Q&A

The pioneer behind southeast Asia's first mRNA COVID vaccine

Thailand is about to launch human trials of its first mRNA COVID-19 vaccine. If it is successful, the country could emerge as an important supplier of mRNA vaccines in Asia, making it a small but significant player in the dash to adopt the new technology. *Nature* spoke to immunologist Kiat Ruxrungtham, founder of the Chula Vaccine Research Center at Chulalongkorn University in Bangkok, about his team's COVID-19 vaccine, called ChulaCov19.

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Kiat Ruxrungtham led the design of Thailand's ChulaCov19 mRNA vaccine.

What motivated you to develop a vaccine?
During the H1N1 influenza pandemic in 2009–10, it took more than a year for Thailand to get vaccines. We wanted to develop our own so wouldn't have to wait in the future. We might be too late to fill the gap in the Thai market with our first-generation COVID-19 vaccine, but we have a chance to compete with second- and third-generation vaccines against variants. Our goal is to produce enough to supply Thailand and possibly our neighbours.

Why the shift to mRNA technology?
I founded my laboratory more than a decade ago, and we've been developing vaccines against dengue fever, leptospirosis and cancer using various technologies. In 2017, we invited mRNA technology pioneer Drew Weissman, of the University of Pennsylvania in Philadelphia, to speak at our annual forum. We then began working with him on mRNA vaccines for allergies. But when the pandemic hit, we decided to focus on designing a COVID-19 vaccine instead.

The beauty of mRNA vaccines is that they are quicker to produce and can be made at large scales. These vaccines use small pieces of genetic material — mRNA — to tell cells to make viral proteins, such as the spike protein that SARS-CoV-2 uses to enter host cells. They can be developed swiftly using information about a virus's genomic sequence, and can act rapidly before emerging variants even enter Thailand.

Tell me about your progress so far.
ChulaCov19 has shown promising results in unpublished preclinical studies in animal models. We plan to begin phase I clinical trials in people in June, and are already developing next-generation vaccines against the B.1.351 and B.1.1.7 viral variants. We are also keeping a close eye on B.1.617, which first emerged in India. We are happy to have come this far, but it has taken us more than a year to enter human clinical trials — almost a year behind global pharmaceutical companies.

What clinical trials are you planning?
The initial phase I trial will include some 100 people to figure out the appropriate dose for generating a good immune response. A US-based biotech company will probably produce the first batch but, by September, we plan to have the vaccines manufactured by the company BioNet-Asia in Bangkok. If the quality and results are comparable, then our locally produced vaccines will hopefully gain the trust of the government and investors.

Once we pass this milestone, we plan to conduct phase II trials, testing the consistency of response in a few hundred volunteers, and then assessing the safety of the vaccine in some 5,000 individuals. To test efficacy, we will need to conduct phase III trials in tens of thousands of individuals.

Is approval possible without late-stage trials?
The World Health Organization, the US National Institutes of Health and several other organizations are working to determine the level of neutralizing antibodies that a vaccine should induce to provide adequate protection. This 'correlate of protection' could be used to assess efficacy without conducting late-stage trials, as is commonly done for new flu vaccines.

We have also asked colleagues abroad to send us blood samples from people vaccinated with the Pfizer–BioNTech vaccine, and we will collect samples from people in Thailand immunized with AstraZeneca's and Sinovac's vaccines. If the immune response generated by our vaccines is as good as those induced by others, the Thai regulatory body might consider approving ChulaCov19 for emergency use without phase III trials.

What have been the biggest challenges?
Funding. As we are an academic centre, the majority of support is from the government. We had interesting preclinical results in May 2020, but it took almost six months to get the funds to start human trials. It also took time to transfer the know-how for mRNA vaccines to a manufacturer in Thailand.

Would vaccine patent waivers benefit you?
An agreement to waive patent protections for COVID-19 vaccines in low- and middle-income countries would be wonderful. It would allow us to use technologies that are currently unaffordable or inaccessible, and make our vaccine even better and cheaper.

Interview by Smriti Mallapaty
This interview has been edited for length and clarity.