

## Front runners in vaccine race

Just eight months into the Covid-19 pandemic, two vaccines have raced through approvals and are already in use, although questions remain on whether they are safe and effective. Several other vaccine candidates, including four in China, are in the final phases of testing. Joyce Teo and Clara Chong look at those at the front of the pack.

### IN PHASE 3 TRIALS

Who	What	Current developments
Moderna, with the National Institutes of Health in the United States	<ul style="list-style-type: none"> <li>• Messenger RNA-based (mRNA) vaccine. Viral fragments are injected into the volunteer. The hope is that the cells would take in the genetic snippets, make viral proteins, and trigger an immune response.</li> <li>• It is different from most traditional methods of vaccine development which introduce the body to either an inactivated or weakened form of a virus or to one of its viral proteins.</li> <li>• Moderna aims to test it on 30,000 people and said last week that it has enrolled 13,194 participants.</li> </ul>	The company has entered into a supply agreement with the United States government to provide 100 million doses of its potential vaccine for around US\$1.5 billion (\$2 billion).
British-Swedish pharmaceutical giant AstraZeneca and the University of Oxford in Britain	<ul style="list-style-type: none"> <li>• A chimpanzee adenovirus-based vector.</li> <li>• This vaccine is made from a weakened version of a common cold virus (adenovirus) that infects chimpanzees. It has been genetically modified to express the coronavirus spike protein to stimulate an immune response when given to people.</li> </ul>	AstraZeneca has reached an agreement with Europe's Inclusive Vaccines Alliance to supply up to 400 million doses, with deliveries starting by the end of this year.
American pharmaceutical company Pfizer in collaboration with German firm BioNTech	mRNA vaccine	<ul style="list-style-type: none"> <li>• The US government placed an initial order of 100 million doses for US\$1.95 billion and can acquire up to 500 million additional doses.</li> <li>• Pfizer and BioNTech remain on track to seek regulatory review as early as in October this year, and manufacture up to 100 million doses globally by the end of this year and potentially more than 1.3 billion doses by the end of next year.</li> </ul>
Sinovac, a biotech firm in Beijing, China	<ul style="list-style-type: none"> <li>• Inactivated or killed vaccine, named CoronaVac.</li> <li>• It works by introducing the body to either an inactivated or killed form of a virus or to one of its viral proteins. The immune system responds by producing antibodies that recognise particular proteins of the virus. Those antibodies could fight future infections as long as the virus does not evolve.</li> </ul>	<ul style="list-style-type: none"> <li>• It started phase three trials involving 9,000 volunteers in Brazil last month.</li> <li>• Sinovac is aiming to triple its current capacity to produce 300 million doses per year, but at least two doses will be required to immunise one person.</li> </ul>
China National Biotech Group's (CNBG) Wuhan Institute of Biological Products. CNBG is a subsidiary of state-owned pharmaceutical giant China National Pharmaceutical Group (Sinopharm).	Inactivated vaccine	CNBG is aiming to produce 200 million doses of inactivated Covid-19 vaccines a year, according to state news agency Xinhua.
China National Biotech Group's (CNBG) Beijing Institute of Biological Products.	Inactivated vaccine	

### APPROVED VACCINES

Who	What	When
CanSino Biologics in Tianjin, China, together with the country's Academy of Military Medical Sciences.	Adenovirus-vectored vaccine	<ul style="list-style-type: none"> <li>• It was approved on June 25 by the Chinese military for limited use as a specially needed drug for a year.</li> <li>• A phase three trial will be held in Saudi Arabia.</li> </ul>
Gameleya Research Institute of Epidemiology and Microbiology in Moscow, Russia	Vaccine using two different types of adenoviral vectors	<ul style="list-style-type: none"> <li>• Known as Sputnik V, the vaccine was approved by the Russian Ministry of Health on Aug 11 for widespread use, after it was given to 76 volunteers in early-stage trials.</li> <li>• The fast-track vaccine has drawn flak from scientists, who worry the vaccine may not be safe or effective as it has not been tested on large numbers of people. Russia has said that it will start testing the vaccine in 40,000 people this week.</li> </ul>