

## Cocaine

Cocaine is a powerfully addictive stimulant drug. The powdered hydrochloride salt form of cocaine can be snorted or dissolved in water and then injected. Crack is the street name given to the form of cocaine that has been processed to make a rock crystal, which, when heated, produces vapors that 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 insert 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 it is by injection. All three methods of cocaine abuse can lead to addiction and other severe health problems, including increasing the risk of contracting HIV/AIDS and other 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 administration. 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 higher doses.

### How Does Cocaine Affect the Brain?

Cocaine is a strong central nervous system stimulant that increases levels of dopamine, a brain chemical (or neurotransmitter) 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, thus shutting off the signal between neurons. Cocaine acts by preventing the dopamine from being recycled, causing excessive amounts of the neurotransmitter to build up, amplifying the message to and response of the receiving neuron, 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. Regular intranasal use (snorting) of 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/AIDS and other blood-borne diseases. Binge-patterned cocaine use may lead to irritability, restlessness, and anxiety. Cocaine abusers can also experience severe paranoia—a temporary state of full-blown paranoid psychosis—in which they lose touch with reality and experience auditory hallucinations.

Regardless of the route or frequency of use, cocaine abusers 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***

Polydrug use—use of more than one drug—is common among substance abusers. When people consume two or more psychoactive drugs together, such as cocaine and alcohol, 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.<sup>1</sup>

## **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 FDA-approved medications for treating cocaine addiction; thus, developing a medication to treat

cocaine and other forms of addiction remains one of NIDA’s top research priorities. Researchers are seeking to develop medications that help alleviate the severe craving associated with cocaine addiction, as well as medications that counteract cocaine-related relapse triggers, 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. Current research suggests that while medications are effective in treating addiction, combining them with a comprehensive behavioral therapy program is the most effective method to reduce drug use in the long term.

## **How Widespread Is Cocaine Abuse?**

### ***Monitoring the Future Survey<sup>†</sup>***

According to the 2009 Monitoring the Future survey—a national survey of 8th, 10th-, and 12th-graders—there were continuing declines reported in the use of powder cocaine, with past-year<sup>††</sup> usage levels reaching their lowest point since the early 1990s. Significant declines in use were measured from 2008 to 2009 among 12th-graders across all three survey categories: lifetime use decreased from

7.2 percent to 6.0 percent; past-year use dropped from 4.4 percent to 3.4 percent; and past-month use dropped from 1.9 percent to 1.3 percent. Survey measures showed other positive findings among 12th-graders as well; their perceived risk of harm associated with powder cocaine use increased significantly during the same period. Additionally, survey participants in the 10th grade reported significant changes, with past-month use falling from 1.2 percent in 2008 to 0.9 percent in 2009.

<b>Use of Cocaine by Students 2009 Monitoring the Future Survey</b>			
	8th Grade	10th Grade	12th Grade
Lifetime	2.6%	4.6%	6.0%
Past Year	1.6%	2.7%	3.4%
Past Month	0.8%	0.9%	1.3%

<b>Crack Cocaine Use by Students 2009 Monitoring the Future Survey</b>			
	8th Grade	10th Grade	12th Grade
Lifetime	1.7%	2.1%	2.4%
Past Year	1.1%	1.2%	1.3%
Past Month	0.5%	0.4%	0.6%

**National Survey on Drug Use and Health (NSDUH)<sup>†††</sup>**

According to the 2008 National Survey on Drug Use and Health, the estimated percentage of persons aged 12 or older who used cocaine in the past month (0.7 percent) was similar to the percentage in 2007 and 2002. However, the percentage of past-month crack users in 2008 (0.1 percent of the population) was lower than in 2007 and all other years going back to 2002, with the exception of 2004. From 2002 to 2008, rates of past-month cocaine use among youth aged 12 to 17 declined significantly, from 0.6 percent to 0.4 percent. Past-month cocaine use also dropped significantly among young adults aged 18 to 25 during this time period, from 2.0 percent to 1.5 percent.

Significant declines in the number or percentage of past-year cocaine initiates were also estimated among several age groups measured, including persons 12 or older and those aged 18 to 25. The percentage of past-year initiates also dropped significantly from 2007 to 2008 for crack use among the 12–17 age group.

## Other Information Sources

For additional information on cocaine, please refer to the following sources on NIDA's Web site, [www.drugabuse.gov](http://www.drugabuse.gov):

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

For street terms searchable by drug name, cost and quantities, drug trade, and drug use, visit [www.whitehousedrugpolicy.gov/streetterms/default.asp](http://www.whitehousedrugpolicy.gov/streetterms/default.asp).

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### Data Sources

<sup>†</sup> These data are from the 2009 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 on line at [www.drugabuse.gov](http://www.drugabuse.gov).

<sup>††</sup> "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.

<sup>†††</sup> 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, Department of Health and Human Services. This survey is available on line at [www.samhsa.gov](http://www.samhsa.gov) and can be ordered by phone from NIDA at 877-643-2644.

### Reference

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