

Cocaine

Cocaine is a powerfully addictive stimulant drug. The powdered hydrochloride salt form of cocaine can be snorted or dissolved in water and injected. Crack is cocaine base that has not been neutralized by an acid to make the hydrochloride salt. This form of cocaine comes in a rock crystal that is heated to produce vapors, which are smoked. The term “crack” refers to the crackling sound produced by the rock as it is heated.

How is Cocaine Abused?

Three routes of administration are commonly used for cocaine: snorting, injecting, and smoking. *Snorting* is the process of inhaling cocaine powder through the nose, where it is absorbed into the bloodstream through the nasal tissues. *Injecting* is the use of a needle to release the drug directly into the bloodstream. *Smoking* involves inhaling cocaine vapor or smoke into the lungs, where absorption into the bloodstream is as rapid as by injection. All three methods of cocaine abuse can lead to addiction and other severe health problems, including increasing the risk of contracting HIV and infectious diseases.

The intensity and duration of cocaine’s effects, which include increased energy, reduced fatigue, and mental alertness, depend on the route of drug administra-

tion. The faster cocaine is absorbed into the bloodstream and delivered to the brain, the more intense the high. Injecting or smoking cocaine produces a quicker, stronger high than snorting. On the other hand, faster absorption usually means shorter duration of action. The high from snorting cocaine may last 15 to 30 minutes, but the high from smoking may last only 5 to 10 minutes. In order to sustain the high, a cocaine abuser has to administer the drug again. For this reason, cocaine is sometimes abused in *binges*—taken repeatedly within a relatively short period of time, at increasingly high doses.

How Does Cocaine Affect the Brain?

Cocaine is a strong central nervous system stimulant that increases levels of dopamine, a brain chemical associated with pleasure and movement, in the brain’s reward circuit. Certain brain cells, or neurons, use dopamine to communicate. Normally, dopamine is released by a neuron in response to a pleasurable signal (e.g., the smell of good food), and then recycled back into the cell that released it, shutting off the signal between neurons. Cocaine acts by preventing the dopamine from being recycled, causing excessive amounts of

dopamine to build up, amplifying the message, and ultimately disrupting normal communication. It is this excess of dopamine that is responsible for cocaine's euphoric effects. With repeated use, cocaine can cause long-term changes in the brain's reward system and in other brain systems as well, which may eventually lead to addiction. With repeated use, tolerance to the cocaine high also often develops. Many cocaine abusers report that they seek but fail to achieve as much pleasure as they did from their first exposure. Some users will increase their dose in an attempt to intensify and prolong the euphoria, but this can also increase the risk of adverse psychological or physiological effects.

What Adverse Effects Does Cocaine Have on Health?

Abusing cocaine has a variety of adverse effects on the body. For example, cocaine constricts blood vessels, dilates pupils, and increases body temperature, heart rate, and blood pressure. It can also cause headaches and gastrointestinal complications such as abdominal pain and nausea. Because cocaine tends to decrease appetite, chronic users can become malnourished as well.

Different methods of taking cocaine can produce different adverse effects. Regularly snorting cocaine, for example,

can lead to loss of the sense of smell, nosebleeds, problems with swallowing, hoarseness, and a chronically runny nose. Ingesting cocaine can cause severe bowel gangrene as a result of reduced blood flow. Injecting cocaine can bring about severe allergic reactions and increased risk for contracting HIV and other blood-borne diseases. Binge patterns of use may lead to irritability, restlessness, anxiety, and paranoia. Cocaine abusers can suffer a temporary state of full-blown paranoid psychosis, in which they lose touch with reality and experience auditory hallucinations.

Regardless of how or how frequently cocaine is used, a user can experience acute cardiovascular or cerebrovascular emergencies, such as a heart attack or stroke, which may cause sudden death. Cocaine-related deaths are often a result of cardiac arrest or seizure followed by respiratory arrest.

