

## **CHOCOLATE: GOOD FOR HEALTH OR NOT**

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### **Summary**

Chocolate is delicious and most desired among child. Our parents, doctors and many others advise us to avoid the use of chocolate due to its damaging effects on health. But some of the recent researcher does not find it harmful. So, the question is this that how can we fight from the truth that this sweet delicious chocolate containing fats, calories and sugar is good for health or not? If it is beneficial then under which conditions it is good?

### **Introduction**

Recent studies showed that chocolate, not milk chocolate but dark chocolate, is not the health alarming stuff but is proving as health saving as reducing the risk of heart disease, reduce blood pressure, and reduce platelet activation. So decrease the risk factor for chronic diseases like diabetes and cardiovascular failure.

It is thought that these healthful effects on our health are due to the nature of chocolate mean its composition as it has high concentration of health benefiting compound particularly a class of flavonoids; which are the polyphenolic compounds which are also called catechins and also procyanadins.<sup>[1]</sup>

In fact, dark chocolate is derived from *Theobroma cocoa*. It is a plant which is chief source of flavonoids. And actually this flavonoids cocoa is a health protective including cardio protection, platelet activity inhibition also the activation of endothelial nitric oxide synthesis. In adults by increasing plasma epichatichin concentration it improves endothelial function.<sup>[2]</sup>

### **CHEMICAL COMPOSITION OF CHOCLATE**

#### ***Cocoa Polyphenols***

As chocolate is composed of cocoa beans which are chief source of flavanols containing procyanidins and subgroup of natural anti oxidant plant flavonoids and have all health protective effects found in tea, red wine tomato and other foods containing cocoa.<sup>[3,4]</sup> It contribute to trace mineral intake and is necessary for optimum functioning for all biological systems and vascular tone.

It has been proved experimentally that cocoa polyphenols have benefit effect on vascular health.<sup>[5]</sup> Epidemiological data put forward that daily consumption of foods containing

cocoa polyphenols like chocolate have helpful effect on heart and reduce stroke. Also a good and enhancing effect of cocoa on B.P. vascular function and platelet function and insulin resistance and Cocoa beans have been used for a long period of time as major source of cocoa and chocolate [6, 7]

Cocoa is a chief source of polyphenols and contains approximately 6-8% polyphenols by dry weight. [8] Cocoa products mainly involve flavanol glycosides, procyanidins, anthocyanins, catechins and polyphenols are also found in cocoa beans. Flavonoids and other polyphenols are antioxidant and powerful effects in vitro, having ability to scavenge a wide range of reactive species, including hypochlorous acid, hydroxyl radicals, peroxy radicals and super oxide radicals.

### **Flavonoids**

Two observations put light on the potential biological meaning of flavonoids. Initially, people which use the polyphenols red wine showed having ability to reduce the oxidation of LDL in vitro and this was recommended as an explanation of the "French paradox". [9] Second, the Zutphen study, an epidemiological study in the Netherlands, puts light on an inverse relationship between the incidence of coronary heart disease and stroke and the dietary eating of flavonoids, particularly quercetin. [10]

Actually the oxidation of LDL which is a key event in atherogenesis and cocoa polyphenols may prevent or resist the oxidation of LDL. [11] Furthermore cocoa polyphenols reduce lipoxygenase action in vitro. [12] There is proved from investigational studies that cocoa polyphenols may lessen linoleic acid auto-oxidation and NADPH-dependent lipid per oxidation [13] with rat liver microcosms. Additional studies in cultured cells suggest that cocoa polyphenols may show anti-inflammatory action by down regulating the production of pro-inflammatory cytokines. [14]

As cocoa polyphenols have positive effects on vascular health in humans. And reduce LDL oxidation. [15,16] Some studies also showed that it cause an increase in plasma HDL cholesterol, a decrease of biomarkers of lipid per oxidation and a decrease in plasma triglyceride [17] subsequent cocoa polyphenols utilization. According to the Cleveland Clinic's Heart & Vascular Institute Guide [18] flavonoids are compounds having ability of antioxidant protection against free radicals, help in the lessening of platelet activation, contribute the vasodilatation for enhancement in blood flow and confidently influence the production of eicosanoids to promote their role in cardiovascular health.

