

The Cannabis-Psychosis-Schizophrenia Connection

Marijuana is popular because it alters perceptions. Psychosis revolves around misperceptions.

by Erik Messamore, MD, PhD



What is Psychosis?

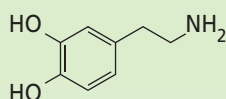
Psychosis is a neurological symptom involving unusual experiences or beliefs. It happens when the conscious mind tries to make sense of the misperceptions that can happen when the brain becomes inefficient at processing information.

What is Schizophrenia?

Schizophrenia is a form of long-term psychosis that can't be explained by other medical conditions. It often involves changes in important brain chemicals like dopamine, glutamate, anandamide, or serotonin.

The Chemical Effects of Cannabis resemble the Biochemistry of Psychosis.

DOPAMINE

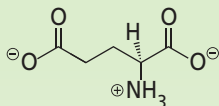


Dopamine is a chemical signal for significance. Misperceiving significance can lead to psychosis.

Chemical Effects of Cannabis

Cannabis triggers dopamine release.¹

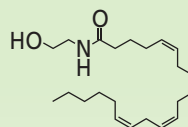
GLUTAMATE



Glutamate is the brain's most abundant neurotransmitter. It's especially important in the networks that form perceptions. Other drugs that reduce glutamate signals (like ketamine or PCP) can produce psychosis.

Cannabis reduces glutamate release.²

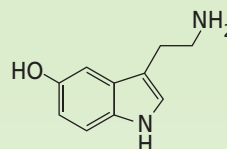
ANANDAMIDE



Named after the Sanskrit word for bliss, anandamide reduces brain inflammation and protects the brain against schizophrenia.

Cannabis reduces the level of protective anandamide.³

SEROTONIN



Serotonin is part of the brain circuits that create perception. Drugs like LSD or psilocybin produce their hallucinations by turning on the 2A-type of serotonin receptor.

Frequent exposure makes the hallucination-producing 2A-type of serotonin receptor more sensitive.⁵

Biochemistry of Psychosis

Most people with psychosis or schizophrenia release too much dopamine.

Many people with psychosis or schizophrenia have weak glutamate signals.

Low anandamide levels correspond to more severe symptoms of psychosis in people with schizophrenia.⁴

Many people with schizophrenia have abnormal 2A-type serotonin receptors.

- Sources:**
1. Bloomfield, M. A. P., Ashok, A. H., Volkow, N. D. & Howes, O. D. The effects of Δ^9 -tetrahydrocannabinol on the dopamine system. *Nature* 539, 369-377 (2016).
 2. Sánchez-Blázquez, P., Rodríguez-Muñoz, M. & Garzón, J. The cannabinoid receptor 1 associates with NMDA receptors to produce glutamatergic hypofunction: implications in psychosis and schizophrenia. *Front Pharmacol* 4, 169 (2014).
 3. Morgan, C. J. A. et al. Cerebrospinal fluid anandamide levels, cannabis use and psychotic-like symptoms. *The British Journal of Psychiatry* 202, 381-382 (2013). Koethe, D. et al.
 4. Anandamide elevation in cerebrospinal fluid in initial prodromal states of psychosis. *Br J Psychiatry* 194, 371-372 (2009).
 5. Ibarra-Lecue, I. et al. Chronic cannabis promotes pro-hallucinogenic signaling of 5-HT2A receptors through Akt/mTOR pathway. *Neuropsychopharmacology* 43, 2028-2035 (2018).

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Cannabis Causes Schizophrenia-Like Changes in Animals

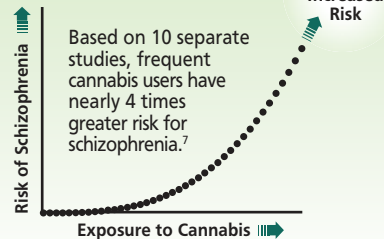
Giving THC to animals changes their:

- Emotional Response
- Social Behavior
- Motivation
- Activity
- Brain Function

in ways that resemble schizophrenia in people.⁶



Schizophrenia Risk Goes Up with More Frequent Cannabis Use



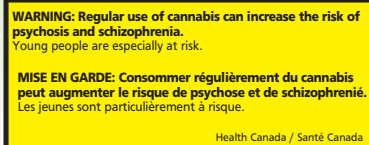
Cannabis Causes Schizophrenia-Like Changes in People

THC causes psychosis in healthy human beings and usually worsens symptoms in people with schizophrenia.⁸



Canadian Warning Label

The government of Canada requires this health warning on all cannabis packages.⁹



Links between marijuana and psychosis have been known for more than 150 years. Cannabis was widely used as a medicine during the 19th century. And medical textbooks from that era described a number of side effects, including psychosis.

A 1996 survey in New Zealand¹⁰ revealed that about 15% of people who have used marijuana experienced a side effect of psychosis. Modern studies also find higher rates of schizophrenia among cannabis consumers, with higher risk among more frequent consumers⁷.

The chemical effects of marijuana resemble the biochemical changes seen in psychosis or schizophrenia. The main active ingredient of marijuana is THC, and giving THC to rats creates a brain information processing abnormality usually seen in psychosis or schizophrenia. And healthy human volunteers will experience symptoms of psychosis when given THC or cannabis extracts under laboratory conditions.

As more and more states create medical marijuana programs, it's important to remember that all medications have side effects and that marijuana is not the right medicine for everyone.

- Sources:**
6. Renard, J., Rushlow, W. J. & Laviolette, S. R. What Can Rats Tell Us about Adolescent Cannabis Exposure? Insights from Preclinical Research. *Can J Psychiatry* 61, 328-334 (2016).
 7. Marconi, A., Di Forti, M., Lewis, C. M., Murray, R. M. & Vassos, E. Meta-analysis of the Association Between the Level of Cannabis Use and Risk of Psychosis. *Schizophr Bull* 42, 1262-1269 (2016).
 8. Sherif, M., Radhakrishnan, R., D'Souza, D. C. & Ranganathan, M. Human Laboratory Studies on Cannabinoids and Psychosis. *Biol. Psychiatry* 79, 526-538 (2016).
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