

**ALL ABOUT CHOCOLATE** by Ann Gerhardt, MD  
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**Bottom Line at the Top: Chocolate contains *many* bio-active substances, not just flavanols. Its dark color tells very little about the composition and may be healthy, may not. Read on...**

Given the prevalence of chocoholics, any hint of chocolate as a health food makes big news, not just once, but every time some new glimmer of hope appears. Since chocolate is a veritable cauldron of naturally occurring bio-active chemicals, we can expect scientific revelations for years to come as each new one is studied.

**Cacao beans, the source of chocolate, contain naturally occurring, fountain-of-health chemicals called flavanols.** These are the same nutrients presumed to be responsible for the medicinal benefits of green and black tea, apples, grapes and red wine. Flavanols decrease inflammation, act as anti-oxidants and stimulate nitric oxide production, which opens up blood vessels and normalizes blood pressure.

All cacao beans start out flavanol-rich, some more than others, depending on soil and other factors unique to their origin. Cacao beans from the San Blas islands off the coast of Panama, provide a perfect example. High blood pressure is very rare in San Blas Island Kuna Indians, even in old age. Their resistance to hypertension disappears when they move to Panama City. Scientists propose that their daily habit of drinking 5 cups of San Blas-grown, flavanol-rich cocoa keeps their blood pressure low.

**Health benefits of flavanol-rich cocoa:** A study of 13 hypertensives, consuming chocolate bars either rich in or devoid of flavanols, showed that **blood pressure** dropped within 14 days of starting only the flavanol-rich bars.

A single ounce of flavanol-rich semi-sweet chocolate abruptly reduces **platelet clotting**. Chronic daily consumption of the same amount maintains the effect.

The fat content of chocolate products varies from 6.6 to 40%, and depends on how much cacao bean fat is retained and how much fat from other ingredients is added. Cacao bean fat is mostly stearic and palmitic acids, which, though saturated, are not terribly horrible for you. There is a small amount of oleic acid (think olive oil) and even less linoleic acid (an essential fatty acid).

In spite of chocolate's considerable fat content, it seems to improve **cholesterol** levels. LDL-cholesterol declined by 6% in non-obese adults consuming 3.5 ounces of Lindt Dark Chocolate per day. At the same time their HDL-cholesterol climbed by 9% (for HDL-C, that's a lot) and markers of inflammation and platelet aggregation slightly decreased. The Lindt chocolate contained 70% cocoa and 800 mg flavanols. In another study in Finland, dark chocolate, with or without additional flavanols, raised HDL-cholesterol 11-13%.

Higher flavanol intake reduced risk of **heart disease** and death over 16 years in 34,489 post-menopausal women in the Iowa Women's Health Study who were free of any heart disease at baseline. The flavanol-rich foods associated with better health were chocolate, bran, apples, pears, red wine, grapefruit and strawberries.

Chocolate is a rich source of **magnesium**, an essential mineral for normal heart, muscle and brain function.

Flavanols have a plasma half-life of approximately six hours, suggesting that any biological effects may wear off quickly. This might be construed as a fault, or an excuse to eat chocolate four times a day.

**Dark chocolate:** Currently, the common misperception is that if chocolate is dark, it is healthy. **In actuality there is nothing inherent in chocolate's color that gives a clue to its health benefits.**

Flavanols taste bitter and have an astringent (dry) feel on the tongue. Cacao bean processing intentionally destroys flavanol content to remove the unpleasant taste. With a process called 'dutching', alkali-potash is added to cocoa nibs to enhance cocoa's taste, texture and appearance, but it eliminates active flavanols and their bitter flavor. It also darkens chocolate (non-dutched cocoa tends to be an almost reddish-brown, color). Really dark, almost black cocoa or chocolate is often less healthy because of fewer flavanols. That doesn't mean that milk chocolate is healthier because of its light color – It is 'dutched', then lightened with milk and other ingredients.

Dutching is only one of a number of steps in cacao bean processing that destroy flavanols. Following picking, the cacao seed pods ferment for up to several days prior to drying and packaging for shipping. Fermentation greatly enhances flavor generation, but reduces flavanol content in proportion to its duration.