Added Danger: Cocaethylene

When people consume cocaine and alcohol together, they compound the danger each drug poses and unknowingly perform a complex chemical experiment within their bodies. Researchers have found that the human liver combines cocaine and alcohol to produce a third substance, cocaethylene, which intensifies cocaine's euphoric effects. Cocaethylene is associated with a greater risk of sudden death than cocaine alone.¹

What Treatment Options Exist?

Behavioral interventions—particularly, cognitive-behavioral therapy—have been shown to be effective for decreasing cocaine use and preventing relapse. Treatment must be tailored to the individual patient’s needs in order to optimize outcomes—this often involves a combination of treatment, social supports, and other services.

Currently, there are no medications for treating cocaine addiction, so this remains one of NIDA’s top research priorities. Researchers are looking for medications that help alleviate the severe craving experienced by people in treatment for cocaine addiction, as well as medications to counteract other triggers of relapse, such as stress. Several compounds are currently being investigated for their safety and efficacy, including a vaccine that would sequester cocaine in the bloodstream and prevent it from reaching the brain. Research so far suggests that addiction medications are most effective when used as a part of a comprehensive treatment program.

How Widespread is Cocaine Abuse?

Monitoring the Future Survey[†]

According to the 2007 Monitoring the Future survey—a national survey of 8th-, 10th-, and 12th-graders—cocaine use among students did not increase signifi-

cantly, though it remained at unacceptably high levels: 3.1 percent of 8th-graders, 5.3 percent of 10th-graders, and 7.8 percent of 12th-graders have tried cocaine; 0.9 percent of 8th-graders, 1.3 percent of 10th-graders, and 2.0 percent of 12th-graders were current (past-month) cocaine users.

**Use of Cocaine in Any Form by Students
2007 Monitoring the Future Survey**

	8th Grade	10th Grade	12th Grade
Lifetime ^{††}	3.1%	5.3%	7.8%
Past Year	2.0	3.4	5.2
Past Month	0.9	1.3	2.0

**Crack Cocaine Use by Students
2007 Monitoring the Future Survey**

	8th Grade	10th Grade	12th Grade
Lifetime ^{††}	2.1%	2.3%	3.2%
Past Year	1.3	1.3	1.9
Past Month	0.6	0.5	0.9

National Survey on Drug Use and Health (NSDUH)^{†††}

According to the 2006 National Survey on Drug Use and Health, 35.3 million Americans aged 12 and older reported having used cocaine, and 8.5 million reported having used crack. An estimated 2.4 million Americans were current (past-month) users of cocaine; 702,000 were current users of crack. There were

an estimated 977,000 new users of cocaine in 2006—most were 18 or older when they first used cocaine. Among young adults aged 18 to 25, the past-year use rate was 6.9 percent, showing no significant difference from the previous year.

Other Information Sources

For additional information on cocaine, please refer to the following sources on

NIDA's Web site,
www.drugabuse.gov:

- Cocaine Abuse and Addiction—*Research Report Series*
- Various issues of *NIDA Notes* (search by "cocaine" or "crack")

For a list of street terms used to refer to cocaine and other drugs, visit **www.whitehousedrugpolicy.gov/streetterms/default.asp**.

† These data are from the 2006 Monitoring the Future survey, funded by the National Institute on Drug Abuse, National Institutes of Health, Department of Health and Human Services, and conducted annually by the University of Michigan's Institute for Social Research. The survey has tracked 12th-graders' illicit drug use and related attitudes since 1975; in 1991, 8th- and 10th-graders were added to the study. The latest data are online at **www.drugabuse.gov**.

†† "Lifetime" refers to use at least once during a respondent's lifetime. "Past year" refers to use at least once during the year preceding an individual's response to the survey. "Past month" refers to use at least once during the 30 days preceding an individual's response to the survey.

††† NSDUH (formerly known as the National Household Survey on Drug Abuse) is an annual survey of Americans aged 12 and older conducted by the Substance Abuse and Mental Health Services Administration. This survey is available online at **www.samhsa.gov** and from NIDA at 877-643-2644.

Reference

¹ Harris DS, et al. The pharmacology of cocaethylene in humans following cocaine and ethanol administration. *Drug Alcohol Depend* 72(2):169–182, 2003.