"Many of us crave chocolate, but we also feel guilty about its calories and fat," says Julia Horne, an assistant professor of psychology at the State University of New York at Albany and an expert on cravings. "I want it, but I shouldn't have it. It's taboo, but it's also really appealing. That's the ambivalence we feel about chocolate."

No wonder the frequent chocolate-is-good-for-you stories in the media are so irresistible. But is chocolate really good for us?

**Flavanols 101**

Cocoa powder is the non-fat portion of the cocoa bean. If you combine it with cocoa butter (the fatty part of the bean) and sugar, you get chocolate. Add milk and you get milk chocolate.

The cocoa bean is one of the richest food sources of a group of phytochemicals ("phyto" means plant) called flavanols. If chocolate is good for you, it's probably because of the flavanols.

"Other foods, such as tea, red wine, berries, and some fruits, especially the skins of apples, contain flavanols," points out Naomi Deirdre Fisher, an associate professor of medicine at the Harvard Medical School.

"It just so happens that the cocoa bean is particularly endowed with very high concentrations."

But the flavanol content takes a hit when raw cocoa beans are converted into chocolate. How big a hit depends on how the cocoa is processed.

"Flavanols are bitter tasting, so to make cocoa more palatable, chocolate manufacturers roast, ferment, pulverize, and sometimes alkalinize the beans or cocoa," says Kevin Monahan, a physiologist and associate professor of medicine at the Penn State College of Medicine in Hershey.

"Unfortunately, this processing can destroy a lot of the flavanols."

"Even something labeled 'dark chocolate' may or may not be a good source of flavanols," notes Monahan. "It depends on how the beans or cocoa has been processed."

So the question isn't just whether flavanols are good for you, but whether you can get enough of them from eating chocolate without consuming too many calories.

**Cardiovascular Disease**

Take people who are free of cardiovascular disease and ask them what they eat. Then, years later, find out if they've had a heart attack or stroke or have high blood pressure.

"Generally, those who report consuming the most chocolate at the start of the study are less likely to later be diagnosed with cardiovascular disease," says Monahan.

"That makes chocolate sound great," says Monahan. "But those studies are limited because they're observational. You don't know if the result is an effect of eating chocolate, or if it has something to do with other factors that differ in people who eat chocolate."

It could be that someone who eats chocolate every week is demonstrating restraint and willpower, says Catherine Kwik-Uribe, director of research and development for Mars Symbioscience, a scientific division of the candy giant that makes Snickers, M&M's, and other chocolates.

"So what we may actually be seeing is evidence of a disciplined approach to health and lifestyle that's reflected in the food choices they make, as opposed to the chocolate itself being the cause of their good health."

That's why scientists have conducted dozens of randomized controlled trials during the past decade in which they compared (flavanol-rich) dark chocolate to (flavanol-free) white chocolate, or they compared flavanol-enriched cocoa to low-flavanol cocoa. If flavanols—rather than something else about people who consume flavanols—matter, those studies should pick it up.

**Blood flow.** "Large amounts of cocoa flavanols have consistently improved endothelial function in studies in healthy young people, in patients with coronary artery disease, and in people with diabetes or high blood pressure," says Monahan.

Endothelial function is a measure of how an artery responds to an increase in blood flow. (The endothelium is the inside lining of blood vessels.)

"The endothelium is a barometer of the health of your blood vessels," says Joseph Vita, a professor of medicine and senior staff cardiologist at the Boston University School of Medicine.
Take a Powder

Processing cocoa beans destroys flavanols. How much is lost depends on the beans and the processing. Since there is no standard method of analyzing for flavanols yet, and since most manufacturers don’t seem eager to disclose how much—or how little—their products contain, consumers are pretty much left in the dark.

“Even labeling a chocolate bar as having, say, ‘70% cacao’ isn’t a reliable guide to the amount of flavanols,” says Catherine Kwik-Uribe of Mars Symbioscience, a research division of the chocolate manufacturer. “You can’t tell how heavily that cocoa was fermented or processed, both of which can destroy flavanols.”

Last year, the European Food Safety Authority (the European Union’s equivalent of the Food and Drug Administration) concluded that it takes at least 200 milligrams of flavanols to improve blood flow. Most studies of cocoa have used far more than that.

How to get 200 mg? Two ounces of dark chocolate would probably do it. (That was the average in a recent analysis of Hershey’s Special Dark, Lindt Excellence 70% Cocoa, and Dove Promises Dark Chocolate.) But it will cost you 300+ calories.

“It would be unfortunate if people consumed hundreds of calories a day from confectionery chocolate, thinking they’re helping themselves,” says Harvard flavanol researcher Naomi Deirdre Fisher.

You could also opt for the 70-ounce calories in half an ounce of baking chocolate. But your best bet might be two tablespoons of unsweetened pure cocoa powder like Hershey’s or Nestlé Toll House, which have around 20 calories. Try mixing it into your coffee, warm milk, oatmeal, or yogurt.

