Why marijuana affects different people differently

July 8 2019

Credit: University of Western Ontario

For some people, marijuana causes a rewarding high. For others, it produces serious psychiatric side effects.

Whether a person enjoys the experience or adverse effects from cannabis may well be decided by which region of the brain it's acting upon, Western researchers have determined.

The psychological effects of marijuana can differ between individuals: some experience highly rewarding effects which may lead to dependence on the drug, while others may experience paranoia, cognitive problems or an increased risk of developing schizophrenia.

"Until now, it was unknown which specific regions of the brain were responsible for these highly divergent effects of marijuana," said Steven Laviolette Ph.D., Professor at Western's Schulich School of Medicine & Dentistry.

"Translational rodent research performed in our lab has identified highly specific target regions in the brain that seem to independently control the rewarding, addictive properties of marijuana versus the negative psychiatric side-effects associated with its use."

The study, led by Laviolette and postdoctoral fellow, Christopher Norris, Ph.D., is newly published in *Scientific Reports* and reveals critical new insights into how marijuana can produce such highly diverse psychological effects in different individuals.

By looking at THC's effect on a rat brain, the researchers showed that THC, the main psychoactive compound in marijuana, can produce highly rewarding effects in the front-most part of a region of the brain called the nucleus accumbens.

The study showed that THC in this brain area not only produced highly rewarding effects in and of itself, it amplified the addictive properties of opioid drugs like morphine and increased reward-related activity patterns in the neurons.

By contrast, THC in the posterior area of the nucleus accumbens region produced highly adverse effects.

These included more schizophrenia-related cognitive and emotional symptoms and patterns of neuron activity similar to those found in people with schizophrenia.

"These findings are important because they suggest why some people have a very positive experience with marijuana when others have a very negative experience," said Norris.

"Our data indicate that because the reward and aversion are produced by anatomically distinct areas, the different effects between individuals is likely due to genetic variation leading to differential sensitivity of each area."

More information: Christopher Norris et al. The Bivalent Rewarding and Aversive properties of Δ9-tetrahydrocannabinol are Mediated Through Dissociable Opioid Receptor Substrates and Neuronal Modulation Mechanisms in Distinct Striatal Sub-Regions, *Scientific Reports* (2019). DOI: 10.1038/s41598-019-46215-7

Provided by University of Western Ontario