How India's Serum Institute became a COVID-19 vaccine powerhouse

As the world's largest maker of low-cost vaccines, the institute finds itself in the middle of an uphill battle to vaccinate the world against COVID-19.

A Sri Lankan nurse administers a COVID-19 vaccine to an army soldier in Colombo, Sri Lanka, Jan. 29, 2021. The island nation has received 500,000 doses of the AstraZeneca-Oxford University vaccine donated by India and manufactured by the Serum Institute of India.

Eranga Jayawardena/AP

With the world's attention on COVID-19 vaccines and treatments, you've probably heard about big pharmaceutical companies like Pfizer and Johnson & Johnson.

But the Serum Institute of India is playing an outsized role in the pandemic, creating a lifeline of hundreds of millions of vaccine doses for COVID-19.

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"Serum [beats] them all by being the world's largest vaccine manufacturer, both by number of doses and by what it sells worldwide," said Dr. Bobby John, a global health advocate who spent years living near the institute, in Pune, India.

Last year, Serum produced more than 1.6 billion vaccine doses — including for measles and whooping cough — distributed in more than 170 countries, according to Serum's executive director, Dr. Suresh Jadhav.

Now, the Serum Institute finds itself in the middle of an uphill battle to vaccinate the world against COVID-19.

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A horse farm becomes a lab

The Serum Institute began not with pipettes and lab coats but with prized racing horses.

Cyrus Poonawalla, owner of India's largest horse farm, Poonawalla Stud Farms, would donate retired or unfit racehorses to a public lab, who'd use the serum (the liquid found in his retired horses' blood) to make tetanus vaccines and antivenom for snakebites.

At the time, India was experiencing major vaccine shortages, with most of its costly supply coming from Europe.

Poonawalla decided to start his own lab on the farm, launching the Serum Institute in 1966. The first vaccine came out two years later.

The little lab grew and expanded its vaccine types, eventually exporting vaccines to neighboring countries. By the 1990s, the company went global.

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Jadhav oversaw Serum's accreditation through the World Health Organization, and it became the go-to for affordable vaccines supplied to United Nations programs. Serum helped develop and manufacture a version of a meningitis A vaccine, which led to near elimination in northern Africa.

These days, a majority of the world's children have gotten a Serum shot.

From the start, Serum found a way to make low-cost vaccines. The Indian government had set the global vaccine price at an in-country, not-for-profit level.

"This is a different mindset," Jadhav said.

Their business model thrives on high-volume, low-cost production. Jadhav said the company scales up production through the use of large, stainless steel fermenters and quickly adopting new technologies. (Horse serum is no longer used in vaccines).

The pandemic ups the stakes

Serum is now co-developing vaccines for the coronavirus, running clinical trials and manufacturing vaccines developed by other companies. This includes the promising vaccine from US-based Novavax and UK company AstraZeneca, with whom they've worked for years, at Oxford, on a malaria vaccine.

The institute is producing this vaccine specifically for low- and middle-income countries while it also tries to develop its own vaccine, which is expected to enter phase 3 trials in a matter of weeks, Jadhav said.

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In recent months, Serum reached major agreements with Gavi, the Vaccine Alliance and COVAX, the world's main initiative to ensure fair, equitable distribution of COVID-19 vaccines. It will offer up to a billion doses of approved vaccines at a low cost this year.

Related: *A global initiative could ensure equitable access to a COVID-19 vaccine. Can it work?*

As richer countries vie for direct deals for vaccines, providing low-cost vaccines is critical.

"I need to be blunt — the world is on a brink of a catastrophic moral failure," stated WHO's director-general, Tedros Adhanom Ghebreyesus, last month.

"The price of those failures will be paid with lives and livelihoods in the world's poorest countries," he said.

Beyond Serum

Why don't more institutes like Serum exist to meet the high global demand for COVID-19 vaccinations?

Prashant Yadav, a senior fellow at the Center for Global Development who specializes in supply chains, says this is one of the most important questions. Several smaller companies are manufacturing vaccines, even in India, Yadav said, but vaccine production challenges stand in the way.

Making vaccines is a specialty.

Some new vaccines are based on new technologies, like ones produced by Pfizer and Moderna, and these private companies determine whether to share their know-how. It also depends on identifying capable manufacturers, which requires attention and work, Yadav said. Looking for partners "is largely an afterthought."

But the problem may run even deeper.

A months-old WHO initiative aimed at improving access to technical know-how has yet to garner much interest. Tedros recently wrote that open-sourcing could enable labs across Latin America and Africa to better meet current and future vaccine demands.

Nicole Hassoun, a philosophy professor at Binghamton University in New York, said the current incentive structure for developing and distributing drugs prioritizes communities with the most resources.

That just doesn't work well in a pandemic, she said.

"[I]t's a lack of global imagination and cooperation that's really the problem."

More demand

Serum is experiencing high demand for its low-cost, COVID-19 vaccines.

AstraZeneca recently fell short on its deal with European countries to keep up with its promised supply, and the company may be turning to Serum.

"AstraZeneca is coming back to us requesting us to supply this product even in the developed world," like Canada and the UK, Jadhav said.

Half of Serum's vaccine supply is set aside for domestic use, Jadhav said, and the Indian government also oversees exports to neighboring countries.

The African Union, Morocco, South Africa, Saudi Arabia and Brazil are among others that have secured direct deals with Serum for vaccine doses.

Serum has a stockpile of about 70 million doses, Jadhav said, and is now waiting for final approval from countries to start exporting.

By April, the company aims to make 100 million doses monthly of AstraZeneca's COVID-19 vaccine. Currently, the monthly total ranges from 50 million to 60 million doses.

It's an anxious, high-stakes moment for vaccines.

In recent weeks, a Serum facility under construction for a separate vaccine project caught fire, killing five people.

That was "a traumatic experience for every one of us," Jadhav said.

Making vaccines, especially a new one, can be a complex process, and requires ensuring all the raw materials and other elements are in place.

Jadhav said Serum is finding its rhythm with vaccine production and mastering the art and science of scaling up.