

Stimulants

Rimrock
Foundation

FACT SHEET

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What are stimulants?

Stimulant drugs such as cocaine, “crack”, methamphetamine, and nicotine are substances that speed up activity in the brain and spinal cord. This, in turn, can cause the heart to beat faster and blood pressure and metabolism to increase. Stimulants often influence people to be more talkative, anxious, and to experience feelings of exhilaration.

Use of cocaine and other stimulants can cause the heart to beat abnormally fast and at an unsteady rate. Use of these drugs also narrows blood vessels, while reducing the flow of blood and oxygen to the heart, which results in “starving” the heart muscle. **Even professional athletes whose bodies are well-conditioned have succumbed to a stimulant's ability to cause heart failure. Researchers currently have no way of detecting who may be more susceptible to these effects.**

Cocaine

Cocaine is a powerfully addictive stimulant that directly affects the brain. Cocaine has been labeled the drug of the 1980's and 1990's because of its extensive popularity and use during this period. However, cocaine is not a new drug. In fact, it is one of the oldest known drugs. The pure chemical, cocaine hydrochloride, has been an abused substance for more than 100 years, and coca leaves, the source of cocaine, have been ingested for thousands of years.

There are basically two chemical forms of cocaine: the hydrochloride salt and the "freebase."

The hydrochloride salt, or powdered form of cocaine, dissolves in water and, when abused, can be taken intravenously (by vein) or intranasally (in the nose). Freebase refers to a compound that has not been neutralized by an acid to make the hydrochloride salt. The freebase form of cocaine is smokable.

Cocaine is generally sold on the street as a fine, white, crystalline powder, known as "coke," "C," "snow," "flake," or "blow." Street dealers generally dilute it with such inert substances as cornstarch, talcum powder, and/or sugar, or with such active drugs as procaine (a chemically-related local anesthetic) or with other stimulants such as amphetamines.

Crack is the street name given to the freebase form of cocaine that has been processed from the powdered cocaine hydrochloride form to a smokable substance. The term "crack" refers to the crackling sound heard when the mixture is smoked. Crack cocaine is processed with ammonia or sodium bicarbonate (baking soda) and water, and heated to remove the hydrochloride.



Cocaine's course of action

The principal routes of cocaine administration are oral, intranasal, intravenous, and inhalation. The slang terms for these routes are, respectively, "chewing," "snorting," "mainlining," "injecting," and "smoking" (including freebase and crack cocaine).

Snorting is the process of inhaling cocaine powder through the nostrils, where it is absorbed into the bloodstream through the nasal tissues. Injecting releases the drug directly into the bloodstream and heightens the intensity of its effects. Smoking involves the inhalation of cocaine vapor or smoke into the lungs, where absorption into the bloodstream is as rapid as by injection. The drug can also be rubbed onto mucous tissues. Some users combine cocaine powder or crack with heroin in a "speedball."

As cocaine abuse continues, tolerance quickly develops. This means that higher doses and more frequent use of cocaine are required for the brain to register the same level of pleasure experienced during initial use. Recent studies have shown that during periods of abstinence from cocaine use, the memory of the euphoria associated with cocaine use, or mere exposure to cues associated with drug use, can trigger tremendous craving and relapse to drug use, even after long periods of abstinence.

Methamphetamine

Methamphetamine is an addictive drug also belonging to the class of drugs known as stimulants. Methamphetamine is made illegally with relatively inexpensive, over-the-counter ingredients. **Many of the ingredients that are used to produce methamphetamine, such as drain cleaner, battery acid, and antifreeze, are extremely dangerous.** The rapid proliferation of "basement" laboratories for the production of methamphetamine has led to widespread problems in many communities in the U.S.

Methamphetamine has many effects in the brain and body:

Short-term effects can include increased wakefulness, increased physical activity, decreased appetite, increased respiration, hyperthermia, irritability, tremors, convulsions, and aggressiveness. Hyperthermia and convulsions can result in death. Single doses of methamphetamine have been shown to cause damage to nerve terminals in studies with animals.

Long-term effects can include addiction, stroke, violent behavior, anxiety, confusion, paranoia, auditory hallucinations, mood disturbances, and delusions. Long-term use can also cause damage to dopamine neurons that persists long after the drug has been discontinued.

Meth's course of action

Methamphetamine acts on the pleasure circuit in the brain by altering the levels of certain neurotransmitters present in the synapse. Chemically, methamphetamine is closely related to amphetamine, but its effects on the central nervous system are greater than those of amphetamine.

Methamphetamine is also chemically similar to the neurotransmitters dopamine and norepinephrine. It produces its effects by causing dopamine and norepinephrine to be released into the synapses in several areas of the brain. **Specifically, methamphetamine enters nerve terminals by passing directly through nerve cell membranes.** It is also carried into the nerve terminals by transporter molecules that normally carry dopamine or norepinephrine from the synapse back into the nerve terminal.



Methamphetamine can also affect the brain in other ways. For example, it can cause cerebral edema, brain hemorrhage, paranoia and hallucinations. Some of the effects of methamphetamine on the brain may be long-lasting and even permanent.

Studies have shown that even three years after chronic methamphetamine users have discontinued use of the drug, there is a long-lasting impairment in dopamine function as a result of drug use. This is highly significant because dopamine has a major role in many brain functions, including experiences of pleasure, mood, and movement.

