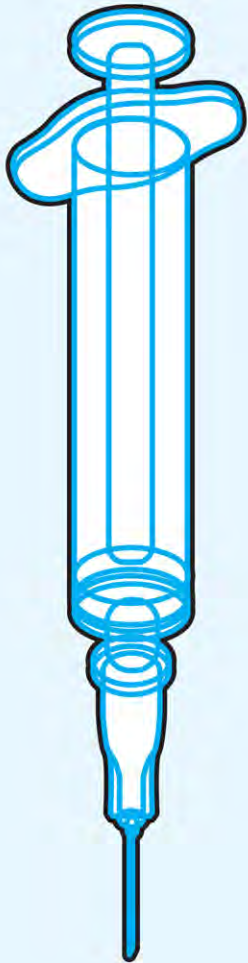


Asia's virus busters

From the scientists who decoded the DNA of Sars-CoV-2, and opened the door to developing vaccines, to the researchers who developed vaccines in record time and the manufacturers making doses in the millions. These are The Straits Times Asians of the Year.



Professor Zhang Yongzhen

Decision to publish genome map made at some personal risk

Aw Cheng Wei

Professor Zhang Yongzhen broke ground when he published the first complete genome of Sars-CoV-2 in January, which allowed health authorities around the world to recognise the mysterious pathogen that would soon begin to cause mayhem beyond China's shores.

It was a choice he made at some personal risk, considering the political sensitivity of information surrounding the coronavirus at the time.

Prof Zhang, 55, who is at the Shanghai Public Health Clinical Centre, has been lauded for his bravery and professionalism by the international media, and was included as one of Time's 100 most influential people of this year.

His decision to publish the genome map helped save countless lives by reducing the time it takes to get a diagnosis.

Prof Zhang told Time news magazine that he uploaded the sequence to the United States National Centre for Biotechnology Information on Jan 5 – the same day he and his team had completed the sequencing after working non-

stop for about 40 hours.

But the centre can take "days or even weeks" to look at a submission, Time said.

So Prof Zhang decided instead to publish the results online on Jan 11, through Professor Edward Holmes, a colleague at the University of Sydney, because of the gravity of the situation.

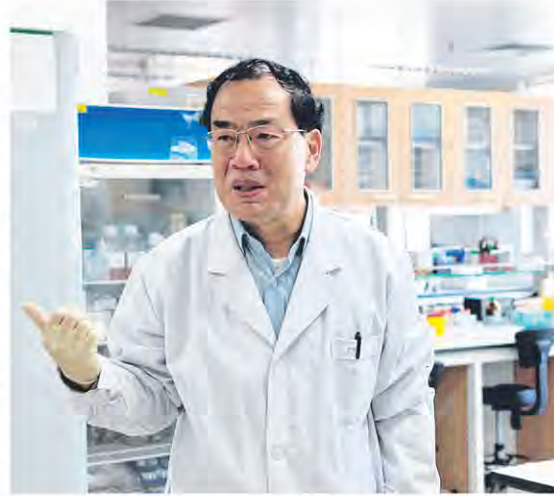
After he obtained the genome, Prof Zhang noted that the virus that causes Covid-19 resembled the Sars (severe acute respiratory syndrome) virus, which killed 774 people worldwide in 2003.

He told Time: "I had two suggestions (to top public health officials): that we should take some emergency public measures to protect against this disease; also, clinics should develop antiviral treatments."

He told a colleague that Sars-CoV-2 was certainly more dangerous than avian flu H5N1.

Prof Zhang, a top scientist, and his team have discovered more than 2,000 viruses in some 10 years, according to Shanghai Science and Technology News.

Prof Zhang, who was educated at the South China Agricultural University, Southern Medical University and Kunming Institute of Zoo-



China's Professor Zhang Yongzhen broke ground when he published the first complete genome of Sars-CoV-2 in January, which allowed health authorities around the world to recognise the mysterious pathogen that would soon begin to cause mayhem beyond China's shores. PHOTO: CHINACDC.CN

logy, is well known for his hard work. He did not go home to see his family thousands of miles away for the three years that he was doing his doctorate in Kunming, the Chinese news outlet said.

He also worked through week-

ends and public holidays, and forfeited his annual leave.

He was back at work a week after undergoing an eight-hour surgery for thyroid adenoma in 2009.

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Major-General Chen Wei

'People's Hero' worked on virus treatment at Ground Zero

Major-General Chen Wei of the People's Liberation Army in China knows what it means to don her uniform.

Whether it was fighting a dangerous viral outbreak, or contributing to relief efforts in the 2008 Sichuan earthquake and the 2014-16 Ebola outbreak in West Africa, she has never shied away from duty.

