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High-flavanol Cocoa or Chocolate Last updated Mar 10, 2015



Flavanol-rich cocoa or chocolate might improve cognition function in elderly people but potential benefits are selective to specific aspects of cognition. Whether it can protect against dementia itself is less clear. On the plus side, safety concerns are generally limited to the caffeine and theobromine content, as well as the high caloric content.

EFFICACY

Possibly

with Limited evidence

SAFETY WHEN

USED AS DIRECTED

Very likely

with Moderate evidence

-

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[About High-flavanol Cocoa or Chocolate](#)

The cocoa bean, also called the cacao bean, is the seed of the *Theobroma cacao* tree. It is used to generate cocoa solids (eg. cocoa powder) and cocoa butter, which are used in turn to create chocolate as well as other foods like mole sauce. The processing of cocoa beans to create cocoa powder is complex and many of the steps change the chemical composition.

The cocoa bean is very high in flavanols, also called flavan-3-ols. Not to be confused with flavonols, flavanols are class of compounds that, in cocoa, include (-)-epicatechin, catechin, and procyanidins. Processing the cocoa bean to create cocoa and chocolate reduces the amount of flavanols but, depending on the specific processing and storage, cocoa and chocolate can still contain substantial flavanols.

Did you know? The Mayans worshiped a goddess of chocolate/cocoa named “Ixcaao” and the Toltecs, who challenged the Mayan empire, believed that the cocoa bean was a gift from the god Quetzalcoatl, who taught them how to cultivate it (reviewed in [1]). The name of cocoa tree itself (*Theobroma*) derives from Greek roots to mean “food of the gods.”

[Sources of High-flavanol Cocoa or Chocolate](#)

Cocoa and chocolate contain a diverse array of chemicals. If the critical ingredients are the flavanols, as some experts believe, then different cocoa and chocolate products vary hugely in the dose that they provide.

Before we describe the flavanol content of different cocoa products, it is important to note that cocoa is not the primary source of flavanols in our diet. For example, one recent survey concluded that Europeans get most of their flavanols from tea, then pome fruits (eg. apples, pears), then berries and small fruits, followed by cocoa beans and related products. Cocoa and related products provided only 3% of the dietary sources of flavanols [2]. Now, onto the cocoa and chocolate...

Milk chocolate contains less cocoa powder by weight than dark chocolate and therefore has less flavanol content. The milk might also reduce how much of the flavanols are absorbed through the gut, but not all scientists agree with this idea [3].

Dark chocolate with a higher percentage of cocoa will often have more flavanols. However, this isn't always the case. For example, dutching is a common processing step in which cocoa is treated with alkali to darken the cocoa and reduce bitterness and acidity. It also lowers the amount of flavanols by 60 to 90% [4]. The fermentation and roasting of the beans, the location in which they were grown, and the way in which they were stored can also affect how many flavanols remain in the final product [3]. Where the beans were grown and how they were stored can also affect flavanol levels [3]. Some products like Acticoa™ cocoa and chocolate and CocoaVia® cocoa-extract supplements are specifically marketed as high in flavanols.

Clinical studies hinting at benefits of high-flavanol cocoa products have often used flavanol doses ranging from 520-990 mg/day, with (-)-epicatechin specifically between 58 and 138 mg per day. Dietary intake of flavanols is much lower, particularly for cocoa-related flavanols. For example, dietary intake in Europe has been estimated at between 181 and 793 mg per day for flavanols and 13.5 mg per day epicatechin specifically and only 3% of those flavanols come from cocoa and related products.

Flavanols may not be responsible for the biological effects of cocoa and chocolate. When scientists have directly compared high versus low flavanol cocoa products in clinical trials, the high flavanol product has sometimes had additional effects on the brain [5,6] but sometimes not [7].

Cocoa contains other compounds that might affect the brain like the methylxanthines, caffeine and theobromine (a

derivative of caffeine). The levels of caffeine in cocoa are typically lower than that in coffee or tea but they can vary (for information on caffeine, see our Cognitive Vitality report on [caffeine and coffee](#)). Cocoa and chocolate have often been reported to improve mood but scientists don't yet know whether that is because of specific compounds in the chocolate or to its "orosensory" properties (i.e. that chocolate is usually delicious) [1].

Bottom line: if you want to consume more cocoa flavanols, look for a dark chocolate with a high percentage of cocoa, particularly a cocoa that has not been dutched (i.e. alkalinized). Or, look for a cocoa supplement with high flavanol content. But if you don't like those sources, remember that scientists aren't exactly sure that the benefit, if any, comes from the flavanols.

[Can It Prevent Dementia?](#)

Possibly, based on limited evidence.

The research on cocoa and long-term brain health in humans is limited and somewhat mixed. One study has reported that older women who regularly ate chocolate were no more or less likely to experience [cognitive decline](#) over 5 years [14] while another study reported that elderly Norwegians who ate chocolate tended to have better cognitive abilities. Even in the latter study, the protective association was stronger for wine than for chocolate [15] (see ADDF's Cognitive Vitality report on [alcohol](#)). Both these studies looked at cognition in older people rather than looking directly at the risk of getting [dementia](#).

