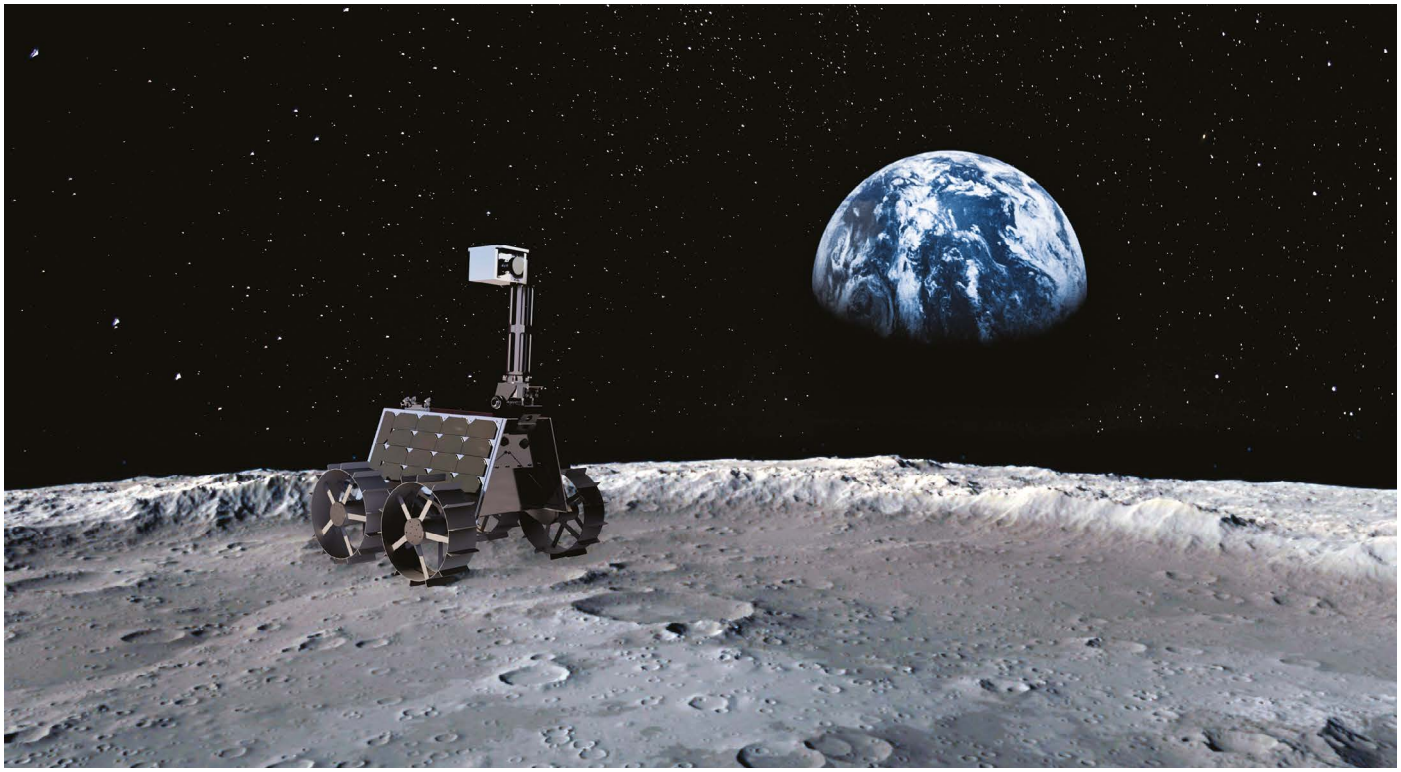

MBRSC

An artist's impression of Rashid, the UAE's lunar rover, which will include high-resolution cameras, a thermal imager and a Langmuir probe.

lift to the lunar surface", says Al Marzooqi. This will allow the UAE to send frequent missions to the lunar surface, with a variety of locations and scientific objectives, he adds.

