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Impact of Tea on Cardiovascular Disease

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Abstract

Cardiovascular disease (CVD) is a class of diseases that involve the heart or blood vessels. Cardiovascular diseases are the leading cause of death globally. It is estimated that 90% of CVD is preventable. Tea is a good source of compounds known as catechins and epicatechins, which are thought to be responsible for tea's beneficial health effects. Compounds belong to a group of plant chemicals called flavonoids. The results of compounds present; antioxidative properties; enzymatic reaction and nutrients present reviews the health benefits of tea in preventing cardiovascular disease. Most prospective cohort studies, summarizes the intervention programmes on tea against cardiovascular disease. At present, available research evidence that the consumption of tea reduces risk for cardiovascular disease.

Keywords-Cardiovascular disease, Tea, Compounds, Enzymes, Nutrients, Benefits, Intervention Studies

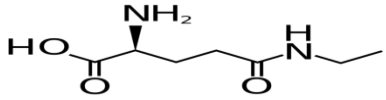
Introduction

Cardiovascular disease includes coronary artery diseases (CAD). Research makes it clear that abnormal blood lipid (fat) levels have a strong correlation with the risk of coronary artery disease, heart attack and coronary death. Much of the food we eat every day contains saturated and transfats. They raise the blood cholesterol level, which may potentially clog up the arteries, putting one at greater risk of heart disease. Age, sex, smoking, blood pressure, blood lipids and diabetes are important predictors of future cardiovascular disease in people who are not known to have cardiovascular disease. Epidemiological observations suggesting an inverse correlation between tea consumption and the incidence of cardiovascular diseases have been well established. A research study that enrolled 203 patients who underwent coronary angiography, the observation that green tea consumption was significantly higher in patients without coronary artery disease than in those with coronary artery disease was made. Mechanistic studies have shown that tea and tea polyphenols have favorable effects on systemic risk factors and direct effects on the vasculature and platelets that might account for reduced cardiovascular risk.

Compounds in tea

Tea leaves are obtained from the Camillia Sinensis plant. Based on how the leaves are processed, Tea leaves contain a large amount of polyphenols (about 30% of the dry substance), mainly flavonoids. The major class of flavonoids in tea is flavanols, which include catechin, epicatechin (EC), epigallocatechin (EGC), epicatechin gallate (ECG), and epigallocatechin gallate (EGCG). Total polyphenol content is similar in different types of tea, but the individual components vary, based in part on the degree of polyphenol oxidation during the manufacturing process. Catechins constitute about 80–90% and flavanols about 10% of the total flavonoids in green tea. On the other hand, theaflavins account for 50–60% and catechins only 20–30% of total flavonoids in black tea.

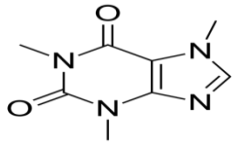
Aminoacids



L-theanine

Amino acids give tea its brothiness, or umami taste. Tea leaves contain many amino acids, the most abundant of which is theanine. Theanine, more specifically L-Theanine is responsible for promoting alpha brain wave activity which promotes relaxation. L-Theanine in concert with caffeine can induce a state of "mindful alterness" in the tea drinker. In steeped tea, amino acids make up 6% of the extract solids[1].

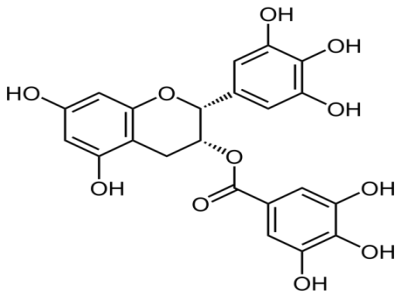
Methylxanthines



Caffeine

Methylxanthines in tea include the stimulant caffeine and two similar compounds: theobromine and theophylline. The tea plant creates these chemicals as a natural combatant towards insects and other animals. On average, methylxanthines in tea leaves make up 2% to 5% of the dry weight of the fresh leaves[5]. Methylxanthines also contribute to a bitter taste in the tea infusion. Levels of these compounds depend on the variety and cultivar of Camellia sinensis used, climate, age of the leaves, and the propagation method (seed vs. cutting) used on the plant.

Polyphenols



EGCG

In steeped tea, polyphenols are largely responsible for astringency. The term polyphenol simply refers to a categorization of compounds composed of many phenolic groups, hence the name poly-phenol. These compounds are plant metabolites produced as a defense against insects and other animals and are the most abundant compounds in tea comprising as much as 30-40% of both freshly plucked tea leaves and solids in tea liquor. There are an estimated 30,000 polyphenolic compounds in tea[4], flavonoids are arguably the most important group of polyphenols in tea and are the source of the many health claims surrounding tea, and specifically tea antioxidants. EGCG is the most active of these catechins and is often the subject of studies regarding tea antioxidants.

