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Students are inoculated at a mass-vaccination hub at Peking University in Beijing.

CHINA'S COVID VACCINES ARE GOING GLOBAL — BUT QUESTIONS REMAIN

The WHO has approved one of China's COVID-19 vaccines for use worldwide, and another is under review. But published trial data remain scarce.

By Smriti Mallapaty

The World Health Organization (WHO) has authorized the first of China's COVID-19 vaccines for emergency use, and another could be listed in the coming days, potentially opening the door to widespread distribution in lower-income nations through the COVID-19 Vaccines Global Access (COVAX) initiative.

The listing will boost global confidence in these vaccines, say scientists. China's five different vaccines have not been used widely in wealthy nations, but are already sustaining immunization campaigns in the global south.

"There is big demand for the Chinese vaccines," says Firdausi Qadri, an immunologist at the International Centre for Diarrhoeal

Disease Research, Bangladesh, in Dhaka.

The first vaccine to be listed is made in Beijing by the Chinese state firm Sinopharm. The other under review — named CoronaVac — is produced by the private company Sinovac Biotech, also based in Beijing. Five COVID-19 vaccines have already been authorized by the WHO, but, unlike these, the Chinese ones use inactivated virus and are not widely used in Western nations.

Sinopharm and Sinovac's vaccines account for the bulk of shots given in China, which has so far inoculated 243 million people. More than 45 countries have already approved their use, but the WHO is among the first stringent regulatory authorities to review the data.

"It is very important to have the support of the WHO," said Rafael Araos, an epidemiologist at the University for Development in Santiago,

before the Sinopharm vaccine was listed. He said a positive response would be "good news for the vaccine developers and for the countries that are interested in getting these vaccines".

The WHO approval process assesses safety, efficacy and manufacturing quality, says Qadri. Approved products can be purchased by United Nations agencies. "Until that happens, it will be up to the individual countries to procure the vaccines, and most countries will be not be able to," she adds.

The approvals could also help to address the shortfall in vaccines available through COVAX, an initiative led by international partnerships and agencies, including the WHO, to ensure COVID-19 vaccines are distributed equitably.

By the end of April, COVAX had shipped only about 50 million of the 2 billion doses it aims

to deliver globally in 2021. India is meant to contribute one billion doses of its Covishield vaccine, but exports have halted, owing to the country's ongoing COVID-19 crisis. Deliveries to COVAX of another WHO-listed vaccine produced by the pharmaceutical firm Pfizer have been limited, and none of Johnson & Johnson's vaccine has been shipped yet. Moderna's vaccine was listed by the WHO on 30 April.

As a result, Chinese vaccines are badly needed, says Gagandeep Kang, a virologist at the Christian Medical College in Vellore, India, and a member of a technical group on immunization that advises the WHO. The group met on 29 April to review data on the two Chinese vaccines, and will soon provide recommendations on their use.

Inactivated-virus vaccines have generally proven less effective than others in use. However, they still exceed the WHO's 50% efficacy threshold for emergency-use approval, making them important in reducing the global shortfall, argues Murat Akova, a clinical infectious-diseases researcher at Hacettepe University in Ankara. "If nothing else is available, I think these vaccines are a good choice."

Scattered data

Chinese researchers were among the first to begin developing vaccines against COVID-19 in early 2020, but have yet to publish full trial results. Some researchers have raised concerns that a lack of transparency could fuel vaccine hesitancy, but others say collating the data takes time, and information should be available for both front-runner vaccines within weeks.

China's vaccines (see 'How China's vaccines compare') have had to be trialled elsewhere because the country didn't have enough transmission itself to conduct them, says George Gao, who heads the Chinese Center for Disease Control and Prevention in Beijing.

Hilda Bastian, an independent scientist who studies evidence-based medicine in Victoria, Australia, says that so far, only scattered information has been released on Sinopharm's Beijing vaccine. (Sinopharm is producing a second inactivated-virus vaccine in Wuhan.)

In early December, both the United Arab Emirates (UAE) and Bahrain approved it – making it among the first COVID-19 vaccines to be granted full clearance in any country. Approval was based on late-stage trial data, including a UAE study involving 31,000 participants. These showed that the vaccine was 86% effective at preventing COVID-19 after 2 shots, with no deaths among immunized individuals. The WHO listed the vaccine on 7 May and reported an efficacy of 79%.