International partnerships

The UAE Space Agency is just 6 years old. The country's satellite programme only 14 years old, and the nation awarded its first PhD in any field just 10 years ago. It rapidly became a spacefaring nation through a policy of hiring international academic and industry partners to help build and design missions, while training home-grown engineers.

Although the country now has expertise in satellites, orbiters and remote-sensing instruments, a robotic mission will require new skills — in building the rover's mechanical structure, and its heating and communication systems. Particularly challenging will be sending signals across the 384,000 kilometres to Earth with only the limited power and antenna length of a lightweight rover, says Al Maeeni.

The rover team at the MRBSC has been working on the project for around two years, and is designing Rashid based on previous successful probes. They also plan to model and hone a series of rapid prototypes, says Al Marzooqi. Unlike the country's Hope Mars mission, which was largely built in the United States by both US and Emirati engineers, Al Marzooqi stresses that the entire lunar rover will be developed in the UAE. However, it will still involve international partnerships, he says.

That Rashid will get to the Moon is not a given. So far, only Chinese, Soviet and US space agencies have landed spacecraft safely on the Moon, and no private company has yet succeeded. More than 20 landers have crashed; India's 2019 Chandrayaan-2 mission was the most recent to do so. And although the mission's 2024 date coincides with Artemis — an international NASA-led return of humans to the Moon — the Emirates Lunar Mission will go ahead even if Artemis stalls, adds Al Rais. "Our plans are totally independent."

The next few years could see a flurry of rovers and landers as a precursor to the Artemis project. NASA plans to pay companies to fly scientific and technical experiments to the Moon beginning in 2021, while the European Space Agency, China, India, Israel, Japan and Russia are among the nations planning to send landers or rovers in the next five years.

"Everyone is rushing to go to the Moon, and we want to be a key contributor to these international efforts," says Al Marzooqi.

SCIENTISTS CRITICIZE USE OF UNPROVEN COVID DRUGS IN INDIA

The treatments are being widely prescribed, yet there is little evidence that they work.

By Gayathri Vaidyanathan

In India, which has the world's second-largest COVID-19 outbreak, there is a desperate need for effective treatments. But researchers are concerned about how the country's drug regulator is handling potential therapies. The Drugs Controller General of India (DCGI) has approved several repurposed drugs for 'restricted emergency use' for treating the disease, the first time it has used such powers. Yet scientists say it's unclear on what basis the drugs were approved, and critics argue that the manufacturers' data on their effectiveness is unconvincing so far.

"Transparency is even more important in the pandemic," says Anant Bhan, a public-health researcher at Yenepoya University in Mangalore. "It's a new virus where we don't have definitive treatments available."

India has the world's second-largest COVID-19 outbreak.

SAM PANTHAKY/AFP/GETTY

Scientists are also concerned that the emergency authorizations are influencing other countries' decisions. One of the drugs approved for COVID-19 in India is itolizumab, which is used to treat the autoimmune condition psoriasis. This has now been approved for emergency use in Cuba, partly on the basis of Indian data and approval, according to Cuban media. And Equillium, a biotech company based in La Jolla, California, which has a licence to manufacturer itolizumab, received approval in the United States on 29 October to proceed with a large trial. Equillium's filing to the US financial regulator notes that it was encouraged by India's data and approval.

The DCGI has granted emergency authorization for the use of at least three drugs for treating COVID-19. The influenza drug favipiravir was approved in June for treating mild to moderate cases; remdesivir, a broad-spectrum anti-viral drug, was also authorized in June; and itolizumab was approved in July for treating moderate to severe acute respiratory distress in people with COVID-19.

