

COCOA FLAVANOLS

A Snapshot of the Science

A Cocoa Glossary

Cocoa flavanols are naturally occurring compounds found in cocoa beans – the unprocessed cocoa bean is from the tropical plant *Theobroma cacao*. Flavanols are a distinct group of compounds within the **flavonoids** family – plant compounds that can be found in a variety of drinks and foods such as red wine, green tea and certain fruits and vegetables. Flavonoids are part of a broader class of compounds known as **polyphenols**.

Cocoa flavanol is the term used to refer to the single flavanol molecules called **monomers** and the larger **oligomer** molecules, which link 2 to 10 molecules together.

The compounds in cocoa are **flavanols**, not **flavonols** – which are entirely different compounds found in fruits and vegetables. Both are sub-groupings in the **flavonoids** family.

Flavanols are often confused with **antioxidants**. Some of the earliest research showed cocoa flavanols may have an antioxidant function -- helping to reduce LDL cholesterol oxidation. More recent and breakthrough research indicate the benefits go far beyond this role as an antioxidant. Newer studies point to broader benefits: improved blood flow, vessel relaxation and reduced risk of clotting. These functions appear to be the primary mechanism behind the potential cardiovascular benefits of flavanols.

It's in the Beans

While flavanols are found naturally in cocoa beans, traditional cocoa processing often destroys many of these heart-healthy compounds. After 15 years of scientific research on flavanols, Mars, Incorporated developed a patented and proprietary process called **Cocoapro**[®] that retains the natural goodness of the cocoa bean. This technology helps ensure that **CocoaVia**[™] retains much of the naturally-occurring cocoa flavanols, which support both heart health and the rich flavor.

What the Research Suggests

A growing body of evidence suggests that cocoa flavanols can help support cardiovascular health in multiple ways:

Ø Promotes a healthy blood flow and circulation

Harvard researchers studied the effects of flavanol- rich cocoa consumption on peripheral blood flow. Healthy participants regularly consumed a flavanol-rich cocoa beverage for five days and had measurements of blood flow taken on the first and last day of the study. Those subjects that consumed the flavanol-rich cocoa beverage experienced both acute and sustained increases in peripheral blood flow – improvements that appeared to be related to the production of nitric oxide, a molecule produced within the body that has an important role in regulating the response of blood vessels to blood flow.

In contrast, the consumption of a flavanol-poor cocoa beverage did not result in the same dramatic increases in blood flow. The results of this study suggest that cocoa flavanols can promote a healthy blood flow, which provides support that these flavanols may be an important dietary factor in maintaining cardiovascular health.

Fisher ND, Hughes M, Gerhard-Herman M, Hollenberg NK, Flavanol-rich cocoa induces nitric-oxide-dependent vasodilation in healthy humans. *Journal of Hypertension*. 2003; 21: 2281-6.

Researchers in Germany compared the effects of a high-flavanol cocoa beverage with a low-flavanol cocoa beverage among participants with a single cardiovascular risk factor. Those who consumed the high-flavanol beverage experienced significant increases in blood vessel dilation (relaxation) and this effect was paralleled by an increase in circulating nitric oxide, a compound in the body that helps blood vessels relax. When these same subjects consumed the low flavanol beverage, these changes were not observed. These findings support the concept that the consumption of flavanol rich cocoa may help to support a healthy vascular system.

Heiss C, Dejam A, Kleinbongard T, Schewe T, Sies H, Kelm M. Vascular effects of cocoa rich in flavan-3-ols. *Journal of the American Medical Association*. 2003; 290:1030-1031.

A study conducted at the University of California-San Francisco explored the impact of high-flavanol and low-flavanol chocolate on vascular function in a population of healthy adults. Participants who ate the high-flavanol chocolate experienced blood vessel dilation two hours after consumption, while there was no change observed in those who consumed the low-flavanol chocolate. The authors concluded that cocoa flavanols may be able to influence vascular health by improving vessel function.

Engler MB, Engler MM, Chen CY, Malloy MJ, Browne A, Chiu EY, Kwak HK, Milbury P, Paul SM, Blumberg J, Mietus-Snyder ML. Flavonoid-rich dark chocolate improves endothelial function and increases plasma epicatechin concentrations in healthy adults. *Journal of the American College of Nutrition*. 2004; 23:197-204.

