

Medical drugs

'Disturbing' number of sedatives prescribed in the US

Jessica Hamzelou

BENZODIAZEPINE drugs are prescribed at about 66 million doctors' appointments a year in the US, according to a report by the US National Center for Health Statistics. This means that for every 100 adults visiting an office-based doctor, 27 visits result in a prescription for a benzodiazepine.

The figures are based on surveys conducted between 2014 and 2016. "The statistics we have are disturbing, and everyone should be concerned about bringing them down," says Lois Platt at Rush University in Chicago.

Benzodiazepines are sedatives often prescribed for sleep disorders and anxiety. They can be addictive and overdoses can be fatal.

A third of the recorded US benzodiazepine prescriptions were given alongside a prescription for an opioid painkiller. This is especially concerning, because it is easy to overdose when taking the drugs together, says Rebecca McDonald at King's College London. "Benzodiazepine deaths have gone up substantially over the past two decades in the US," she says. "Almost all cases also involved opioids."

"Our finding suggests that most patients prescribed these medications might be long-term users of these drugs," says Loredana Santo at the National Center for Health Statistics.

That is also worrying, says Benedict Hayhoe at Imperial College London. "We should be avoiding using benzodiazepines in the long term."

Platt hopes that prescriptions in the US will start to fall as more people become aware of the dangers of benzodiazepines.

That is what seems to be happening in the UK. A report by Public Health England published last year found a decrease in prescribing rates of benzodiazepines between 2015/16 and 2017/18. ■

Space exploration

How to sprout a garden on the moon's far side

Donna Lu

CHINA'S Chang'e 4 lunar lander captivated global attention when a cotton seed on board became the first plant ever to germinate on another world – and now the engineer behind this moon garden has revealed just how it was done.

Cotton, *Arabidopsis*, potato and rape seeds, as well as yeast and fruit fly eggs, were all inside a 2.6-kilogram biosphere on Chang'e 4 when it landed on the moon's far side in January 2019.

Months of uncertainty and planning led to the successful mission, says Xie Gengxin at Chongqing University, the experiment's chief designer.

The idea to send a biosphere to the moon was selected from 257 suggestions submitted by Chinese students in 2016.

Rice and *Arabidopsis* have been grown on China's Tiangong-2 space lab and plants have been cultivated on the International Space Station, but those experiments were conducted in low Earth orbit, at an altitude of about 400 kilometres. The cosmic radiation on the moon – 380,000 kilometres from Earth – makes it a more

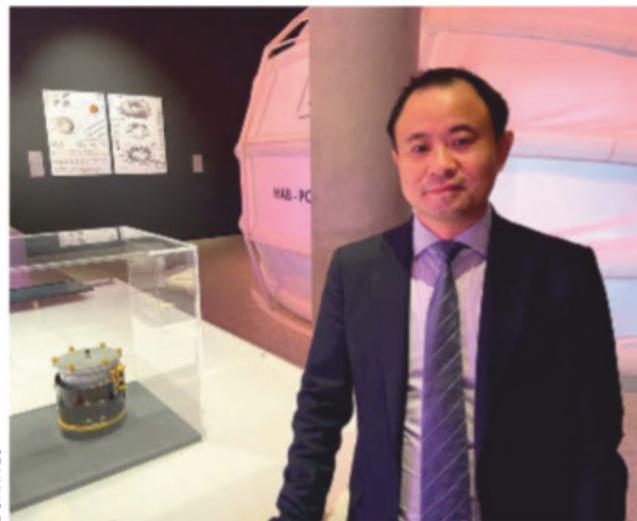


CHONGQING UNIVERSITY-CLEP

A camera caught a glimpse of seedlings on the moon

challenging environment.

Given limited space on the lander, the experiment had to be small and light, says Xie. The cylindrical capsule his team designed was 19.8 centimetres high with a diameter of 17.3 cm. It had a rectangular seedbed inside, measuring 800 cubic centimetres. A pipe in the top



Xie Gengxin with a replica of his lunar garden

allowed sunlight to reach the plants, and the whole capsule was kept at Earth atmospheric pressure.

A replica is currently on display in the Design Museum's Moving to Mars exhibition in London.

The real capsule was powered up just under 13 hours after Chang'e 4 landed, at 11.19 pm on 3 January. The first order of business was remotely watering the seeds with a measured spritz of 18 millilitres.

The team had to consider in advance a number of things that could go wrong during the mission. In addition to camera or data transmission failures, these included the possibility that the water might be released too early or not at all, or that the pipe to let in sunlight might get blocked by moon dust.

The capsule's two cameras photographed the seedbed every 10 hours. Images confirmed that the seeds weren't watered before Chang'e 4 launched from Earth and that none of the seeds had sprouted prematurely.

Once on the moon, the cotton plant sprouted two leaves and its root system grew horizontally rather than down into the soil, probably as a result of the weak lunar gravity. The rape and potato seeds also sprouted on the moon.

The team is uncertain whether the fruit fly eggs hatched, says Xie – if they did, they weren't caught on camera.

The temperature on the surface of the moon reaches highs of 127°C in daytime. But by using two cooling plates, the team was able to limit the daytime temperature inside the biosphere to under 36.5°C. The plant lived for the equivalent of nine Earth days, until the moon's far side

"If astronauts can see living, green things in space, it's sure to raise their spirits"

turned away from the sun. Temperatures on the moon drop to -173°C during the lunar night, which lasts for a fortnight.

Although the team knew the plant wouldn't survive the cold, the capsule wasn't powered down until 9 May. After months of experimentation, the capsule had lost some air, with a pressure reading of 0.9 Earth atmospheres.

Future research will focus on how to improve and cultivate more ecosystems in space, says Xie. "If astronauts or space tourists can breathe oxygen generated by plants and see living, green things in space, it's sure to raise their spirits," he says. ■