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Animals

Noise-cancelling genes stop bats losing their hearing

James Urquhart

ECHOLOCATING bats have noise-cancelling genes that may help explain why they don't go deaf despite emitting very loud ultrasonic sounds as they fly.

Most bats produce intense, high-pitched sounds that bounce off objects, letting them navigate and find food in the dark. These sonar calls are beyond human hearing and are often louder than 100 decibels.

A conversation between people is at about 60 decibels, but prolonged exposure to noise above 80 decibels can cause ear damage in most mammals, including us. Above 120 decibels, it becomes painful. Extreme noise can irreparably harm sensitive hair cells in a mammalian cochlea (a spiral-shaped cavity in the ear) that are required in hearing.

Echolocating bats have a muscle in their ears that dampens incoming sounds, but the effect isn't enough to explain how their hearing – which is essential for their echolocation abilities – isn't damaged by the cacophony they make when flying.

Seeking an answer, Peng Shi at the Chinese Academy of Sciences and his colleagues attached brainwave-recording electrodes to the heads of anaesthetised mice, a non-echolocating fruit bat species and five echolocating bat species. Sounds within their hearing range were then played to them at 120 decibels for 2 hours. A week later, the researchers performed the same experiment again.

Results showed that the mice and fruit bats experienced hearing loss and had lost a significant amount of cochlear hair cells, but the echolocating bats were unaffected. By comparing the genetics of bats that do and don't echolocate, the team found that the five species of echolocating bats have several genes that overproduce proteins that seem to protect their cochlear hair cells (*Journal of Genetics and Genomics*, doi.org/gnz4).

Space

Methane-burping microbes may live near Curiosity rover

Jonathan O'Callaghan

NASA/JPL-CALTECH/MSSS

NASA's Curiosity rover has been sniffing for methane

AN UNKNOWN source may be producing methane close to NASA's Curiosity rover, with potential implications for life on Mars.

Since Curiosity landed in Gale crater on Mars in 2012, it has used an instrument called the Tunable Laser Spectrometer (TLS) to measure the amount of atmospheric methane in its vicinity.

For most of the time, it has recorded a very low background level of about 0.41 parts per billion. But on six occasions, Curiosity has witnessed methane spikes, in which methane levels have risen at least tenfold – with one spike registering a methane concentration of almost 10 parts per billion.

The cause of the methane spikes is unclear, so Yangcheng Luo at the California Institute of Technology and his colleagues generated a model to try to work out where they were coming from.

Taking into account factors such as the local wind speed and direction at the time a spike was detected, they were able to pinpoint a possible source a few dozen kilometres away from Curiosity inside the 150-kilometre-wide Gale crater (*Research Square*, doi.org/gnsc).

"[The results] point to an active emission region to the west and the southwest of the Curiosity rover on the northwestern crater floor," the team writes in its paper.

10

parts per billion of methane detected by Curiosity

"This may invoke a coincidence that we selected a landing site for Curiosity that is located next to an active methane emission site."

If correct, this would be the most accurate localisation of a methane source ever on Mars.

"This would make this site interesting to visit, or other similar sites that could have the same properties," says Håkan Svedhem, the project scientist for the European Space Agency's Trace Gas Orbiter (TGO), which is currently orbiting Mars.

Although Curiosity has detected methane at the surface, the TGO has found nothing in the atmosphere. The reason for this is unclear, and is perhaps linked to Curiosity performing its searches for methane at night when the Martian atmosphere is calmer. But another possibility is that Curiosity just happens to sit near a methane source.

John Moores at York University in Toronto, Canada, says it is possible this source is some sort of crack or "seep" in the surface, leaking methane from underground, but it could be hard to locate.

"It's a bit of a haystack," he says. "It could be covered by dust and be almost impossible to find."

Finding the source of methane on Mars could play an important role in working out its origin. On Earth, "probably 95 per cent of methane is of biological origin", says Svedhem, and scientists have wondered if the same might be true on Mars, perhaps indicating the presence of some form of microbial life. "Our hope was that we could see sufficient amounts of it and determine if it is a biological or not biological origin," says Svedhem.

We aren't yet any closer to that yet, but with methane on Mars expected to have a detectable lifespan of no more than 300 years or so, its continued presence on Mars "indicates that something is producing methane today", says Moores. It is possible the source is geological, connected perhaps to asteroids or comets hitting Mars, but the prospect of a biological origin remains a possibility.