Scientists are unlocking the neurological code of dissociation, a form of altered consciousness that is frequently associated with psychedelic drug use. The findings, published in Nature, point toward a possible future when psychedelic states can be created through technology rather than substances

Using data obtained from sophisticated brain imaging technology as their guide, a team of bioengineers from Stanford University were able to manipulate the activity of neurons in the brains of mice, getting them to fire in synchronized rhythms that recreate patterns correlated with dissociative states. Even more significantly, the researchers were able to recreate the same rhythmic patterns in the brain of one human test subject, who suffered from a form of epilepsy that causes dissociative episodes.

Initially, some of the mice used in the experiment were fed doses of ketamine, an anesthetic with psychedelic qualities that will cause dissociation if taken in large enough quantities. During follow-up monitoring, the researchers discovered rhythmic and coordinated firing of neurons in the retrosplenial cortex, an area of a mouse's brain that acts as an interface for a range of cognitive functions.

"It was like pointing a telescope at a new part of the sky, and something really unexpected jumped out at us" Dr. Karl Deisseroth, a Stanford neuroscientist who participated in the project, told NPR. ."

Excited by the implications of this discovery, the researchers turned to a cutting-edge technology known as optogenetics, which relies on finely-tuned, precisely-aimed light beams to provoke neural responses in individual cells. Applying optogenetic techniques, they were able to replicate the neural patterns of dissociation in the brains of mice that had not been given ketamine.

Neural activity in the brain of the human subject was monitored through electrodes that had been implanted by doctors, to aid in the treatment of their epilepsy. When the patient reported dissociative symptoms, the scientists detected rhythmic oscillations in an area of the brain known as the posteromedial cortex (PMC), which is connected to self-awareness and self-reflection and is structurally analogous to the retrosplenial cortex in the brains of mice.

Once again, the scientists were able to replicate these patterns of activity artificially, this time using high-frequency electrical signals. During this procedure, the patient reported symptoms of dissociation that were identical to those produced as a side effect of the epilepsy, proving that the link between rhythmic brain patterns and dissociation were more than coincidental.

**Exploring the Therapeutic Potential of Dissociation**

Rhythmic oscillations in the brain are associated with integrated consciousness, learning, and memory. They strengthen neural connections and induce more vibrant functioning at the cellular level.

Conversely, scattered or chaotic firing of neurons is a sign of dysfunction. This type of activity is associated with debilitating neurological conditions like Parkinson's disease, schizophrenia, and epilepsy.

When someone experiences dissociation, their conscious awareness seems disconnected from their mind, body, and the surrounding environment. Dissociation represents a profound dislocation of consciousness, somewhat akin to an out-of-body experience.

But as these latest experimental findings make clear, dissociation is not synonymous with neural chaos, unlike the epilepsy that sometimes precipitates it. It is instead an alternative form of consciousness that can emerge under certain unusual circumstances, sparked by a diverse range of potential causal factors.

If experienced frequently and organically, dissociation can be a sign of mental illness. But when carefully controlled, the invocation of dissociative states can have actual therapeutic value.

Psychedelic-assisted (ketamine) therapy, which leverages the drug's capacity to cause dissociation, has proven especially useful for the treatment of depression. The changes in consciousness caused by dissociative episodes appear to relieve the symptoms of depression within a few hours, producing strong anti-depressant effects that may last for a week or more.

A 2019 study published in the journal *Science* found that the therapeutic consumption of ketamine can rapidly improve the functioning of mood-related brain circuitry. The drug helps regenerate broken or frayed connections between individual neurons within these circuits, by initiating the creation of new synapses (connectors) to replace those that have been lost. Synaptic destruction is a known side effect of stress, and exposure to chronic, long-term stress is believed to play a vital causative role in the onset and continuation of depression.

Notably, when doses of ketamine are too low to cause dissociation, they don't appear to offer the same benefits.

See Also

Health

New Study Shows Ayahuasca's Benefits When Used in a Traditional Setting

"There seems to be this link between dissociation and the anti-depressive effect of ketamine," explains Dr. Ken Solt, an anesthesiologist from Harvard Medical School who helped summarize the results of Stanford University study for an accompanying article.

Ketamine use can facilitate the mind-altering rhythms that correlate with dissociation. But theoretically, any process that can spark the firing of neurons in a controlled manner, in sequence and in predictable patterns, could produce these same rhythms. Presumably, dissociative states could therefore be created on demand, eliminating the need for any chemical supplement.

**The Promise of Psychedelic-Assisted Therapy—and Its Alternative**

Psychedelic-assisted therapy relies on the mind-altering effects of ketamine to cause positive changes in neural functioning. But now that scientists have discovered a way to recreate that drug's distinctive neural signature of dissociation, it may be only a matter of time before simulated forms of psychedelic-assisted therapy will be developed, possibly using optogenetic techniques like those adopted in the Stanford study.

As of now, ketamine is used primarily to treat depression. But preliminary research into the drug's effect on PTSD and bipolar disorder has yielded positive outcomes for these conditions as well.

Psychedelic-assisted therapy may ultimately prove beneficial for men and women suffering from a broad variety of mental health conditions. If technologically-based methodologies for creating dissociative states can duplicate those results, they could function as an attractive alternative treatment for professionals and patients who aren't comfortable prescribing or using psychedelics.

*Image: Bret Kavanaugh*