India is not alone in fast-tracking COVID-19 treatments. The US Food and Drug Administration (FDA) has granted emergency-use authorizations (EUAs) for three putative COVID-19 drugs: infusions of antibody-rich plasma from people who have recovered from the disease; the malaria drug hydroxychloroquine; and remdesivir, which has now been granted full approval for use in adults. Once an EUA is granted, the FDA issues a public notice of the evidence — or lack thereof — for its decision, and hospitals and doctors are required to monitor patients for side effects. Although EUAs can be issued with evidence that they merely "may be effective", some researchers criticized the lack of information on the hydroxychloroquine authorization. The FDA later revoked this authorization, after clinical trials showed that the drug did not work for COVID-19 and had serious side effects.

But in India, it's unclear what 'restricted emergency use' means, says Sahaj Rathi, a visiting hepatologist at the Mahatma Gandhi Institute of Medical Sciences in Sevagram. The term is not mentioned in any law, regulation or policy document available to the public.

"In the interest of getting approvals passed, I think scientific rigour has taken a back seat."

A safety committee that the DCGI established to fast-track COVID-19 drug and vaccine approvals recommended the authorizations. But it is unclear who is on the committee, and the evidence underlying its decisions has not been made public, says Bhan. The most detailed information about the approvals is the committee's brief meeting minutes.

In the case of favipiravir, the committee has granted emergency use to several manufacturers of the drug, but for different dosages — of 200, 400 and 800 milligrams, according to meeting minutes. "In the interest of getting approvals passed, I think scientific rigour has taken a back seat," says Rathi, who has published about his concerns (S. Rathi and S. P. Kalantri *Indian J. Med. Ethics* **3**, 175–180; 2020).

India's health ministry, which oversees the regulator, did not respond to e-mailed questions about emergency authorizations.

Emergency approvals are typically granted on the basis of preliminary evidence that a drug works. But scientists say there is little evidence so far that favipiravir and itolizumab can treat COVID-19 successfully.

A month after favipiravir was authorized for emergency use, its Mumbai-based manufacturer, Glenmark Pharmaceuticals, revealed that the drug had been tested in just 150 people with mild to moderate illness. But the trial didn't determine whether people taking the drug were less likely to develop severe forms of the disease, or to die from it. Instead, it measured the time it took patients to stop shedding the virus, which Rathi says does not establish that the person recovered faster or was less infectious.

Glenmark says the drug is effective against COVID-19, and its choice of trial endpoint was based on the state of knowledge at that time. The drug has also been approved for emergency use in China and Russia, but regulators in the United States and South Korea have not authorized its use.

In India, at least 15 pharmaceutical companies are selling the drug, and sales have reached 2.80 billion rupees (US$37.6 million) since June, according to AIOCD, a pharmaceutical market-research company. Physicians say that it is being widely prescribed for mild COVID-19 infections, and that families desperate to help ill relatives were initially paying around 12,500 rupees for a 14-day course.

Scientists have also questioned the preliminary data on itolizumab, which is developed by Bengaluru-based Biocon. A company press release says that a phase II safety trial on 30 people hospitalized with COVID-19 reduced mortality. But researchers at the All India Institute of Medical Sciences in Bhopal wrote in a commentary in *BioDrugs* that the trial was poorly designed, and that it was not clear what constituted "standard of care" in the control arm (S. Atal *et al*. *BioDrugs* https://doi.org/fhg5; 2020). (BioDrugs is published by Adis, part of Springer Nature, which publishes *Nature*. *Nature*'s news team is editorially independent of the publisher.)

The trial was also too small to show that the drug works, says Shriprakash Kalantri, an internal-medicine specialist at the Mahatma Gandhi Institute of Medical Sciences. Biocon did not respond to a request for comment on scientists' criticisms of its trial, although it started a post-marketing trial in October.

It is not clear how long the drugs will continue to be approved for emergency use. In the United States, companies need full approval to sell their products beyond the emergency period. This typically requires them to conduct a robust clinical trial, known as a phase III trial, in thousands of people. Kalantri says the Indian regulator should ask pharmaceutical companies to set up such trials to show that the drugs actually work.