A handful of small [clinical trials](#) have suggested that cocoa and sometimes cocoa flavanols might have small benefits on some but not all aspects of brain function. Whether these changes will translate into a reduced risk of dementia or slowed brain aging is not yet clear. For example, the CoCoA study reported that high-flavanol cocoa did not improve overall cognitive function (measured by MMSE) in people with [mild cognitive impairment](#) but it did improve scores on 2 specific cognitive tests [5]. A trial in elderly people has also reported that high-flavanol cocoa improved performance on cognitive task that is vulnerable to brain aging but had no benefit on a different cognitive test vulnerable to early stages of Alzheimer's disease [6]. Other trials in the old and the young have had mixed results, occasionally seeing some slight cognitive improvement but usually not [1].

In summary, the human research on cocoa and cocoa-flavanols on cognition suggest that potential benefits are limited, if any, in the short-term. On the other hand, a theoretical scientific rationale suggests that treatment over many years might be more protective. Cocoa, particularly high-flavanol cocoa, has been reported to protect cardiovascular and metabolic health and to reduce [inflammation](#) and [oxidative stress](#) (discussed in the **Aging** section below). The evidence for these other benefits is not fully conclusive either and it must be balanced against the increased sugar and fat intake of chocolate and cocoa sources. However, if these benefits are genuine, they might in turn protect the brain because [heart disease](#), [diabetes](#), inflammation and oxidative stress are all believed to increase the long-term risk of dementia.

APOE4 Carriers: We are aware of no research for or against the idea that *APOE4* carriers will have a differential response to high-flavanol cocoa or chocolate. For more information on what the *APOE* gene might mean for your health, read our [APOE information page](#).

[Can It Benefit Someone with Dementia or Mild Cognitive Impairment?](#)

Possibly, based on limited evidence.

For people with a diagnosis of [dementia](#), we are aware of no rigorous human research on the possible benefits of cocoa, chocolate, or related flavanols. For people with [mild cognitive impairment](#), one [clinical trial](#) in 90 people for 8 weeks reported that a flavanol-enriched cocoa drink did not affect cognitive function overall (as measured by MMSE) but it did improve two scores on two cognitive tests (verbal fluency and trail making). Compared with patients who received a control low-flavanol cocoa drink, patients who received the high and intermediate flavanol doses (between 990 to 520 mg per day) also had better [insulin](#) resistance and reduced blood pressure [5]. These results are promising but further study is needed to know whether the benefits will be either reliable or robust enough to improve quality of life or slow disease progression in patients.

[Can It Slow Aging or Delay Death?](#)

Possibly, based on limited evidence.

Overall, the evidence isn't particularly convincing that cocoa and cocoa flavanols can slow biological aging or delay death but hints of protection against several age-related health problems are encouraging, particularly for moderate use in people who have a healthy lifestyle and body weight.

For direct evidence on mortality rates, one [observational study](#) reported that elderly men who regularly ate cocoa had a lower overall risk of death and risk of death from [heart disease](#) over 15 years [16]. However, this study is 8 years old and, to our knowledge, similar results have not been reported from any other observational studies or [clinical trials](#). As with any observational study, the men who regularly ate cocoa could have shared other lifestyle choices and habits that might have been responsible for the observed reduced risk of death. On the other hand, if flavanols are indeed the active ingredient in cocoa, then observational studies may not easily detect benefits since many forms of chocolate have very low flavanol levels.

For heart disease, clinical trials show that chocolate or cocoa can slightly reduce blood pressure [10,11] and reduce [LDL cholesterol](#) [17]. A handful of observational studies also suggest that people who regularly eat some chocolate have a lower risk of heart disease and [stroke](#) [18] and possibly have a lower risk of heart failure [19] and calcified arteriosclerotic plaque [20]. However, as with all observational studies, the people who ate cocoa products may have shared other lifestyle choices or habits that were responsible for the observed associations.

Moderation may be key. Chocolate and cocoa are a substantial source of calories, sugar, and saturated fat. If chocolate and cocoa do indeed have protective properties, the beneficial effects might be restricted to people with a healthy body weight, as reported by this study on heart failure [20]. On the other hand, some research suggests that cocoa and dark chocolate might help to protect against obesity itself, although substantially more research is needed [21].

For metabolic function and [diabetes](#), some studies have also reported that cocoa and/or cocoa flavanols can have slight benefits. A [meta-analysis](#) of 12 short-term clinical trials reported that chocolate or cocoa can slightly improve insulin resistance by reducing [insulin](#) levels. In contrast, it has no reliable effect on fasting glucose levels [10]. Whether these effects are strong enough to have a lasting and meaningful effect on health is unclear and under-studied. One study has observed that Japanese people who eat chocolate are less likely to develop diabetes [18] while another study observed that people who eat chocolate are no more or less likely to develop metabolic syndrome [22], a combination of physiological characteristics associated with a high risk of diabetes and heart disease.

