

This is Your Brain on LSD



Kayla Ortiz

Rafael Yitzhakian



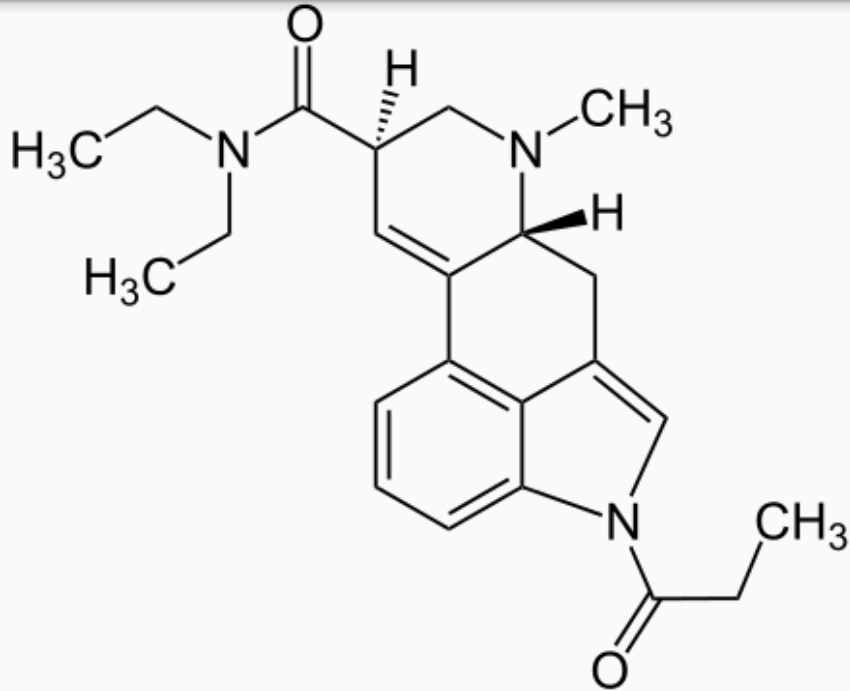
What is LSD?

What is LSD?

- LSD (acid)
 - Lysergic acid diethylamide
 - Hallucinogenic drug
 - Serotonergic psychedelic
 - Banned in the U.S. in the 60's
 - Classified as a Schedule 1 drug



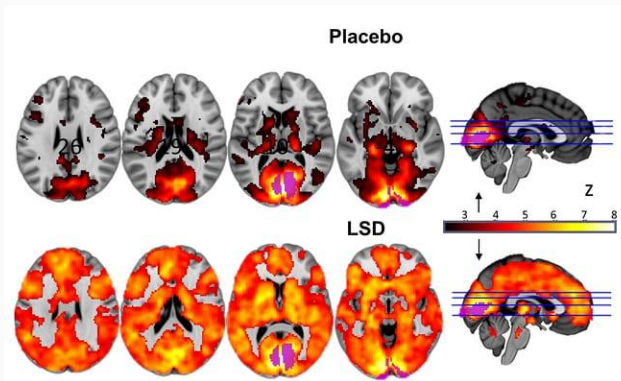
LSD Pharmacology



- LSD is an agonist that targets the 2A subtype 5-HT_{2A} and acts as a 5HT (Serotonin) receptor activator
- Acid works by mimicking Serotonin and binding to the 5-HT_{2A} receptor
- LSD can become addictive because it is a [dopamine agonist](#)

Effects of LSD on Brain Activity

- Researchers studied how brain activity is altered when people were given doses of LSD
 - Both an fMRI and MEG were used to measure the results

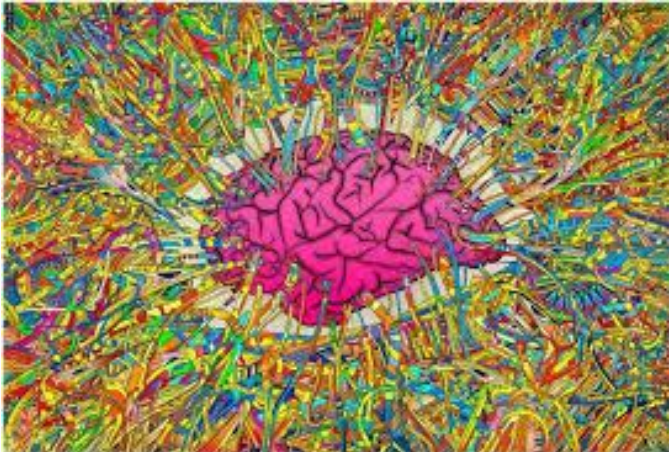


- Common effects of LSD: visual hallucinations and ego dissolution
 - Ego dissolution: an increased sense of unity with one's surroundings



Effects of LSD on Brain Activity

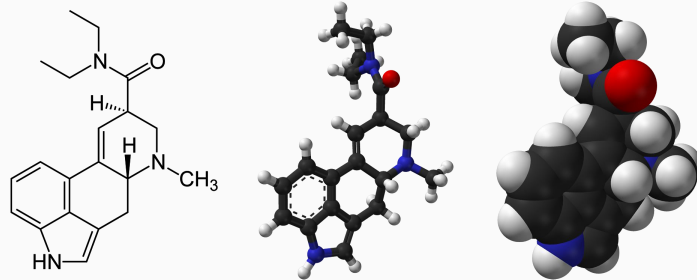
What did the fMRI and MEG results show?