And so it was when Maj-Gen Chen, who was educated at the prestigious Tsinghua University, arrived in Wuhan in late January, on the third day after the city had been sealed to contain a mysterious virus.

It was the second day of Chinese New Year, and she had not even had time to tell her parents.

She told state broadcaster CCTV in an interview: "The pandemic is a military affair, and the affected areas are the war zones."

Her work was commended by President Xi Jinping at a ceremony in September to laud those who had contributed to China's fight against the pandemic.

In Wuhan, the chemistry graduate worked from a makeshift laboratory, where she and a team of military scientists researched on treatment for patients.

They took the lead in developing the plasma therapy that has since been accepted as an officially recognised treatment method, South China Morning Post reported.

Maj-Gen Chen, 54, who was given the title of People's Hero at the ceremony, has also been leading a team to work on a vaccine with Chinese biopharmaceutical firm CanSino Biologics.

Their candidate, Ad5-nCoV, was awarded the first Covid-19 vaccine patent in China on Aug 11.

International media reported that Maj-Gen Chen was among the first to take the vaccine, a claim that she had not verified.

Her dedication to the cause has been praised by Chinese media outlets. She was also a top trending topic on Weibo in February.

Her father, who lives in their home town of Lanxi in eastern Zhejiang province, found out his daughter had been deployed to Wuhan only through the news.

Her husband Ma Yiming, in the meantime, took over the household chores.

He was a technician at a winery in 1989, when they first met on a train from Beijing to Qingdao.

He told CCTV how their then four-year-old son did not see his



Major-General Chen Wei shaking hands with President Xi Jinping at a ceremony in Beijing in September to laud those who had contributed to China's fight against the Covid-19 pandemic. PHOTO: REUTERS

mother for months in 2003 when she and her team were in isolation developing a nasal spray treatment for Sars.

"My son jumped up and kissed the TV screen when he saw his mother on the news," he said.

Maj-Gen Chen was presented national honours alongside traditional Chinese medicine expert Zhang Boli and Wuhan hospital chief Zhang Dingyu at the September ceremony.

Aw Cheng Wei

Dr Ryuichi Morishita

Japanese expert charting a radical path: DNA vaccine

Walter Sim
Japan Correspondent
In Tokyo

Dr Ryuichi Morishita of Osaka University's medical school is a taciturn man with a big vision of developing a DNA vaccine against the coronavirus.

But the odds are stacked against the clinical gene therapist. For one thing, he is charting a radical path in the field of biopharmaceuticals: The idea of DNA vaccines is so novel that they are not yet approved for human use.

The World Health Organisation, while noting that many aspects of the human body's immune system response to a DNA vaccine are not yet understood, said: "This has not impeded significant progress towards the use of this type of vaccine in humans."

Dr Morishita is experimenting with DNA vaccines against infectious diseases like Covid-19, as well as intractable diseases like cancer and hypertension.

Unlike conventional vaccines, which involve injecting either a weakened or inactivated version

of the virus or the pathogen to trigger the immune response, DNA vaccines encode the genetic protein of the target pathogen.

This means that only the DNA code of the disease – and not the pathogen itself – gets injected directly into the human cell to induce the production of antibodies.

Dr Morishita, 58, said last week that such vaccines will be easier to develop since they do not involve cultivating the virus itself. They can also be produced in weeks, compared with the months that conventional vaccines take, he said.

The vaccine may take three or four doses to be effective, but each dose may cost as low as US\$4 (S\$5), he said.

Some have questioned the science behind his project. But the potential for a Covid-19 DNA vaccine has trebled the market valuation of his Osaka-based company AnGes Inc to 161.9 billion yen (S\$2.1 billion) on Wednesday from March.

Dr Morishita, born in Soja city in Okayama prefecture, earned his medical degree and PhD from Osaka University, where he has spent almost his entire career except for a five-year Stanford University stint. The Japanese government is



Dr Ryuichi Morishita of Osaka University is experimenting with DNA vaccines against infectious diseases like Covid-19, as well as intractable diseases like cancer and hypertension. He expects his company's DNA vaccine against Covid-19 to be ready by the first half of next year. PHOTO: REUTERS

backing his research, devoting 11.4 billion yen in grants to AnGes to develop and produce the DNA vaccine against Covid-19.

The vaccine has undergone successful human clinical trials in Osaka, with larger-scale tests planned across Japan and the Asia-Pacific.

Dr Morishita expects the vaccine to be ready by the first half of next year, and said it will be effective even if the coronavirus were to mutate, given that the various strains of the virus have similar genetic codes.

