

Probing Question: Is caffeine harmful to your health?

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Credit: AI-generated image ([disclaimer](#))

A steaming cup of black coffee in the morning is to many people what gasoline is to their cars: essential fuel. The active ingredient in that fuel? Caffeine, a central-nervous-system stimulant found in the leaves and beans of many plants, especially those of coffee and tea.

The National Coffee Association, a trade group, claims that in 2006, daily coffee consumption among American adults rose to 56 percent, up from 49 percent in 2004. In other words, you're not alone in your caffeine dependency. But if you've ever had a case of coffee-induced shakes or a withdrawal headache, you may have asked yourself: Is my caffeine habit harmful to my health?

"In most cases, caffeine will have an effect on the body," said Byron Jones, Penn State professor of biobehavioral health and pharmacology, "but rarely will the effect be so extreme that it's harmful."

How does caffeine achieve its most sought-after effect of counteracting fatigue? To understand that, we first have to understand the chemistry of fatigue itself. Like all cells in the body, brain cells access fuel through an energy-storage nucleotide called ATP. ATP -- adenosine triphosphate -- loses one of its three phosphate molecules with each burst of energy it releases, eventually becoming a single adenosine molecule. The longer a person is awake, the more adenosine will accumulate on special adenosine receptors in the brain, signaling it to slow its activity.

Enter caffeine. Acting as a wolf in sheep's clothing, caffeine is molecularly similar enough to adenosine to fit into its receptors, blocking adenosine from getting through -- yet it is distinct enough not to be "read" by the brain as instructions to take a nap.

Without adenosine's calming effect, the brain's neurons fire more rapidly and the body reads this increased activity as an emergency requiring the release of the "flight or fight" chemical: adrenalin. The result? You feel excited, alert, mentally quick, ready for anything.

A person's sensitivity to these effects can vary, Jones said, according to frequency of caffeine consumption, body weight, activity level and overall genetic make-up. "Some people can fall asleep after a gallon of

soda," he said, "and others get the jitters from one cup of coffee. Everyone's reaction is different."

As a person consumes multiple cups of coffee or cans of soda, reactions can include hand tremors, sweating, sleep loss, restlessness and change of bowel movement patterns -- in other words, symptoms of over-energizing.

Caffeine frequently is described as the world's most popular psychoactive drug and is considered mildly addictive. As with any drug addiction, quitting caffeine can result in symptoms of withdrawal. Some scales even rank the severity of caffeine withdrawal between that of cocaine and marijuana. Symptoms such as headaches, irritability, lethargy, nervousness and mild depression commonly are reported.

Said Jones, "People who drink three or four cups of coffee in the morning during their work week might feel sleepy or grumpy or develop a slight headache when they don't have that caffeine to boost them on the weekends."

Health watchdogs also have studied the the risk of overdosing on caffeine. According to Jones, death by caffeine technically is possible -- "It would most likely come in the form of convulsions," -- but would require ingesting at least 50 cups of coffee. "That's without throwing up first," he noted.

To prevent even the less extreme side effects of too much caffeine, he suggested that people avoid drinking coffee or soda on an empty stomach and be aware of their own tolerance level. As with most indulgences, moderation and common sense are key.

For the most part, said Jones, "caffeine has gotten a bad rap." It's been blamed for everything from excessive insomnia to birth defects, "but

there's little to no evidence to support such claims." In fact, he noted, "it's recently been found that caffeine actually works against liver disease." A few cups of coffee or a can of energy drink now and then, he concluded, is "nothing to lose sleep over."

Source: By Lauren Clark, Research Penn State

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