triggers an immune response.</p>	None	An introduction to RNA vaccines
DNA	 <p>DNA-based vaccines work by inserting synthetic DNA of viral gene(s) into small DNA molecules called plasmids. Cells take in the DNA plasmids and follow their instructions to build viral proteins, which are recognized by the immune system, and prepare it to respond to disease exposure.</p>	None	WHO: About DNA vaccines

***Operation Warp Speed:** US government body responsible for strategic approach, coordination and resource allocation for COVID-19 vaccines

****COVAX:** The vaccine pillar of ACT-A, the global collaboration to accelerate development, production and equitable access to new diagnostics, therapeutics and vaccines. COVAX is led by GAVI, CEPI and WHO.

About AVAC. AVAC is a non-profit organization that uses education, policy analysis, advocacy and a network of global collaborations to accelerate the ethical development and global delivery of new HIV prevention options as part of a comprehensive response to the pandemic. For more information, visit www.avac.org.