

Playful rats reveal brain region that drives ticklishness

Experiments also reveal that rats are ticklish in similar places to humans.

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Like people, rats are ticklish. Now, by implanting electrodes in the brains of these laboratory workhorses, researchers have identified the brain region that seems to drive the trait — an insight that could illuminate the origins of ticklishness in people.

The work, published in the 11 November issue of *Science*¹, also reveals that rats' susceptibility to tickling is affected by mood, rather like in people. Separate from the study, the researchers say they have found that rats are ticklish in similar places to people — on their tummies and back paws, but not on their backs or on their front paws.

In the late 1990s, neuroscientist Jaak Panksepp, who was then of the Bowling Green State University in Ohio, discovered that rats make ultrasonic 'chirps' when being tickled and while playing², which may be similar to human laughter.

Several other animals are ticklish, including dogs and chimps, but rats seem particularly so, and are easy to handle in the lab. So neuroscientists Michael Brecht and Shimpei Ishiyama of the Bernstein Center for Computational Neuroscience in Berlin decided to use the animals to probe what is going on in the brain.

Backs, bellies, tails

They inserted eight wire electrodes into the tiny somatosensory area — the part of the mammalian brain that responds to touch on the skin — into five rats. Then they tickled the animals on their backs, bellies and tails and recorded the ultrasonic chirps.

The neurons in the trunk of the somatosensory cortex fired intensely in response to belly tickling, but less to tickling on the back and hardly at all to that on the tail. The intense firing correlated with a specific chirp pattern.

Brecht and Ishiyama then investigated whether they could get the animals to make the sound simply by stimulating the trunk of the somatosensory cortex — and found that they could, concluding that the region is key to ticklishness.

When the pair tickled rats while they were on an elevated platform under bright light, a situation designed to induce anxiety, the usual

chirping-response was reduced: they conclude that fear suppresses activity in the somatosensory cortex. The fact that rats are ticklish in the same spots as humans, meanwhile, suggests ticklishness may have a hard-wired neural anatomy that is shared between some animals, they say.

Chirping like crazy

The researchers recorded activity in the somatosensory cortex not only during tickling, but also when the rat chasing their hands, says Brecht, even when they didn't touch the animal. This chimes with what some researchers, including Panksepp, suspect is why ticklishness evolved: to promote social bonding and play. "The first animal I tickled chirped liked crazy. And the ones that chirped the most also started to chase our hands for fun," recalls Panksepp, who is now at Washington State University in Pullman. The finding fits with the observation that lab mice do not seem to be ticklish — and are also not playful like rats.

Panksepp is delighted that other scientists have built on his earlier research, and commends the work. But he would like to see an experiment that probes whether the rats actively seek out direct stimulation of the somatosensory cortex to confirm that the chirping produced when this part of the brain is directly stimulated is a sign of enjoyment.

Another suggestion comes from Chris Frith, neuropsychologist and professor emeritus at the Wellcome Trust Centre for Neuroimaging at University College London. In 1998, he used brain scans to show that most people will not respond to self-tickling because the region of the brain called the cerebellum, which seems to predict what kind of feeling a movement will cause, cancels out the tickling sensation³. People with schizophrenia, who have difficulty distinguishing sensations from the outside world and those that they trigger, can tickle themselves, though.

"The next step would be to look at self-tickling in rats," he says. But he acknowledges that "it might be difficult to get rats to tickle themselves".

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References

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