Mixed data on CoronaVac have emerged from clinical trials and national vaccination campaigns. Trials from Brazil and Turkey have revealed efficacy figures of 50.7% and 83.5%, respectively. Researchers say the lower figure might be because Brazil includes mild

HOW CHINA'S VACCINES COMPARE

Five vaccines have been approved for use in China. Unlike RNA vaccines being rolled out elsewhere, all can be stored in a fridge at 2–8 °C. Although full efficacy results have not been published, interim data are available from clinical trials in more than a dozen nations, which have used these vaccines to protect tens of millions of people.

Vaccines:	Sinopharm (Beijing)	CoronaVac	Sinopharm (Wuhan)	Convidecia	Anhui Zhifei
Produced by	Sinopharm's Beijing Institute of Biological Products	Sinovac Biotech	Sinopharm's Wuhan Institute of Biological Products	CanSino Biologics; Academy of Military Medical Sciences	Anhui Zhifei Longcom; Chinese Academy of Sciences
Efficacy at preventing COVID-19	79–86% (2 doses)	50–84% (2 doses)	73% (2 doses)	65–69% (1 dose)	Unavailable (2–3 doses)
Technology	Inactivated virus	Inactivated virus	Inactivated virus	Adenovirus vector	Protein-based
Total doses distributed	>100 million*	260 million	>100 million*	Unavailable	Unavailable
Countries/regions reached	>55 (~50 million doses)*	>40 (~156 million doses)	>55 (~50 million doses)*	Unavailable	Unavailable
Production goal in 2021	1 billion doses*	2 billion doses	1 billion doses*	100 million doses	Unavailable
Phase III clinical trials	UAE, Peru, Argentina, Bahrain, Jordan, Egypt	Chile, Indonesia, Brazil, Turkey, Philippines, China	UAE, Peru, Bahrain, Jordan, Egypt, Morocco	Pakistan, Russia, Chile, Argentina, Mexico	China, Uzbekistan

*Data for both Sinopharm vaccines are aggregated.

cases of COVID-19 in its counting and because there is circulation of the P.1 variant, which is more transmissible and might be better at evading immunity. Results of an analysis after mass-vaccination campaigns in Chile have landed between these numbers, at 67%.

China's vaccines have already catalysed immunization campaigns in more than 40 countries.

CoronaVac and both Sinopharm vaccines are the mainstay of China's own immunization drive, which aims to vaccinate 70% of its population of 1.4 billion by the end of 2021. China approved its first COVID-19 vaccines for emergency use in June 2020 and began rolling out doses more widely in January.

So far, only Chinese vaccines have been listed by the country's drug agency, which since December has approved both of Sinopharm's vaccines; CoronaVac; and a fourth vaccine produced by CanSino Biologics in Tianjin, which uses an adenovirus to introduce DNA encoding the SARS-CoV-2 spike protein into human cells.

In March, China's drug agency also gave emergency-use authorization to a vaccine produced by Anhui Zhifei Longcom, a firm based in Hefei. It works by introducing part of the virus's receptor-binding domain protein to human cells, and is undergoing phase III trials.

Gao says the Chinese vaccines generally provide good protection, but that subsequent boosters might be needed to induce stronger

protection. Mixing vaccines or modes of entry, such as nasal sprays, might be useful, he adds.

China's vaccines have already catalysed immunization campaigns in more than 40 countries. The nation aims to produce to five billion doses this year, and more might come from manufacturing deals with countries such as the UAE, which is making a version of Sinopharm's Beijing vaccine, called Hayat-Vax.

For many countries, Chinese vaccines have been the only accessible ones. In others – such as Brazil, Turkey and Chile, where tens of millions of people have been vaccinated – they make up some 80–90% of doses administered. And researchers in these countries are beginning to see evidence of the jabs' effect in controlling the pandemic (C. G. Victora *et al.* Preprint at medRxiv <https://doi.org/gbh3; 2021>).

Anecdotal reports hint at a low incidence of breakthrough infections, severe illness and death among fully vaccinated individuals in Brazil, says Esper Kallas, an infectious-diseases researcher at the University of São Paulo, Brazil. "Because we have access to CoronaVac, we've got to use it," he says. "I'm not saying this will be the preferred vaccine in the future."

WHO emergency-use listing of CoronaVac would further validate the vaccine's use in countries that led with it. The decision to approve it would "provide confidence", says Akova.

But questions remain. Researchers want more data on how well Chinese vaccine protect older people, children, pregnant people and people with compromised immune systems. They also want to know what types of immune response the jabs trigger, how long protection lasts and how well they work against emerging variants.