[Oxidative stress](#) and chronic inflammation may help to drive many of the diseases of old age. Small clinical trials suggest that cocoa flavanols and dark chocolate sometimes reduce oxidative damage (eg. [5,23]) although the effects are not always seen [24]. Laboratory experiments also suggest that they can reduce chronic inflammation but the human evidence is limited and mixed [23,25,26]. In one observational study, moderate doses (up to 20 grams dark chocolate once every 3 days) had a protective association compared to higher or lower doses [25].

[How High-flavanol Cocoa or Chocolate Might Benefit the Brain](#)

Some small [clinical trials](#) suggest that cocoa or its flavanols can sometimes increase blood flow to the brain [1], although not in every brain area [6] and not necessarily due to the flavanols in the cocoa [7]. Blood flow to the brain often decreases with aging [8] and with neurodegenerative diseases like Alzheimer's disease [9] but many scientists are not convinced that increasing cerebral blood flow will in turn protect the brain from most causes of impaired brain function.

Cocoa and related flavanols might also protect the brain by slightly reducing blood pressure [10,11] and possibly decreasing [insulin](#) levels, protecting against [stroke](#), [heart disease](#) and reducing [oxidative damage](#). The evidence for these benefits is not conclusive but, if genuine, the benefits might in turn protect the brain from damage. Laboratory research in test tubes have also identified some direct ways by which cocoa or cocoa flavanols might protect the brain, such as activating the protective brain-derived neurotrophic factor (BDNF) pathway [12] and reducing [beta-amyloid](#), a component of Alzheimer's disease [13].

[Is It Safe When Used As Directed?](#)

Very likely safe, based on moderate evidence.

NOTE: This is not a comprehensive safety evaluation or complete list of potentially harmful drug interactions. It is important to discuss safety issues with your physician before taking any new supplement or medication.

Chocolate, cocoa, and flavanol-enriched cocoa extracts have few known safety concerns. Existing concerns relate mainly to either the methylxanthines (caffeine and theobromine) or to the sugars, saturated fat, and additional calories. However, high-dose flavanol cocoa, chocolate, and supplements are available today that are somewhat new to the human diet. Although some of these supplements have been tested in short-term [clinical trials](#), little to no information has been gathered on their long-term use.

For more information on the safety of caffeine, see ADDF's Cognitive Vitality report on [coffee and caffeine](#).

Most chocolate has a very high caloric content which could contribute to weight gain and the many potential health risks associated with obesity. Some researchers are exploring whether dark chocolate and cocoa flavanols could protect against obesity [21] but that research is not conclusive. Moderation is the sensible approach.

[If You Are Considering Taking High-flavanol Cocoa or Chocolate](#)

Many of us need little urging to eat chocolate but moderation is common sense. Chocolate and cocoa are high-calorie and often high-sugar foods. They also contain caffeine and theobromine, which may be unsafe for some people.

If flavanols are indeed the critical ingredients for possible health benefits, then the chocolate or cocoa that you typically favor may or may not be a good source. Take a look at the ingredients and processing steps listed. Dutching (i.e. alkalization) can particularly reduce flavanol levels. Unfortunately, flavanol levels vary for other reasons as well and we are not aware of a reputable source of information on flavanol levels in popular chocolate and cocoa products.

[What's the Future?](#)

To our knowledge, no [clinical trials](#) are underway to test dark chocolate, cocoa, or related flavanols on [dementia](#) or brain aging although one trial is underway to compare the effects of white versus dark chocolate in [Parkinson's disease](#) patients for 1 week ([NCT02275884](#)).

Many questions remain unanswered. Chocolate, cocoa, and related flavanols are all highly diverse. Are flavanols the key ingredients and, if so, which flavanols? For that matter, what are the levels of flavanols in popular chocolate and cocoa brands?

Clinical trials in elderly people suggest that cognitive benefits are possible but not universal. Are the potential benefits short-term or might it actually protect against decline due to Alzheimer's or other causes of dementia? Are different people more or less likely to benefit? For example, does the potential benefit depend on cardiovascular and metabolic health or the cause of cognitive impairment in each person? One trial suggested that cognitive benefits might partially depend on effects on [insulin](#) resistance [5] while another trial suggested that benefits focus on a brain area vulnerable to aging rather than Alzheimer's disease per se [6]. Far more research is needed to understand who might benefit, how much they might benefit, and how long they must be treated to benefit.

[Resources For Additional Information](#)

- A Cognitive Vitality post on a [2014 clinical trial](#) on cocoa flavanols and brain aging
- If you are aware of a reputable and open source of information on the flavanol and/or caffeine content in popular cocoa and chocolate products, please send us a link so we can post it here!

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