Ø **Decrease tendency to form blood clots**

Researchers at the University of California-Davis conducted a feeding study to examine the effects of cocoa flavanols alone and in combination with a baby aspirin on platelet function. Participants in the study experienced modest improvements in platelet function, experiencing aspirin-like effects following the consumption of a flavanol-rich cocoa beverage alone. Interestingly, the results upon feeding flavanol-rich cocoa in combination with aspirin suggested that the combination of the two were additive – supporting the concept that cocoa flavanols and aspirin may help to modulate the factors that influence clot formation.

Rein D, Paglioni TG, Wun T, Pearson DA, Schmitz HH, Gosselin R, Keen CL. Cocoa inhibits platelet activation and function. *American Journal of Clinical Nutrition*. 2000; 72(1):30-35.

In this study, platelets (cells in blood that are the main component of blood clots) were found to be less prone to aggregate and form clots several hours after the consumption of flavanol-rich chocolate. The results suggest that cocoa flavanols may be influential modulators of the platelet response and, as such, may represent important dietary factors in the prevalence of clot formation.

Holt RR, Schramm DD, Keen CL, Lazarus SA, Schmitz HH. Chocolate consumption and platelet function. *Journal of the American Medical Association*. 2002;287:2212-2213.

Ø **Antioxidant effects**

Consumption of flavanol-rich chocolates resulted in an increase in blood antioxidant capacity within two hours after eating the chocolate. In addition, researchers also observed a decrease in markers related to damage caused by free radicals. Together, these data support the concept that cocoa flavanols may act as antioxidants in the body, and as such, may help to mitigate damage caused by free radicals.

Rein D, Lotito S, Holt RR, Keen CL, Schmitz HH, Fraga CG. Epicatechin in human plasma: in vivo determination and effect of chocolate consumption on plasma antioxidant capacity. *Journal of Nutrition*. 2000; 130(8):2109S-14S.

To study the potential benefits of regular cocoa flavanol consumption, healthy subjects participated in four-week randomized cross-over study in which they were instructed to consume either an average American diet, or this diet in combination with cocoa flavanols (supplied as flavanol-rich cocoa powder and flavanol-rich chocolate). After four weeks, participants who consumed a diet supplemented with flavanol-rich cocoa and dark chocolate experienced a number of favorable heart-health benefits including a decrease in LDL or “bad” cholesterol oxidation, an increase in HDL or “good” cholesterol, and an increase in total antioxidant capacity in the blood. This study supports the notion that regular cocoa flavanol consumption as part of a mixed diet can have a positive influence on factors related to cardiovascular health and as such, may be an important dietary strategy in supporting heart health.

Wan Y, Vinson JA, Etherton TD, Proch J, Lazarus SA, Kris-Etherton PM. Effects of cocoa powder and dark chocolate on LDL oxidative susceptibility and prostaglandin concentrations in humans. *American Journal of Clinical Nutrition*. 2001; 74(5): 596-602.

CocoaVia™ Research

Beyond the science supporting the heart-health benefits of cocoa flavanols, research presented at the American Heart Association Scientific Sessions (November 2004) demonstrated the cholesterol-lowering benefits of CocoaVia™ Snack Bars.

Ø Lowers total and LDL cholesterol

A free-living population of adults with elevated cholesterol were instructed to consume either two CocoaVia™ Snack Bars per day or a matched control product without plant sterols with meals for six weeks (the daily dose of plant sterols was 3 grams per day). The group that consumed the CocoaVia™ Snack Bars experienced a significant reduction in total (an average of 4.7%) and LDL (an average of 6%) cholesterol levels, as well as significant improvement in the ratio of total cholesterol to HDL cholesterol. This study demonstrated that the CocoaVia™ Snack Bar could effectively and safely reduce total and LDL cholesterol in a free-living adult population, and as such, the CocoaVia™ Snack Bar may represent a useful dietary strategy in maintaining healthy cholesterol levels.

Wang-Polagruto JF, Braun MM, Polagruto JO, Lee L, Kwik-Uribe C, Keen CL. Chocolate snack bars containing phytosterols effectively lowers total and LDL-cholesterol, without affecting plasma vitamins A or E. American Heart Association Scientific Sessions, November 8, 2004.

###