



Radar tracks on Mars's Planum Australe show the location of a potential buried lake (in blue).

► Orbiting probes have spotted ice, including buried glaciers, in many locations. Spacecraft have photographed steep slopes whose appearance changes seasonally, as if liquid water is running downhill and leaving dark marks. And NASA's Curiosity rover has measured water vapour in the planet's atmosphere.

Orosei and his colleagues found the lake using a radar instrument called MARSIS aboard Mars Express, which launched in 2003. It sends radio waves bouncing off the planet's surface and subsurface layers; the way in which the radar signal reflects back reveals the type of material that is present, such as rock, ice or water. The scientists focused their search on the layers of ice and dust that cover the planet's south pole.

But the observations were frustratingly inconsistent. Mars Express sometimes saw a bright reflection in several locations, which did not reappear the next time the spacecraft flew over those sites. Finally, in 2012, the scientists decided to get MARSIS to send back raw data, instead of performing automated

processing before beaming the data to Earth. "This changed everything, and it was much more obvious to spot the bright reflectors," says Orosei.

The data showed the reflections coming from a 20-kilometre-long zone in a region known as Planum Australe. After ruling out other possible causes, such as carbon dioxide ice, the scientists concluded that the reflections were coming from subsurface water.

The lake is about 1.5 kilometres beneath Mars's icy surface and is at least 1 metre deep. To keep from freezing, the water must be very salty, Orosei says — perhaps similar to supersalty subglacial lakes reported in the Canadian Arctic earlier this year³. Salt-rich rocks beneath the Canadian lakes infuse the water and allow it to remain liquid, says Anja Rutishauser, a glaciologist at the University of Alberta in Edmonton. On Mars, salts known as perchlorates might be making the brine; in 2008, NASA's Phoenix spacecraft found perchlorates in soils near the planet's northern polar ice.

Mars might have had many similar lakes

in the past, when heat rising from deep in the planet melted some of the ice covering its polar regions, says Stephen Clifford, a planetary scientist who proposed the idea⁴ in 1987 and now works for the Planetary Science Institute in Houston, Texas. If life once thrived in ancient subsurface lakes, he says, the latest finding "raises support for the idea that life could still persist on Mars".

With liquid water and the right chemical elements available to supply energy, a buried martian lake would have the ingredients needed to sustain life — as long as it's not too salty, says John Priscu, a biogeochemist at Montana State University in Bozeman. But exploring it won't be easy. Priscu leads a team that aims to drill into Antarctica's subglacial Lake Mercer later this year; hauling tonnes of equipment and fuel there required weeks of traversing the Antarctic ice sheet with tractors. "There's no way you're going to get all that to Mars," he says.

But there are ways to learn more with spacecraft already in play. Green notes that NASA's InSight probe, which is scheduled to land near the martian equator in November, will measure heat flow in the top 5 metres of the surface there. Scientists can use those data to extrapolate how much heat might be rising from beneath the south polar cap, melting the ice and potentially creating more lakes.

Orosei says his team has glimpsed other bright reflections, but isn't ready to say whether or not they are lakes. More studies using MARSIS, as well as the radar on board NASA's Mars Reconnaissance Orbiter — which has looked at Planum Australe and not seen the reflections — could help to reveal whether these are actually liquid water or something else, Plaut says. ■

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2. Plaut, J. J. *et al. Science* **316**, 92–95 (2007).
3. Rutishauser, A. *et al. Sci. Adv.* **4**, eaar4353 (2018).
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PUBLIC HEALTH

China vaccine scandal unlikely to dent immunization rates

Vaccines are compulsory for children starting school in China, and enjoy public support.

BY NICKY PHILLIPS

Problems with two Chinese-made vaccines — one of which was distributed to clinics and possibly injected into hundreds of thousands of children — have led to arrests and made international headlines.

But researchers who study vaccination in China don't expect a major effect on the country's high immunization rates.

Widespread support for immunization programmes, combined with strict vaccine requirements for children starting school, means that most parents will continue

vaccinating their children, they say.

"I don't think there'll be an appreciable drop in vaccine coverage but it could impact when people get vaccines, and where the vaccines come from," says Abram Wagner, an epidemiologist at the University of Michigan in Ann Arbor who has interviewed Chinese parents

about their views on immunization.