Milk chocolate has less cocoa and more sugar than dark chocolate, so you’d need 10⅛ oz. (almost 1,600 calories’ worth) to give you 200 mg of flavanols.

Many cocoa mixes, like Swiss Miss, contain cocoa that has been “processed with alkali” (it’s also called “Dutch-process”). That slashes the flavanols to about 3 mg per serving. And white chocolate, which is mostly cocoa butter and sugar, contains no cocoa, so it has no flavanols.

To get 200 mg of flavanols from chocolate, it takes...

<table>
<thead>
<tr>
<th>Cocoa Powder</th>
<th>Baking</th>
<th>Semi-sweet Chips</th>
<th>Dark</th>
<th>Syrup</th>
<th>Milk</th>
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<td>1¼ Tbs.</td>
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<td>70 cals</td>
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“...because it’s one of the first things to go wrong on the path to atherosclerosis, which is the underlying cause of heart attack and the most common form of stroke. If your arteries are stiff, that means your heart has to work harder to pump the blood out.”

Flavanols seem to increase the body’s ability to synthesize nitric oxide, which triggers the dilation of arteries.

“Relaxing, or dilating, is good because it’s the way to get more blood, and more oxygen, flowing,” notes Monahan. “It’s like adding an extra lane to a highway so that more cars can get through.”

In a study funded by chocolate maker Hershey, Monahan and his colleagues found that blood flow in the arteries increased within two hours after older people consumed cocoa flavanols in a beverage, compared with another time when they got a placebo drink.4

But Hershey’s milk chocolate division may not have been jumping for joy. Blood flow improved in people given high doses of flavanols (180, 465, or 1,095 milligrams), but not in those who got 70 mg. The classic 1½ oz. Hershey’s Milk Chocolate bar contains about 25 mg of flavanols.

Last year, the European Food Safety Authority approved a health claim for cocoa and chocolate and endothelial function after concluding that 200 mg or more of flavanols could “help maintain endothelium-dependent vasodilation, which contributes to normal blood flow.”

(The EFSA is the equivalent of the U.S. Food and Drug Administration.)

**Blood pressure.** Improved endothelial function could explain why cocoa or chocolate that contained large amounts of flavanols produced “a small but statistically significant effect in lowering blood pressure by 2-3 mm Hg in the short term.”

That’s what the Cochrane Collaboration, an international network of scientists who evaluate the research for medical therapies, concluded in 2012 after reviewing 15 randomized controlled trials that lasted from 2 to 18 weeks.5

But the trials tested an average of 560 milligrams of flavanols a day. You’d...
have to eat 5½ ounces of dark chocolate to get that much.

The European Food Safety Authority hasn't been impressed with the research. The evidence is "insufficient" for chocolate manufacturers to claim that cocoa and chocolate can lower blood pressure, it declared.

Weight Loss

"Eat chocolate, lose weight," claims weight-loss author Cynthia Sass. "A new study by the University of California, San Diego, found that frequent chocolate eaters weigh less, despite consuming more calories," she wrote in Fox News Magazine.

Many people believe that, says chocolate researcher James Greenberg, an associate professor of health and nutrition sciences at Brooklyn College in New York. "It's based on less-than-rigorous cross-sectional studies supposedly showing that those who eat more chocolate weigh less and those who eat less chocolate weigh more."

But cross-sectional studies—which take a snapshot in time—can't determine what leads to what, says Greenberg. To get a better handle on that, you need to follow people over time.

To do that, Greenberg analyzed data on chocolate consumption from the Atherosclerosis Risk in Communities (ARIC) study. More than 12,000 residents of North Carolina, Minnesota, Maryland, and Mississippi aged 45 to 64 were weighed in the late 1980s and were asked, among other things, how often they ate a serving of chocolate. Six years later, they were weighed and asked about chocolate again.6

"The more frequently someone ate chocolate, the more weight they gained," says Greenberg. "And those who ate the most chocolate gained the most weight."

It didn't take much, either. People who consumed just one ounce of chocolate at least once a week gained an average of 2.4 pounds over the six years.

That's consistent with the results from a small randomized trial of 91 German men and women. Those given about an ounce of chocolate to eat every night after dinner gained almost two pounds over a three-month period, while those given about a quarter of an ounce gained no weight.7

So why do cross-sectional studies seem to show that people who eat more chocolate weigh less?

"Some heavier participants in the studies are eating less chocolate because they're trying to lose weight after having a heart attack or stroke, or after being diagnosed with a disease like diabetes," Greenberg explains. "That makes it look like people who eat more chocolate weigh less. But if researchers exclude people who have obesity-related illness, those who eat more chocolate don't weigh less."

Brain Health

Last year, a Columbia University researcher whimsically reported that the number of Nobel Prize winners in a particular country is "powerfully correlated" with the amount of chocolate that country consumes.8

That hardly proved cause and effect, noted other researchers, since a country's chocolate consumption is correlated with a long list of unrelated things—the number of IKEA stores, for instance.9

Still, there could be something to the link between chocolate and the brain, at least for some people. "We know that flavanols and the compounds they're metabolized into can cross into the brain and improve blood flow there," says Harvard flavanol researcher Naomi Deirdre Fisher.