### **Other Components**

Collectively, the benefit in chocolate comes from cocoa butter, the lipid content of chocolate is relatively very high and consists of about equal amounts of a heart-healthy fat and stearic and palmitic acids and oleic acid which are a monounsaturated both are saturated fats. Even if saturated fats are generally linked with a higher risk of heart disease, stearic acid has been found to have a more neutral effect on cholesterol, neither raising nor lowering LDL-cholesterol levels. Palmitic acid, secondly, does affect cholesterol levels. It represents only one third of fat calories in chocolate. [19] More researches indicates that much of the fat present in chocolate exists mainly in the form of stearic triglycerides, having effects to increase high-density lipoproteins and are the "good cholesterol" and readily cleansed from our corporal souls through gastrointestinal excretion. [15]

## **BENEFICIAL EFFECTS OF CHOCOLATE**

### ***Cardiovascular Disease***

As we know that chocolate is composed of flavonoids which is present in cocoa. It has various beneficial effects on cardiovascular health. Epidemiological analysis among elderly participants suggest that daily intake of cocoa flavonoids protect against heart disease.<sup>[20]</sup> Recently published reports indicates the Flavanol-3-ols which is the main flavonoids found in chocolate cocoa and its oligomeric derivatives, procyanidins, by antioxidant protection and vascular homeostasis have variety of beneficial effects. These beneficial effects also find beneficial for other flavonoids.<sup>[21]</sup> Eating such foods containing rich amount of cholesterol and saturated fatty acids have been long predictable an important antecedent for the progress of coronary heart disease. Cholesterol and fatty acids each separately enhance the LDL and Cholesterol concentration in the blood. Some modern researches have tells that utilization of dark chocolate have no insensitive effect on serum cholesterol level; Though also reports that dark chocolate can in fact improve cholesterol concentration these two points have been mixed. Among four freshly available studies to show the effects of eating dark chocolate (approximately 75-100g/daily ) has effect on cholesterol level in humans, two studies published has no effect on LDL 'bad' cholesterol on the other hand the other two published have moderate improvements.<sup>[22]</sup> It is also recommended that an enhancement in HDL cholesterol 'good cholesterol' is due to the much of fat in chocolate is mainly due to the stearic triglycerides, which in turn increase HDL(High-Density lipoprotein).<sup>[15]</sup>

Cocoa chocolate without fat helps to prevent blood clots thus prevent heart attack. Chocolate is composed of nearly equal amount of palmitic, stearic and oleic acid. Among all stearic acid has been measured to be benign or neutral a 18 carbon saturated fatty acid does not increase the blood pressure like other saturated fatty acids. Its benign nature is due to the failure to increase the blood pressure and plasma cholesterol concentration.<sup>[23]</sup>

Chocolate contains a large amount of lipids; on the other hand, one third of cocoa fat is consisting of stearic acid that has a neutral cholesterolomic reaction in humans. Actually the cocoa and the chocolate have a trace mineral response, which is important for maximal functioning of all biological systems and for smoothness of vessels. Thus it has a relationship between health and nutrition.<sup>[24, 25]</sup>

### ***Effect on Blood Pressure***

As chocolate is a chief source of flavonoids and also those compounds which have the antioxidant activity. Its verification exist and showed that use of dark chocolate which is rich in flavanols causes an increase in level of epicatechin antioxidant and in the activity of antioxidant and a decrease in fat oxidation in a dose-related manner. Thus making the walls of arteries smooth and promote efficient and steady blood flow and chocolate thus prevent the plaque formation so helps in smooth blood flow.<sup>[19]</sup> In healthy adults, flavanol-rich cocoa cause the activation of nitric oxide thus induce vasodilatation this is the way that chocolate helps in mechanism for protection which is induced in coronary blood vessels.<sup>[17]</sup> Actually it improves endothelial function and decrease in systolic and diastolic blood pressure.<sup>[26]</sup>

In ischemic patient it was observed over 6-week there was not considerable difference in forearm blood flow and soluble cellular adhesion molecule-concentration in plasma and did not modify vascular function in subjects with coronary artery disease.<sup>[27]</sup>

There is increase risk of cardiovascular disease after menopause and can be associated with increase in endothelial dysfunction. A study of 32 postmenopausal hypercholesterolemia women, used to eat a flavanol cocoa food for 6 weeks was to identify beneficial effects on vascular epithelium of flavanol-rich cocoa consumption in this population. In addition to that, the results of all studies showed that flavanol because reductions in plasma soluble vascular cell adhesion markers after chronic expenditure of a flavanol-rich cocoa may improve vascular reactivity.<sup>[28,29]</sup>