In these same studies, researchers compared the damage to the dopamine system of methamphetamine users to that seen in patients with Parkinson's disease. They found the brains of former methamphetamine users showed similar patterns of damage. It should be noted that Parkinson's disease itself is not caused by drug use. **Research conducted in laboratory has demonstrated that exposure to a single, high-dose of methamphetamine or prolonged exposure at even low doses destroys up to fifty percent of the dopamine-producing neurons in certain parts of the brain.**

Nicotine

Tobacco, which is also a stimulant, comes primarily from the plant *nicotiana tabacum* and has been used for centuries. It can be smoked, chewed, or sniffed. The first description of addiction to tobacco is contained in a report from the New World in which Spanish soldiers said that they could not stop smoking.

Research has shown tobacco contains thousands of chemicals but the main ingredient that acts in the brain and produces addiction is nicotine. Recent research has shown that the addiction produced by nicotine is extremely powerful and is at least as strong as addictions to other drugs such as heroin and cocaine. Some of the effects of nicotine include changes in respiration and blood pressure, constriction of arteries, and increased alertness. Many of these effects are produced through its action on both the central and peripheral nervous system.

Nicotine's course of action

Nicotine readily enters the body. When tobacco is smoked, nicotine enters the bloodstream through the lungs. When it is sniffed or chewed, nicotine passes through the mucous membranes of the mouth or nose to enter the bloodstream. Nicotine can also enter the bloodstream by passing through the skin.

Regardless of how nicotine reaches the bloodstream, once there, it is distributed throughout the body and brain where it activates specific types of receptors. Receptors are involved in many activities, including respiration, maintenance of heart rate, memory, alertness, and muscle movement.

Regular nicotine use causes changes in both the number of cholinergic receptors and the sensitivity of these receptors to nicotine and acetylcholine. Some of these changes may be responsible for the development of tolerance to nicotine. Once tolerance has developed, a nicotine user must regularly supply the brain with nicotine in order to maintain normal brain functioning. If nicotine levels drop, the nicotine user will begin to feel uncomfortable withdrawal symptoms.



Recently, studies have shown nicotine also stimulates the release of the neurotransmitter dopamine in the brain's pleasure circuit. This release of dopamine is similar to that seen for other drugs of abuse, such as heroin and cocaine which is thought to underlie the pleasurable sensations experienced by many smokers.

However nicotine may not be the only psychoactive ingredient in tobacco. Using advanced brain imaging technology, it is possible to actually see what tobacco smoking is doing to the brain. Using one type of brain imaging, positron emission tomography (PET), scientists discovered that cigarette smoking causes a dramatic decrease in the levels of an important enzyme that breaks down dopamine.

The decrease in this enzyme results in an increase in dopamine levels. Importantly, this particular effect is not caused by nicotine but by some additional, unknown compound in cigarette smoke. Thus, there may be multiple routes by which smoking alters the neurotransmitter dopamine to ultimately produce feelings of pleasure and reward. **That nicotine is a highly addictive drug can clearly be seen when one considers the vast number of people who continue to use tobacco products despite their well known harmful and even lethal effects. Ninety percent of smokers would like to quit, but each year fewer than 10% are actually successful.**

While nicotine may produce addiction to tobacco products, it is the thousands of other chemicals in

tobacco that are responsible for its many adverse health effects. Smoking either cigarettes or cigars can cause respiratory problems, lung cancer, emphysema, heart problems, and peripheral vascular disease. In fact, smoking is the largest preventable cause of premature death and disability. **Cigarette smoking kills at least 400,000 people in the United States each year and makes countless others ill, including those who are exposed to secondhand smoke.**

The use of smokeless tobacco is also associated with serious health problems. Chewing tobacco can cause cancers of the oral cavity, pharynx, larynx, and esophagus. It also causes damage to gums that may lead to the loss of teeth. Although popular among sports figures, smokeless tobacco can reduce physical performance.

The path to healing

Treatment of addiction to stimulants is often based on behavioral therapies which have proven effective for treating cocaine or methamphetamine addiction. At this time, there are no proven medications for the treatment of stimulant addiction. However, antidepressants may help manage the symptoms of depression that often accompany the early days of abstinence from stimulants.



Depending on the patient's medical condition, the first steps in treating stimulant addiction will be tapering off the drug's dose and treating the withdrawal symptoms. The detoxification process can then be followed by one of many behavioral therapies.

The behavioral approach is a cognitive-behavioral intervention, which focuses on modifying the patient's thinking, expectations, and behaviors while at the same time increasing skills for coping with various life stressors. Recovery support groups are also effective in conjunction with intensive group therapy sessions.

At Rimrock Foundation, we directly address the physical and psychological elements of dependency disorders, as well as the defeating beliefs that accompany addiction. We give our patients and family members an unparalleled understanding about themselves, their disease, their thinking patterns, and alternative behaviors necessary for abstinence from mood-altering chemicals.

For further information on Rimrock Foundation's treatment of stimulant addiction, call Jen Porter, Admissions Supervisor, at 1-800-227-3953 or 1-406-248-3175, or visit our website at www.rimrock.org. For more educational information on stimulants, contact the Rimrock Foundation Library at the above numbers.

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