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Environment

Antibiotics on crops may harm the ability of bees to find food

Gary Hartley

EXPOSURE to streptomycin, an antibiotic used to treat crop diseases in the US, weakens the foraging capabilities of the common eastern bumblebee, which may have negative implications for plant pollination.

The use of antibiotics for spraying crops has increased exponentially in recent years, with streptomycin predominantly used in the US to control the bacterial disease fire blight in apple and pear orchards.

To assess the impact of contact with the drug on a key pollinator, Laura Avila at Emory University in Atlanta, Georgia, and her colleagues fed a group of eastern bumblebees (*Bombus impatiens*) a diet of sucrose mixed with streptomycin at a concentration of 200 parts per million – representative of strengths used to spray crops. A control group received sucrose alone. After two days on these diets, the bees were given a series of tests.

Bees exposed to streptomycin took longer to be trained to associate sucrose and water with different coloured strips of card soaked in the liquids. Also, in a 2-hour foraging test in which the bees were tracked by radio tags, they visited fewer sucrose-filled artificial flowers than bees in the control group (*Proceedings of the Royal Society B*, doi.org/hhw6).

"We are conducting follow-up work to see if these behavioural effects are driven by changes in the bee gut microbiome," says Avila.

"Laboratory studies from other research groups have shown that antibiotics can – unsurprisingly – disrupt bee gut microbiomes," she says, "and work in other insects has shown microbiome changes can impact insect behaviour."

The researchers are also beginning to assess the levels of exposure to the drugs faced by bees in the real world when they are sprayed on crops. ■

Analysis Space junk

Whose rocket is about to hit the moon? A chunk of space junk will hit the lunar surface this week and it is troubling that no one is admitting responsibility, finds Jonathan O'Callaghan



CHINA has denied it is the owner of a rocket that is about to hit the moon – but experts believe it is.

The confusion has highlighted our inadequacies in tracking space junk, particularly at remote distances from Earth. The impending collision also has implications for the idea of returning humans to the moon this decade.

In January, astronomers announced that a human-made object was set to hit the far side of the moon on 4 March.

Initially identified as the upper stage of a SpaceX Falcon 9 rocket that took off in 2015, later analysis showed it was more likely to be part of a Chinese rocket launched to the moon in 2014, a practice run for returning lunar samples to Earth in 2020.

China disagrees. In a press conference on 21 February, Wang Wenbin, a spokesperson for China's foreign ministry, said the country's data showed the rocket had previously "entered into Earth's atmosphere and completely burned up", letting China off the hook.

But Bill Gray, an independent astronomer in the US, believes China has mistaken debris from

a later mission in 2020 for debris from the practice mission in 2014.

"We have increasingly solid evidence," says Gray, including analysis of paint on the object headed towards the moon that links it to China. "I don't think anybody at this point is seriously considering it being anything else."

The issue has highlighted that tracking space debris, especially at large distances from Earth, is extremely difficult.

Experts use launch data to estimate where objects like these will go, but making accurate

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Lunar missions are planned for this year alone

predictions without an easy way to follow them in space – particularly if they fly past the moon – is difficult.

"It's an intrinsically hard problem," says Jonathan McDowell at the Harvard-Smithsonian Center for Astrophysics. "Sometimes, we make mistakes."

While debris is tracked in low Earth orbit by organisations like the US military, there is no official

On 4 March, a mystery rocket will crash into the far side of the moon

body tasked with tracking debris further out to the moon's orbit. Instead, people like Gray and McDowell do the job in their spare time. "We are the only people keeping track of these things," says Gray.

That doesn't pose many problems for now; only a few dozen human-made objects are in distant orbits around the moon.

But lunar activity is set to increase in the coming years, with multiple uncrewed missions set to launch before NASA hopes to return humans there later this decade.

"We've got nine missions going to the moon this year alone," says Alice Gorman at Flinders University in Adelaide, Australia. "Fast forward 10 years and somebody might have an industrial installation at the moon's south pole. If there's an uncontrolled re-entry of some random thing, those risks are very different."

Holger Krag, space safety manager for the European Space Agency, says one solution might be to designate regions of the moon where objects can be disposed, similar to how a portion of the South Pacific Ocean is used to crash dead spacecraft and even entire space stations. "We need to decide on these things pretty soon," says Krag. Spent rocket boosters could also be equipped with tracking beacons "so you always know where they are", says Gorman.

For now, our knowledge of these objects relies on the spare time of people like Gray. "I don't think this really should be something that is left to one person," he says. "I may wind up getting a different job." ■