### ***Effects on Blood Flow***

Dark chocolate is a rich source of flavonoids and compounds having anti-oxidant and anti-inflammatory properties. Chocolate contain procyanadins polyphenols which hypothesized providing cardio protective effects only due to having inhibition of lipid oxidation and free radical. So, the people who consumed 80g cube of a chocolate then there is an increase in plasma epichetichin level, plasma oxidation and decrease in plasma lipid oxidation products<sup>[30]</sup> and decrease in fat oxidation and also improve mediated dilation of blood vessel.<sup>[31]</sup> Modern studies among the young's using functional magnetic resonance imaging showed that chocolate rich in flavanols play an important role in an increase in blood flow to cerebral gray matter, thus cocoa polyphenols might reduce stroke which is useful in impairment of cerebral gray matter. And the 2<sup>nd</sup> way in which cocoa have a cardio protective action is its capability to thin the blood by reducing platelet activation. It has been seen in human after given dark chocolate<sup>[32]</sup> or also the cocoa polyphenols supplements.<sup>[33]</sup>

### ***Hypertension***

Overall in the world Hypertension is foremost risk of death among the people.<sup>[34]</sup> Anti-hypertensive drugs are recommended in case of high blood pressure. Khuna Indians in Panama; a population which is famous for their lack of high blood pressure and hypertensive drugs comes from their observational studies.<sup>[35]</sup> Several effects of chocolate on blood pressure heart are favorable. Furthermore, it also results in weight gain; which is one of the factors to fight against hypertension.

### ***Diabetes***

It is known by studding two available studies by Davide Grassi and his colleagues in Italy that 100g of chocolate rich in cocoa-flavonoids daily result in a decrease in insulin levels, also a decrease in insulin resistance and a rise in insulin sensitivity.<sup>[8]</sup>

Jennie Brand-Miller and her co-workers compared the cocoa added foods and foods without cocoa and examined the different effects on insulin and glucose levels.<sup>[36]</sup> They notice that foods added with cocoa cause increase in insulin level average 28%. But increase in insulin level on diabetic patient weather it is harmful, neutral or beneficial in the absence of change in glucose level is unknown. But all these studies examined in non-diabetics.

### ***Antioxidant***

Chocolate is one of the daily available sources of anti-oxidant. And it is thought that chocolate is on third number for US. Among 6000 antioxidant 4000 are categorized as polyphenols yet identified. Flavanoids in chocolate cocoa have ability of anti-oxidant. Especially the procyanidins found in cocoa. It is associated with anti-oxidant capacity.<sup>[37]</sup>

### ***Platelet Activation***

Several researches has confirmed that flavanol metabolite found in cocoa polyphenols have capacity to inhibit platelet aggregation.<sup>[31]</sup> Platelet activation and endothelial dysfunction leading to the thrombus formation, inflammation and vasoconstriction is cornerstone in pathogenesis of atherothrombosis.<sup>[38]</sup> Additionally, after platelet activation cocoa polyphenols have an inhibitory effect on platelet leukocyte interaction. And this inhibiting effect of cocoa polyphenols is unmistakable both ex vivo and in vivo after eating flavanol-rich cocoa not only cocoa chocolate but also cocoa beverages also inhibited leukocyte activation. So, taken together ex vivo and in vivo researches found that eating of all these cocoa rich in flavanols products have affects on platelet and leukocyte function thus improving cardiovascular health.<sup>[39]</sup>

### ***Chocolate Effects on Mood***

Chocolate has been used from long period of time as a source of enjoyment and pleasure. And the main properties are being a stimulant, tonic and antidepressant. Food was distinguished between hunger and emotional eating and effects of chocolate was studied on each psycho-physiological concepts. When chocolate is used as comfort or emotional eating it is related with the maintenance rather than the ending of dysphoric mood and also provides self-indulgent return by satisfying the hunger. So, it can be used as self-medication.<sup>[40]</sup>

### ***Action as Aspirin***

As we know that chocolate have ability to inhibit platelet function, it cause the clotting time to slow, have inhibitory effect on platelet leukocyte interactions all these properties are like the aspirin. So, it is said that chocolate have same effects like aspirin.

## **Conclusion**

It is concluded that chocolate not milk chocolate but it is dark chocolate which is beneficial for health it has no harmful effects on health. Using a cube of dark chocolate daily keeps doctor away but in limited amount mean in dose related manner.

So, it is the dark chocolate which reduces the blood pressure, protective cardiovascular effect, insulin sensitivity, antioxidant effect, platelet activation. Hence effects similar to aspirin.

Knowing all potential benefits of chocolate it results that dark chocolate is health loving but not the milk chocolate because milk chocolate contains the fats and calories and bad cholesterols which have alarming effects on health.

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