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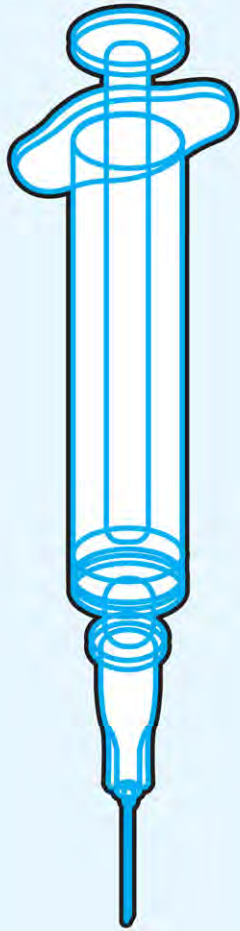
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Asia's virus busters

Sars-CoV-2, the virus that has brought death and hardship to the world's largest and most populous continent, is meeting its tamer in the virus busters. ...we salute your courage, care, commitment and creativity. In this peril-filled hour, you are a symbol of hope for Asia, indeed the world.



CITATION FOR THE STRAITS TIMES ASIANS OF THE YEAR



Professor Ooi Eng Eong

Local don credits teamwork as S'pore joins race for vaccine

Audrey Tan
Science Correspondent

The world is racing towards a Covid-19 vaccine, and efforts by a local scientist have also put Singapore in the running to develop one.

Professor Ooi Eng Eong of the Duke-NUS Medical School is co-developer of a Covid-19 vaccine candidate that is among only 51 in the world being tested on humans.

Prof Ooi, 53, said it was satisfying to know that his team's research is being applied to developing and evaluating a new vaccine to solve a global health problem.

"That we were able to contribute to a rapid development of our vaccine candidate, and be among those in the clinical phase of testing, is a bonus," said Prof Ooi. He had graduated from St Joseph's Institution and National Junior College in Singapore before pursuing medical training at the University of Nottingham Medical School.

Now, he is driven by the urge to give back to society through science, though the accelerated timeline has been a challenge. His team has overcome this by conducting multiple experiments simultaneously, instead of sequentially.

"Even though there was urgency

in developing a vaccine, it was imperative we provide the same quality of evidence to show that the vaccine is likely to be safe in humans and has a chance of eliciting protective immunity," said the professor of emerging infectious diseases.

The early-phase trials for the Lunar-Cov19 vaccine co-developed by Prof Ooi and American pharmaceutical company Arcturus Therapeutics began in Singapore in October. Preliminary results were positive, and *The Straits Times* had earlier reported that late-stage trials are expected to begin before the end of the year.

The Lunar-Cov19 vaccine leverages a new technology called messenger RNA (mRNA), similar to the candidates being developed by Moderna and Pfizer-BioNTech, with one difference. The Lunar-Cov19 mRNA molecule is a replicating one that makes multiple copies of the viral spike protein after the injection. The other two are not.

Prof Ooi said the replication more closely mimics how a viral infection plays out in the body, and could coax a stronger immune response from the body.

His team is hopeful that the vaccine could work with only one dose. On the other hand, the vaccines by Moderna and Pfizer-BioNTech require two doses.



Professor Ooi Eng Eong of the Duke-NUS Medical School is co-developer of a Covid-19 vaccine candidate that is among only 51 in the world being tested on humans.
ST PHOTO: SHINTARO TAY

As he battles the clock to produce a vaccine, Prof Ooi stresses that the work done on it was a result of teamwork. "Many people in Arcturus Therapeutics, the SingHealth Investigational Medicine Unit and my lab worked long hours and even over weekends to meet ambitious timelines

so that vaccines would be available to the Singapore population sooner rather than later," he said. He added: "This nomination would not be possible without them and would only be meaningful if done on their behalf."

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Mr Adar Poonawalla

Helping poorer countries level up in access to vaccines

Nirmala Ganapathy
India Bureau Chief
In New Delhi

Mr Adar Poonawalla gave himself a head start in the race to produce a Covid-19 vaccine.

In April, Mr Poonawalla, 39, announced that his company, Serum Institute of India, the world's largest vaccine manufacturer, would start cranking out vaccine doses being developed by the University of Oxford and the global biopharma company AstraZeneca.

Failure would have meant a useless stockpile of vaccines, but the bet has so far paid off.

The vaccine, AZD1222, has so far shown an efficacy of up 90 per cent in advanced trials.

"Risk taking is a part of every business. I believe that since we have the capability and the capacity to help, it is our responsibility to take the mantle ahead, especially in the ongoing pandemic," said Mr Poonawalla in an e-mail interview.

