

HALLUCINOGENS

The Brain's Response to Drugs

A Library and Resource Center on Alcohol, Tobacco, Other Drugs, Mental Health and Wellness

BACKGROUND

Hallucinogens are drugs which cause altered states of perception and feeling and which can produce flashbacks. They include natural substances, such as mescaline and psilocybin that come from plants (cactus and mushrooms), and chemically manufactured ones, such as LSD and MDMA (Ecstasy). LSD is manufactured from lysergic acid, which is found in ergot, a fungus that grows on rye and other grains. MDMA is a synthetic mind-altering drug with hallucinogenic properties. Although not a true hallucinogenic in the pharmacological sense, PCP causes many of the same effects as hallucinogens and so is often included with this group of drugs.

Hallucinogens have powerful mind-altering effects:

- They can change how the brain perceives time, everyday reality, and the surrounding environment.
- They affect regions and structures in the brain that are responsible for coordination, thought processes, hearing, and sight.
- They can cause people who use them to hear voices, see images, and feel sensations that do not exist.

Researchers are not certain that brain chemistry permanently changes from hallucinogen use, but some people who use them appear to develop chronic mental disorders. PCP and MDMA are both addicting; whereas LSD, psilocybin, and mescaline are not.

Research has provided many clues about how hallucinogens act in the brain to cause their powerful effects. However, because there are different types of hallucinogens and their effects are so widespread, there is still much that is unknown.



MECHANISM OF ACTION

LSD (Lysergic Acid Diethylamide) binds to and activates a specific receptor for the neurotransmitter, serotonin. Normally, serotonin binds to and activates its receptors and then is taken back up into the neuron that released it. In contrast, LSD binds very tightly to the serotonin receptor, causing a greater than normal activation of the receptor. Because serotonin has a role in many of the brain's functions, activation of its receptors by LSD produces widespread effects, including rapid emotional swings, and altered perceptions, and if taken in a large enough dose, delusions and visual hallucinations.

MDMA (Methylenedioxy Amphetamine), which is similar in structure to methamphetamine, causes serotonin to be released from neurons in greater amounts than normal. Once released, this serotonin can excessively activate serotonin receptors. Scientists have also shown that MDMA causes excess dopamine to be released from dopamine-containing neurons. Particularly alarming is research in animals that has demonstrated that MDMA can damage and destroy serotonin-containing neurons. MDMA can cause hallucinations, confusion, depression, sleep problems, drug craving, severe anxiety, and paranoia.

PCP (Phencyclidine), which is not a true hallucinogen, can affect many neurotransmitter systems. It interferes with the functioning of the neurotransmitter, glutamate, which is found in neurons throughout the brain. Like many other drugs, it also causes dopamine to be released from neurons into the synapse. At low to moderate doses, PCP causes altered perception of body image, but rarely produces visual hallucinations. PCP can also cause effects that mimic the primary symptoms of schizophrenia, such as delusions and mental turmoil. People who use PCP for long periods of time have memory loss and speech difficulties

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