

Comparing the impacts of propofol and ketamine on the brain

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One 10 ml vial of 1000 mg ketamine. Credit: Psychonaught/Wikipedia

A team of researchers at Indiana University has tested the effects of

propofol and ketamine on the brains of macaques as a means to better understand what happens when humans ingest the drugs. In their paper published in the journal *Royal Society Open Science*, the group describes electrophysiological activity they recorded from the cerebral cortex of two macaques after they were given propofol and ketamine.

The [drug ketamine](#) has been in the news in recent years due to its increasing use as an illicit drug—people who take it experience dissociative, dreamlike states and hallucinations. Prior to its current popularity as a party drug, ketamine was used as an anesthetic for both human and animal patients. Its use in such a way was mostly discontinued, however, as propofol was found to be a better option.

Prior research has shown that ketamine produces sensory detachment because it blocks glutamate receptors in the [brain](#). This leads to increased levels of glutamate, which results in feelings of disassociation. But ketamine can also lead to unconsciousness, which is why it was used as an anesthetic. In this new effort, the researchers wanted to know more about the different ways that ketamine and propofol impact the brain, so they compared the two using macaques.

The work by the team involved giving two adult macaques ketamine and propofol on different occasions and then studying their brain waves. They also obtained electrocorticographical recordings of macaques made by other researchers working on prior research efforts, to use as a benchmark.

In looking at their data, the researchers found that ketamine induced a dual state in the brain—one was of normal consciousness and the other a form of anesthetic sleep. This led to a sort of liminal space where aspects of both states were present—one of them looked a lot like the state a brain was in when under the influence of [propofol](#), while the other was similar to a sleeping, non-drug influenced state. They found

that plotting the data on a graph showed roughly the same thing—that the brain existed in both an unconscious and semi-conscious state at the same time. They suggest it is the dual state nature in the brain that produces the feelings of disassociation.

More information: Thomas F. Varley et al, Topological analysis of differential effects of ketamine and propofol anaesthesia on brain dynamics, *Royal Society Open Science* (2021). [DOI: 10.1098/rsos.201971](https://doi.org/10.1098/rsos.201971)

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