Chocolate manufacturers roast the dried cacao beans to develop flavor. This further reduces flavanol content, because flavanols are heat-sensitive. The beans are shelled to obtain the cocoa nibs, then 'dutched' (or not) and ground to chocolate liquor. **Depending on the duration of each of these steps, the flavanol content of cocoa and chocolate products vary greatly and (to the consumer) unpredictably.**

The liquor is used to make candy and other chocolate products, or the fat is expressed out, leaving cocoa powder. Candy consists of chocolate liquor plus sugar, soy-lecithin, flavorings and (for milk chocolate) milk. The greater the percentage of the final product that comes from cocoa nibs, the more bitter is the final product, generally changing its designation from semi-sweet to bittersweet.

People vary considerably in their perception of chocolate's bitterness and astringency – Hence the wide variation in preference for milk vs. dark and the types of dark, ranging from bittersweet up to the very bitter, 90% cocoa chocolates.

**Cocoa is just chocolate with the fat squeezed out.** It is very low calorie, retains the chocolate flavor and may or may not contain flavanols. The expressed fat (cocoa butter) and white chocolate, a confectionary of cocoa butter, vanilla, milk and sugar, contain no flavanols.

According to a Harvard study, most commercially available cocoa in the developed world is devoid of flavanols. While most candy makers do not process the chocolate liquor they use, some do and claim to produce flavanol-rich cocoa. Scharffen Berger chocolate maker prides itself on not dutching its cocoa in order to preserve flavanol content. Mars Company claims to process cacao beans in such a way that flavanols are retained in their proprietary Cocopro cocoa, which they use in some of their products. It does have a high flavanol content, and performs well in controlled trials of biological effects.

Since color doesn't reveal much about chocolate's nutrient content, what we need to quantify chocolate's healthfulness is not the word 'dark' on the label, but some measure of its active flavanols.

**Mood adjuster:** Some people use chocolate to 'drug' their mood disorders and compulsive behaviors. In spite of the assertion by some that chocolate's neuroactive substance content is too low to make us feel anything, studies prove that **people feel less depressed after chocolate consumption.** Some people assert that all palatable foods stimulate endorphin release in the brain, making us feel satisfied and happy.

There is something different about chocolate, however. Enjoying a piece of pizza is different from craving chocolate, and it just might be due to the tyramine, serotonin, dopamine and cannabinoid content, all of which affect mood and brain function. Many anti-depressants work by stimulating brain serotonin and dopamine activity and at least a few people can attest to the high of cannabinoids (the psycho-active component of marijuana).

Chocolate contains compounds that increase our natural cannabinoids in the brain by preventing their breakdown. This may contribute to the serenity that accompanies eating chocolate.

Cannabinoids stimulate appetite, another reason why eating chocolate may make us want to eat more and more of it. The sometime-soon-to-arrive appetite suppressant, rimonabant, works through its effect on the cannabinoid system and, at least in rats, eliminates chocolate consumption.

**Chocolate cannabinoids are not so similar to marijuana's** that they might produce a positive drug test. That defense was tried and disproved and the guy went to jail.

Some newly identified components, salsolinol and tetrahydro- $\beta$ -carbolines, exist in chocolate in significant quantities. They both have properties that might influence behavior and mood.

In addition to calming chemicals, **chocolate also contains several stimulants**, including caffeine and one used for asthma. Whether the balance of chocolate's biologically active chemicals calms or stimulates any given individual probably relates to that person's own brain chemistry.

Chocolate cravings in women often fluctuate with hormonal changes. Women do not have a monopoly on chocolate addiction, though. Many men in my practice reluctantly admit to being chocoholics, and not just at a particular time of the month. Most likely, a combination of chocolate's taste, mouth-feel, nutrient composition, and psychoactive ingredients induce cravings and make it difficult to stop eating it.

**Adverse effects:** Chocolate products contain some **lead**, occasionally high enough to exceed the Food and Drug Administration's recommendations. The lead usually comes from contamination by cacao bean shells which have adsorbed lead from the environment.

Chocolate contains **oxalate**, which may contribute to kidney stones. Individuals prone to calcium oxalate stones should restrict chocolate intake.

Some people react to chocolate with **headaches**, possibly due to its tyramine content. Cocoa may raise **blood pressure**, from its phenylethylamine, caffeine and methyl-xanthine content. These are naturally occurring in the cacao bean, not additives acquired during processing.

Cocoa powder added to any food stimulates insulin secretion more than occurs with the food alone. Chocolate also has calories and perpetuates its own consumption, often leading to **weight gain**. Both of these might lead to metabolic syndrome in genetically prone individuals.