"And we're learning from animal studies that flavanols may also promote neurogenesis, which is the development of nerves, as well as improve nerve function and the connections between nerves." Mars is hot on the trail. "We now have emerging evidence that cocoa flavanols may improve cognitive function in some people, though this is still a very early area of research," says Mars Symbioscience researcher Catherine Kwik-Uribe.

In a study funded by Mars, she and her colleagues gave 90 Italian men and women with mild cognitive impairment a daily cocoa drink with one of three levels of flavanols: 990 milligrams, 520 mg, or 45 mg (which served as the control).10

(Mild cognitive impairment is memory decline beyond what normally occurs with age. While MCI is not severe enough to interfere with daily life, people with the condition are about three to five times more likely to develop dementia than people without MCI, according to the Alzheimer's Association.)

After two months, those who were consuming 990 mg scored higher on a test of verbal fluency than those getting 45 mg. Asked to name as many nouns as they could that began with a certain letter within 60 seconds, the high-flavanol group averaged 28, while the low-flavanol group averaged 22. The 520 mg group did no better than the 45 mg (placebo) group.

But both higher groups did better on a test of attention, organization, and memory. Asked to draw a line between a series of consecutive numbers, those getting 990 mg or 520 mg of flavanols a day completed the task in an average of 39 seconds, while those getting 45 mg took 53 seconds.

But when 71 healthy Australian men and women aged 40 to 65 consumed a beverage with 250 mg or
Loco for Cocoa

Prefer getting your flavanols from a supplement? Not all of them are equal. Here are three that you may have seen.

CocoaVia

Mars Inc. gave up trying to market flavanol-rich chocolate candy as a health food in 2009. These days it sells cocoa flavanols as dietary supplements.

“To get the higher level of flavanols that we know to be efficacious,” says the company’s Catherine Kwik-Uribe, “we offer consumers choices of products that are more nutritionally responsible.”

That would be Mars’ line of CocoaVia capsules and powders.

Each serving (two capsules or one packet of powder) contains 250 milligrams of cocoa flavanols. The capsules have 5 calories and cost $1.00 a serving. The powder—Mars recommends that you mix it into coffee, milk, yogurt, oatmeal, or protein shakes—has 30 calories and costs $1.33 a serving. (The powder contains cocoa that has been processed with alkali, but Mars adds a cocoa extract and guarantees that each packet delivers 250 mg of flavanols.)

Cocoa Capsules

“Get all the natural health benefits of raw cocoa without feeling any of the guilt,” says mail-order/online marketer Swanson about its raw cocoa.

According to the label, each capsule contains 400 milligrams of cocoa (cacao). But that means less than 400 mg of flavanols.

How much less? The label doesn’t say, since flavanol levels “may vary from batch to batch,” according to the company. (“We are sorry for any disappointment this may cause,” Swanson told us in an e-mail.)

If Swanson’s (or any other company’s) raw cocoa is anything like Hershey’s unsweetened cocoa powder, the recommended dose (one to two capsules a day) would provide just 9 mg or 18 mg of flavanols. Cost? Five or ten cents a day, about 10 times what you’d pay for the amount of a grocery-store cocoa powder like Hershey’s or Nestlé Toll House.

CocoaWell

Cocoa Science bars are organic and made from sustainably grown fair-trade beans, says the company. That’s great. But each bar also has more calories (240) than a similar-size Hershey’s Milk Chocolate bar (210).

Why does the label list just 120 calories per serving? CocoaWell uses a ¾ oz. half-bar serving (instead of chocolate’s 1½ oz.) by calling itself a “dietary supplement” rather than a food.

What do you get in the way of cocoa flavanols for your 240 calories? The label lists only about 6 mg from an added cocoa extract. (The bar’s “Pure Plant Flavanol Complex” provides about 80 mg of flavanols from tea and the herb catechu, not cocoa.)

As for the amount of flavanols in the bar’s main ingredient, chocolate: “We currently do not test for flavanols,” CocoaWell said in an e-mail, because “naturally occurring levels may vary.”

500 mg of cocoa flavanols or a placebo every day for a month, researchers couldn’t detect any improvements in attention, memory, and other cognitive tasks in those getting flavanols.  

Interestingly, when the participants filled out questionnaires at the end of the study, the 24 who had consumed 500 mg of flavanols every day reported feeling calmer and more content than those who had consumed 250 mg of flavanols or the placebo beverage.

Clearly, more studies on flavanols and cognition are needed.

“There are reasons to be hopeful, to suspect that there’s benefit, based on test tube studies, animal studies, human population studies, and a few clinical trials,” says Fisher.

But solid evidence is lacking, she adds. “We haven’t administered flavanols for five years to a set of healthy people over 65 and seen that there was less cognitive decline in those who had higher consumption. Those studies haven’t been done.”