On 15 July, China's national drug watchdog revealed that during a surprise inspection of vaccine maker Changchun Changsheng Biotechnology's facilities in the province of Jilin, it found that the company had faked production data for several batches of the rabies vaccine. Authorities ordered that the doses be disposed of and revoked the company's manufacturing permit for that vaccine; it is not clear whether anyone received the faulty doses.

Five days later, local government investigators announced that the same company had violated standards in making about 250,000 doses of the DTP vaccine, which protects against diphtheria, tetanus and pertussis (whooping cough), rendering the doses potentially ineffective. For that breach, the company says it was fined 3.44 million yuan (US\$505,000).

It is not known how many children received the faulty DTP vaccines, which were recalled when the problem was uncovered by authorities in November, but so far no health issues have been reported. The main concern is that these vaccines won't protect children from the dangerous infections that they're meant to combat, says Wagner.

Parents turned to social media to voice their anger at the company and their concerns about domestic vaccines. But Xiaomin Wang, a social scientist at Zhejiang University Institute for Social Medicine in Hangzhou, agrees that the scandal is unlikely to reduce child immunization rates.

PARENTS SURVEYED

In 2016, when Chinese authorities discovered that childhood vaccines rendered ineffective by improper storage had been distributed to medical clinics across the country over five years, Wang and her colleagues went out and asked parents about their views on vaccines. They found that parents had very low faith in the safety of domestically produced vaccines, which make up 95% of vaccines given in China — only 11% said they trusted them. But the researchers also found that more than half of parents surveyed still intended to rely on them to vaccinate their children (X. Wang *et al.* *J. Health Commun.* **23**, 413–421; 2018).

The disparity between parents' trust in domestic vaccines and their willingness to use them is probably influenced by several factors,



China has one of the world's highest rates of vaccination coverage.

including cost and availability, says one of Wang's collaborators on the survey, Leesa Lin, who studies social behaviour and risk perception at the Harvard T. H. Chan School of Public Health in Boston, Massachusetts.

Although the government subsidizes many domestic-made vaccines, those who have access to and can afford foreign-made vaccines are likely to seek them out, says Lin. "When an incident like this happens, the public might seek safer alternatives but would not give up on vaccination," she says.

She attributes this, in part, to a widespread understanding of the benefits of vaccines, after decades of government campaigns promoting immunization. China has one of the world's highest vaccination coverage rates — for example, 99% of Chinese infants receive the required three doses of the DTP vaccine, compared with 85% of infants globally, and 95% in the United States. Lin and the team are about to submit for publication results from another survey, which confirmed parents' strongly-held faith in the benefits of vaccination programmes.

Those results stand in contrast to the attitudes of some small groups of parents in Europe and the United States who resist vaccinating their children, citing unfounded

safety concerns or religious reasons, says Lin. "In China, those factors do not play much of a role."

Lin and Wang plan to survey parents again in the coming months to improve understanding of the factors that influence their decisions.

Wagner notes that the DTP vaccine is mandatory for children starting school in China and that such requirements contribute to the country's high vaccine uptake. Some parents might delay vaccination in the wake of the latest scare, but they are unlikely to risk their child being denied entrance to school, he says. He adds that it's particularly hard to get an exemption from such requirements in China, compared with other countries that have similar rules.

REPAIR TRUST

Wagner hopes that Chinese officials will be more transparent about what happened at Changchun Changsheng than they were during the 2016 scandal, and that they will take stronger action to prevent another incident. At the time, the government promised to improve oversight of vaccine manufacturing and transportation, he says. "They talked big, but I'm not exactly sure what they did," he says. "I hope that they'll learn some lessons from this event and implement tighter regulations."

There are already encouraging signs. Several Changchun Changsheng executives, including the chair, have been arrested, and Chinese President Xi Jinping has said that the events are shocking and has ordered an investigation of the vaccine production chain. "This is a step forward compared to last time," says Lin.

China's vaccine makers will also have to convince international markets that their vaccines are safe and effective if the country is to become a major global producer, says Wagner. "Vaccines and pharmaceutical products could be a huge industry for them." ■

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