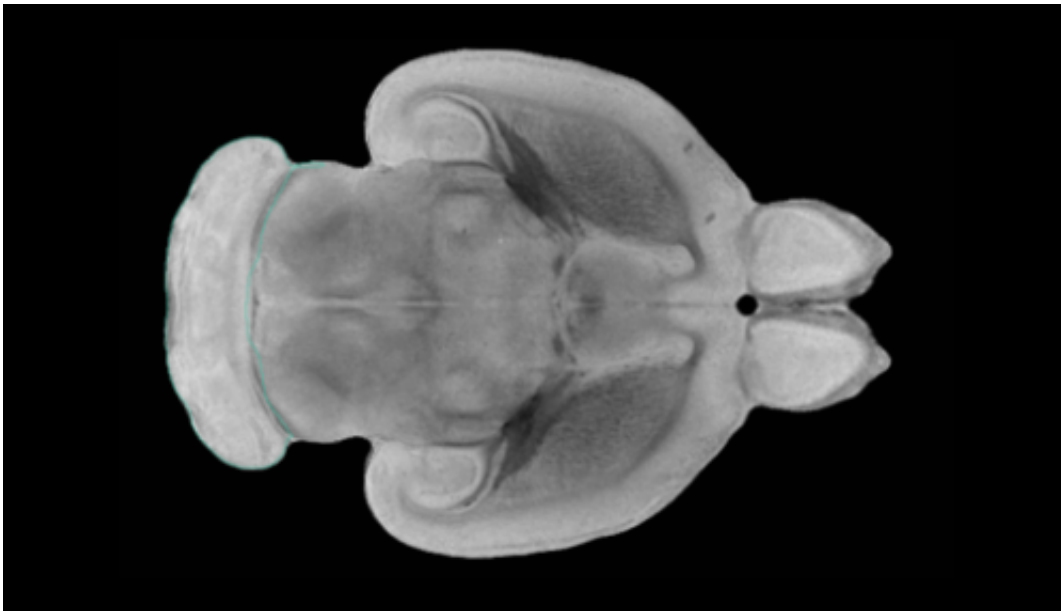


# 'Mystical' psychedelic compound found in normal brains

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Cerebellum of CIVM postnatal rat brain atlas. Credit: Neurolex

In the past few years, thrill-seekers from Hollywood, Silicon Valley and beyond have been travelling to South America to take part in so-called Ayahuasca retreats. Their goal: to partake in a brewed concoction made from a vine plant *Banisteriopsis caapi*, traditionally used by indigenous people for sacred religious ceremonies. Drinkers of Ayahuasca experience short-term hallucinogenic episodes many describe as life-changing.

The active ingredient responsible for these psychedelic visions is a molecule called dimethyltryptamine (DMT). For the first time, a team led by Michigan Medicine has discovered the widespread presence of naturally-occurring DMT in the [mammalian brain](#). The finding is the first step toward studying DMT— and figuring out its role—within the brains of humans.

"DMT is not just in plants, but also can be detected in mammals," says Jimo Borjigin, Ph.D., of the Department of Molecular and Integrative Physiology. Her interest in DMT came about accidentally. Before studying the psychedelic, her research focused on melatonin production in the [pineal](#) gland.

In the seventeenth century, the philosopher Rene Descartes claimed that the pineal gland, a small pinecone-shaped organ located deep in the center of the [brain](#), was the seat of the soul. Since its discovery, the pineal gland, known by some as the third eye, has been shrouded in mystery. Scientists now know it controls the production of melatonin, playing an important role in modulating circadian rhythms, or the body's internal clock. However, an online search for notes to include in a course she was teaching opened Borjigin's eyes to a thriving community still convinced of the pineal gland's mystical power.

The core idea seems to come from a documentary featuring the work of researcher Rick Strassman, Ph.D. with the University of New Mexico School of Medicine. In the mid-1990s, he conducted an experiment in which human subjects were given DMT by IV injection and interviewed after its effects wore off. In a documentary about the experiment, Strassman claims that he believed the pineal gland makes and secretes DMT.

"I said to myself, 'wait, I've worked on the pineal gland for years and have never heard of this,'" she said. She contacted Strassman, requesting

the source of his statement. When Strassman admitted that it was just a hypothesis, Borjigin suggested they work together to test it. "I thought if DMT is an endogenous monoamine, it should be very easy to detect using a fluorescence detector."

Using a process in which microdialysis tubing is inserted into a rat brain through the pineal gland, the researchers collected a sample that was analyzed for—and confirmed—the presence of DMT. That experiment resulted in a paper published in 2013.

However, Borjigin was not satisfied. Next, she sought to discover how and where DMT was synthesized. Her graduate student, Jon Dean, lead author of the paper, set up an experiment using a process called in situ hybridization, which uses a labeled complementary strand of DNA to localize a specific RNA sequence in a tissue section.

"With this technique, we found brain neurons with the two enzymes required to make DMT," says Borjigin. And they were not just in the [pineal gland](#).

"They are also found in other parts of the brain, including the neocortex and hippocampus that are important for higher-order brain functions including learning and memory."

The results are published in the journal *Scientific Reports*.

Her team's work has also revealed that the levels of DMT increase in some rats experiencing cardiac arrest. A paper published in 2018 by researchers in the U.K. purported that DMT simulates the near death experience, wherein people report the sensation of transcending their bodies and entering another realm. Borjigin hopes to probe further to discover the function of naturally occurring levels of DMT in the brain—and what if any role it plays in normal brain functions.

"We don't know what it's doing in the brain. All we're saying is we discovered the neurons that make this chemical in the brain, and they do so at levels similar to other monoamine neurotransmitters."

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