The Serum Institute of India, which produces and sells 1.5 billion doses annually, is expected to help efforts towards levelling the playing field for India and other middle- and lower-income countries in ensuring cost-effective vaccines. The institute has started off by

producing 40 million doses of the vaccine, which will retail for US\$3 (\$\$4) to US\$4 per dose for government procurement and US\$5 to US\$6 for direct private sales.

It has also inked vaccine deals with Codagenix, an American clinical-stage biotech firm, global pharma giant Merck and US firm Novavax.

By next month, the Indian firm will have 100 million doses ready.

Nearly half of the AstraZeneca and Novavax doses will be for India and other middle- and low-income countries apart from 200 million doses through Gavi, The Vaccine Alliance – a public-private partnership that helps vaccinate half the world's children – and the Bill & Melinda Gates Foundation.

All this has thrust Mr Poonawalla, the articulate face of the family-run firm, into the global limelight. The Serum Institute was founded by his father Cyrus Poonawalla in 1966, branching off from the family's stud farm business.

The younger Poonawalla, who took over as chief executive at 30, has driven the company's expansion. Its presence has grown from 35 countries to 170. The firm has ramped up its production of polio vaccines. Last month, it added a new facility that can manufacture half a billion vaccine doses a year. Mr Poonawalla noted that the



Mr Adar Poonawalla, chief executive of Serum Institute of India, the world's largest vaccine manufacturer. It has started off by producing 40 million doses of the vaccine being developed by Oxford University and AstraZeneca. The vaccine will retail for US\$3 (\$\$4) to US\$4 per dose for government procurement and US\$5 to US\$6 for direct private sales.
PHOTO: REUTERS

pharma industry is a tough place to do business, but is proud that 65 per cent of all children globally have received a Serum Institute vaccine at least once.

Mr Poonawalla and his wife Natasha, the executive director of the institute, are also known for their jet-setting lifestyle and for hobnobbing with Bollywood celebrities.

He told *GQ* magazine this year that under normal circumstances, he would have been sailing down the coast in Cannes on a yacht with his family, watching the Grand Prix and attending the film festival, but said what he was doing now "more than compensates".

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Mr Seo Jung-jin

Biotech boss' aim: A Covid-19-free S. Korea by next spring

Chang May Choon
South Korea Correspondent
In Seoul

If billionaire Seo Jung-jin had his way, South Korea could be free of the coronavirus by spring next year.

His biopharmaceutical firm Celltrion is on track to seek conditional approval for the country's first Covid-19 medicine – monoclonal antibody treatment CT-P59 – by the end of the month, and to produce enough to treat up to two million patients a year.

The drug is said to complement vaccines, as it stops the virus from further infecting human cells.

Clinical trials showed that the treatment can kill the virus in four to five days and help patients make a full recovery 44 per cent faster.

Celltrion, one of South Korea's largest drugmakers, invested 300 billion won (\$\$370 million) into its antibody drug. About 100,000 doses have already been made for domestic use. The country has reported more than 36,000 confirmed cases of the virus.

"Globally, there is ample vaccine production but a shortage of treatments, but Koreans don't need to worry because there is a supply of

Celltrion treatments to spare," Mr Seo, 63, told *Hankyoreh* newspaper last month.

He also voiced hope that South Korea will be "corona-free" by next spring, so people can go about their daily lives without wearing masks.

The chairman of Celltrion is known to make bold decisions and dream big.

Born in Cheongju in the central North Chungcheong province, he studied industrial engineering and was working for Daewoo Motors when it went bankrupt during the 1997-1998 Asian financial crisis. He started his own biotech company with former colleagues, with a capital of only 50 million won.

Mr Seo spotted the future potential of biosimilars – cheap copies of expensive biologic drugs used to treat diseases such as cancer – and plunged into researching them.

"I bet I am probably the businessman who has seen more breast cancer cells than anyone," he once told *The Financial Times*.

He had to borrow money from loan sharks to fund his research, and things looked up only in 2010 when Singapore's Temasek injected 207.9 billion won into the company. Celltrion's market capitalisation is now US\$23.1 billion (\$\$30.8 billion), making Mr Seo the second richest man in South Korea.



Celltrion chairman Seo Jung-jin said that during a pandemic crisis, pharmaceutical companies must serve as public assets for the country. PHOTO: CELLTRION

He is slated to retire by Dec 31, after which he plans to invest 2 trillion won in a start-up focused on telemedicine technologies.

For now though, Mr Seo's focus is on making Covid-19 treatment affordable.

"We have promised the people of Korea that our Covid-19 antibody

treatment will be available to them at production cost," he said, adding that the sale price overseas would also be lower than rivals'.

"During a pandemic crisis, pharmaceutical companies must serve as public assets for the country."

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