- LSD-induced visual hallucinations showed:
 - ↑ in cerebral blood flow to the visual cortex
 - ↑ in connections between visual cortex and other brain regions
 - ↓ in visual cortex alpha waves
 - ↑ in uninhibited visual cortex activity
 - ↑ connectivity between normally unrelated brain regions

The Effects of LSD

- Euphoria
- Long Hallucinogenic Trips - Unusual



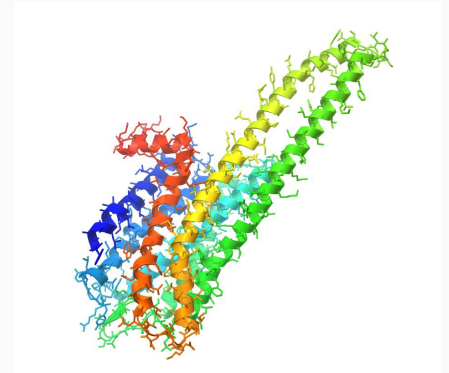
Mechanism of Action - LSD

- Three groups: Placebo, LSD, LSD + Kentaserin
- Kentaserin is a serotonin 2A antagonist
- LSD group was tripping + brain lit up in fMRI
- Placebo and Kentaserin groups felt the same and showed the same normal brain scans

Conclusion: LSD acts on serotonin 2A receptor

LSD - Long Lasting

- Serotonin 2A receptor has protrusion
- Most Neurotransmitters don't attach to protrusion
- LSD **Does** attach to the protrusion
- LSD remains attached to the receptor for longer than
Other neurotransmitters



Important Terms to Know

Psilocybin Mushrooms

- AKA Magic Mushrooms or Shrooms
- Hallucinogen
- Active ingredient: Psilocybin
- Comparable to LSD and Mescaline

Ergotamine

- A medication used to treat migraines



Mescaline

- Hallucinogen
- Naturally occurring psychedelic from the Peyote cactus
- Comparable to LSD and Shrooms

Buspirone

- A medication used to treat anxiety

How Psychedelics Can Help Treat Schizophrenia

- Psychotomimetics = mimic psychosis to study schizophrenia
 - Used to understand specific symptoms such as hearing voices, cognitive problems, and apathy and social disengagement
 - 75% of afflicted patients have cognitive problems
- Psychedelics used in experiment: LSD, Psilocybin Mushrooms, and Mescaline
 - all act on serotonin



How Psychedelics Can Help Treat Schizophrenia: Goals of Study

- Prevent a flood of serotonin and hallucinations caused by magic mushrooms (psilocybin)
- 2 antipsychotic medications being studied: Bupropion or Ergotamine
- Participants were divided into 3 groups:

Group 1 received one of the antipsychotics and the psilocybin

Group 2 received a placebo antipsychotic and the psilocybin

Group 3 received one of the antipsychotics and a placebo

How Psychedelics Can Help Treat Schizophrenia: Study Results



- Buspirone prevented visual hallucinations, flood of memories, and imaginative thinking
 - Common in early Schizophrenia and Parkinson's
- Parkinson's drug Pimavanserin blocks Serotonin 2A receptors
- Hypothesized that Buspirone binds to serotonin 1A receptors, which pair with and counteract the serotonin 2A receptors



Psychedelics - Good or Bad?

- Various studies: conflicting results
- Some say Psychedelics are beneficial to mental health
- Others say they are dangerous



The New Research Into Safety

- Study from Norwegian University of Science and Technology finds that:
- From random sample of 130,000 people from US Substance Abuse and Mental Health Services Administration's 2001–2004 National Survey on Drug Use and Health, 22,000 have used LSD, Peyote or Psilocybin.
- The research did not find any statistical link between use of psychedelics and mental health issues to implicate a negative causal link
- Instead, the researchers actually found a lower rate of psychological distress

Psychedelics - The Caveat

- Psychedelics Don't lead to more mental health issues in society
- They lead to Less mental health issues in society
- But...
- Just because they do help reduce mental issues in many people...
- Doesn't mean that they don't trigger mental health problems in other people
- This epidemiological research can't answer this question as it looks at the population's sum total