Volatiles

The volatile substances in tea leaves are largely responsible for a tea's flavor and aroma. The aroma complex of tea is made up of hundreds (maybe even thousands) of flavor and aroma compounds that exist in trace amounts. Many of these aromatic compounds do not exist in fresh tea leaves and are derived from other substances during processing.When studying tea's aroma complex, it is sometimes broken into two parts: primary aroma (from fresh tea leaves) and secondary aroma (products of manufacture). Regardless, more and more research is being done on tea volatiles and how our olfaction system works in general, so we may expect some clarity on this issue in the coming years.

Enzymes

Polyphenol oxidase and peroxidase are the most important enzymes in tea leaves. They are responsible for the enzymatic browning of tea leaves that takes place when the cell walls in the leaves are broken and the polyphenols are exposed to oxygen – otherwise known as oxidation. These enzymes may be denatured or deactivated using heat so that browning cannot occur. The enzymes may also be denatured by simply depriving them of moisture for a time which is what happens during the long withering period in white tea production

Health Benefits of tea

Table 1: Tea as a preventive agent of Cardiovascular Disease

S.NO	Potential Mechanisms of Benefit for Tea against Cardiovascular Disease
1.	Blood pressure lowering
2.	Improved dyslipidemia
3.	Improved insulin sensitivity
4.	Weight loss
5.	Antioxidant effects – scavenging reactive oxygen species and preventing oxidation of lipids, proteins, and DNA
6.	Anti-inflammatory effects
7.	Improved endothelial function
8.	Platelet inhibition
9.	Inhibition of smooth muscle cell proliferation and migration

Antioxidant properties of tea

A large number of studies, including large clinical trials were conducted, and overall there remains little evidence that antioxidant supplements, including vitamins E and C and beta carotene, reduce cardiovascular disease.

Pigments in tea

Tea carotenoids are another pigment group found in tea leaves and are mainly composed of carotenes which are orange and xanthophylls which are yellow and are also responsible for the color of finished tea leaves

Nutrients
Carbohydrates

All plants store energy formed during photosynthesis in starches and sugars, otherwise known as carbohydrates. Plants later use this stored energy to fuel important reactions, in tea, carbohydrates help to fuel the enzymatic reactions that take place during oxidation .Carbohydrates make up on average 11% of extract solids in steeped tea[1] and lend to its sweetness.

Minerals

28 mineral elements have been found in the tea flush. Compared to other plants, tea has a higher than average amount of: fluorine, manganese, arsenic, nickel, selenium, iodine, aluminum, and potassium[5]. Tea also has an unusually high amount of fluorine, which has been known to help prevent tooth decay in humans, however too much fluorine can be harmful. It is important to note that fluorine occurs in greater amounts in older tea leaves. Tea minerals vary greatly with each harvest and change greatly during processing.

Research on tea with cardiovascular disease subject

Table 2: Intervention studies of tea on blood pressure and lipids since the FDA decision

S.No	Reference	Endpoint	Study design	Result
1.	Nagao	Body fat, LDL, blood pressure	Green tea extract, randomized parallel group, 12 weeks, n=240	Benefit
2.	Bertigaglia de Santana	LDL,HDL, triglycerides	Green tea, randomized parallel group, 90 days, n=25 per group	No benefit
3.	Fujita	LDL, triglycerides, body weight	Black tea, randomized parallel group, 3 months, n=47	Benefit
4.	Brown	Blood pressure, LDL, HDL,	EGCG, randomized parallel group, 8 weeks, n=88	Benefit on blood pressure,no benefit for lipids
5.	Nantz	Blood pressure, LDL	Tea extract, randomized parallel group, 3 weeks, n=111	Benefit on LDL andblood pressure
6.	Basu	Blood pressure, LDL, body weight	Green tea extract, randomized parallel group, 8 weeks, n=35	Benefit on body weight,no benefit on LDL
7.	Trautwein	Serum lipids	Black tea extract, randomized parallel group, 11 weeks, n=102	No benefit
8.	Hooper	LDL	Meta-analysis of 133 green tea intervention studies	Benefit on LDL

LDL= low density lipoprotein cholesterol, HDL= high density lipoprotein cholesterol

Conclusion

Nutrition Committee of the AHA recommended that individuals consume a diet rich in fruits and vegetables to reduce the risk for cardiovascular disease. Such a diet includes green and black tea. Through this review article, it is clear that consumption of tea may prevent the cardiovascular disease.

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