

## Coffee: Guilty pleasure or life saving elixir?

You're a health-minded person. You eat healthy, you go to the gym, you run and, of course, you have never smoked. You also try to stay on a good sleep schedule. But still, you need that caffeine jolt from your morning cup of Joe.

Sometimes, you may wonder whether coffee, beloved by so many, might be bad for your health, but over the years you've encountered various magazine articles citing studies suggesting that coffee actually has some health benefits, so you relax. Yet there are also reports of scientific studies finding basically the opposite, that coffee could cause health problems; in fact, that it might be associated with certain cancers, at least if you drink it a lot.

Why the contradictory research? It's not that some of the studies are bogus and some are state-of-the-art. It's because coffee has a lot of ingredients and there are a lot of different diseases and modes of action. Figuring out cause and effect is complicated.

### Caffeine impact

Coffee contains a tremendous number of chemicals, with over 1,000 aroma compounds. Caffeine is the most well-known ingredient in coffee and the reason why most people consume it. It's a drug, and it's often [promoted](#) as a way to help boost one's mental focus and even improve athletic performance. But, as with any other drug, as the dosage increases, the benefits taper off and side effects start to kick in. With caffeine, this happens around 200-300 mg (roughly 1-2 cups of brew coffee or 3-4 espresso shots) per day, depending on the person's weight and "caffeine sensitivity".

Physically, caffeine is not addictive, but if you are used to consuming it and suddenly stop, you get what's called a caffeine withdrawal headache. [Side effects](#) that develop as the "dose" increases can include anxiety, palpitations, abdominal cramps, diarrhea, lightheadedness and even seizures, and various physical problems affecting a wide range of body systems, such as the cardiovascular system and digestive tract. In rare cases, death can occur from caffeine toxicity, but it really takes a lot of caffeine to do that. Thus, most investigations of potentially fatal effects of coffee have looked into long-term effects of coffee, due not to caffeine, but [to numerous other chemical compounds](#), including some that are possible carcinogens, linked to the brewing of coffee beans.

### Health pluses and minuses of coffee

In recent years, research studies have uncovered some evidence that coffee may reduce the risk of developing certain conditions, such as gall stones, Type 2 diabetes and Parkinson disease. Coffee also has been found to lower the risk of heart disease and liver cirrhosis, and some researchers are nearly at the point of [calling it a "health drink"](#). In 2008, a team of researchers from Harvard Medical School in Cambridge, United States, and the University of Madrid, Spain, assessed data from two major US epidemiological studies following more than 125,000 people over two decades. They concluded that regular coffee consumption was "not associated with an increased mortality rate". In fact, taking into

account risk factors such as body size, smoking and specific diseases, the team suggested that people who drank more coffee were actually less likely to die within the decades of the study because of a lower risk of cardiovascular disease.

There is also a suggestion that caffeine may benefit those suffering from Alzheimer disease. The hypothesis is that blocking A<sub>2A</sub> receptors prevents or mitigates damage caused by beta-amyloid, an altered form of peptides that accumulates in Alzheimer brains. In mice engineered to have the disease, caffeine has been shown to keep levels of beta-amyloid low and to increase levels of adenosine.

Earlier this year, a study published in *Journal of the National Cancer Institute* presented evidence that consumption of high quantities of coffee [may decrease one's risk of developing cutaneous malignant melanoma](#), a deadly form of skin cancer that unfortunately is fairly common in our society. More recently, coffee has also been demonstrated to [reduce the risk of developing liver cancer](#). But such findings must be weighed against other research and concerns that coffee might actually cause certain cancers. That's a conundrum that's been popping up for more than 30 years.

### **Does coffee cause cancer?**

In the early 1980s, a study [published](#) in the prestigious *New England Journal of Medicine* appeared to demonstrate a positive correlation between coffee consumption and pancreatic adenocarcinoma, one of the worst forms of cancer; as it is often detected late, the chances of survival are very low. The study was well publicized, and for about a week many people stopped drinking coffee, especially in the United States. But there was one problem. It turned out that the authors had forgotten to account for smoking as a possible confounding factor. When this was done, the paper had to be retracted and the study modified. It turned out that there was no connection between coffee and any kind of cancer of the pancreas, but there was a big connection between smoking and pancreatic cancer. In the study, smokers tended to be the people who drank large quantities of coffee, meaning 5 or 6 cups (or more) per day, and that was the reason for the initial, incorrect conclusion that coffee caused the disease.

It's also known that coffee contains 4-methylimidazole, which the US National Toxicology Program (NTP) has identified as a carcinogen. The compound is used to manufacture many products, from dyes to agricultural chemicals and rubber. Then there's the suspected carcinogen acrylamide. The European Chemical Agency includes acrylamide on its 'list of substances of very high concern'. Acrylamide formation peaks at some point in the roasting process before decreasing significantly.

Based on studies published over the years, the International Agency for Research on Cancer (IARC) lists coffee as a [category 2B carcinogen](#), meaning possibly carcinogenic to humans. Specifically, there is concern about a link between coffee and cancer of the colon and bladder. For some perspective on what this means, category 2B is just one category less risky than category 2A, which means probably carcinogenic to humans and includes glyphosate. This is the agent feared by many anti-GMO activists. Yes, both glyphosate and coffee might cause cancer, but the key factor is the exposure and dose, which in the case of coffee means how much you drink, and how frequently. Research on coffee and the various chemical compounds it contains continues, and researchers can now say, pretty clearly, that drinking excessive amounts is not good for you.

### **Navigating risks and benefits**

As with many chemical and physical phenomena, from radiation, to aspirin, to glyphosate, coffee may prove to be one of those things that simply has positive and negative impacts. The case is not closed yet, but given the trend of the study results, the answer is probably going to be that the black drink causes some medical conditions, while preventing others. A new study by the London-based World Cancer Research Fund International suggests that coffee may have some very real benefits. Coffee, it appears, might protect against liver cancer. That finding follows a 2013 CUP report that found coffee to be protective against endometrial cancer. Coffee contains a variety of naturally occurring compounds that are currently being studied for their anti-cancer potential.

“It may act on liver enzymes that eliminate carcinogens, for example,” said Stephen Hursting, Ph.D., M.P.H., a researcher at the University of North Carolina Chapel Hill. Because coffee is consumed in such a variety of ways, however, it is not yet possible to determine the amount or style of preparation that provides optimal protection.

The results suggest that only very large quantities of coffee produce the benefit. So if you're someone who drinks just a cup a day, your morning indulgence might not do you much good. Also, the new finding does not mean that coffee now moves from the maybe causing cancer category into the probably preventing cancer category. All cancers are different and, as with certain anti-cancer drugs, you may prevent one cancer while increasing the risk of another. That factor could be useful. If, for example, colon cancer runs in your family, the studies suggesting a possible link between coffee and the disease are particularly relevant for you. If you drink a lot of it, it could be wise to cut back. But then, if you also have one of a handful of familial mutations for Alzheimer disease, you have a dilemma, since cutting back would be eliminating a possible Alzheimer countermeasure.

It may be helpful to keep in mind the one thing that is consistent among all of the published coffee studies: whether the observed effect is good, or bad, generally the observed effects show up, only in people who consume multiple cups of coffee per day. Usually, people who consume large quantities are unlikely to stop what they're doing anyway. As for the people who consume less, they may have a much easier time cutting the drink from their diet, but for them it won't make much of a difference in terms of long-term effects.

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