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NOTE

A 'Healthy' Hot Cuppa

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Tea is an important dietary source of flavanols and flavonols. *In vitro* and animal studies provide strong evidence that tea polyphenols may possess the bioactivity to affect the pathogenesis of several chronic diseases, especially cardio vascular diseases and cancer. However, the results from epidemiological and clinical studies of the relationship between tea and health are mixed. Clinical trials employing putative intermediary indicators of disease, particularly biomarkers of oxidative stress status, suggest tea polyphenols could play a role in the pathogenesis of cancer and heart disease.

Key Words: Tea, Flavonoids, Cardiovascular disease, Cancer, Oral health, Kidney stones.

From ancient period people have been brewing tea made from the leaves of the *Camellia sinensis* plant. Although health benefits have been attributed to tea consumption since the beginning of its history, scientific investigations of this beverage and its constituents has been underway for less than three decades. Epidemiological surveys have associated tea drinking with reduced risk of cardiovascular and cancer, while studies in cell cultures and animal models indicate a potentially beneficial effect of tea on phase I and phase II hepatic enzymes, gene transcription, cell proliferation and other molecular function. Within the last few years, clinical studies have revealed several physiological responses to tea which may be relevant to the promotion of health and the prevention or treatment of some chronic diseases.

Tea is a rich source of polyphenolics[1], particularly flavonoids. Flavonoids are phenol derivatives synthesized in substantial amounts and variety and widely distributed among plants. The major flavonoids present in green tea include catechins, such as epicatechin, epicatechin-3-gallat and epigallocatechin-3-gallat. In black tea the polymerized catechin such as theaflavins and thearubigens predominate. The flavonoid concentration of any particular tea beverage depends upon the type of tea (*e.g.*, blended, decaffeinated instant) and preparation. Decaffeinating reduces slightly the catechin content of black tea. The highest concentration of flavonoids are

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found in brewed hot tea, less in instant preparations and lower amounts in iced-to-drink tea. The addition of milk or water can reduce the flavonoid concentration per serving.

Tea flavonoids have been found, *in vitro*, to enhance gap junctional communication, stimulate B cell proliferation and inhibit hepatic cytochrome P450-dependent enzymes. The principal hypothesis associated with the putative health benefits of tea linked to the antioxidant properties of its constituent flavonoids. Tea flavonoids can chelate metal ions like iron and copper to prevent their participation in Fenton reactions. The antioxidant capacity of tea and tea polyphenols has been assessed by several methods, using the oxygen radical absorbance capacity assay. It is found that both green and black tea have much higher antioxidant activity against peroxyl radicals than vegetables such as garlic, kale, spinach and Brussels sprouts. Using the ferric reducing ability of plasma aasay, it is suggested that the total antioxidant capacity of green tea to be more potent than black tea. Using the tocol equivalent antioxidant capacity assay. The antioxidant capacity of flavonoids determined *in vitro* is dependent upon the type of assay employed and does not reflect factors such as bioavailability and metabolism.

Recently, several clinical trials have demonstrated that a single dose of tea improves plasma antioxidant capacity of healthy adults within 0.5 to 1.0 h after ingestion. Repeated consumption of tea and encapsulated tea extracts for one to four weeks has been demonstrated to decrease biomarkers of oxidative status.

The black tea, together with apples and onions, contributes substantially to total flavonol consumption. Epidemiological evidence, particularly from a 10 to 15 year follow up of coharts of 550-800 men from the Zutphen study in the Netherlands, reveals a strong inverse association between flavonol intake and coronary heart disease mortality and stroke incidence. Tea consumption has been inversely associated with the development and progression of atherosclerosis. Elevated blood pressure can accelerate the atherosclerotic process and evidence linking reduced blood pressure with tea consumption has been reported in studies of green tea polyphenols in hypertensive animals and among black tea drinkers in Norway.

Evidence for the anticarcinogenic potentiality of tea polyphenols has been provided by numerous *in vitro* and experimental studies describing their action to bind directly to carcinogens, induce phase II enzymes such as UDP-glucuronosyl transferase and inhibit heterocyclic amine formation[2,3]. Some epidemiological studies also support a protective role of tea against the development of cancer, studies conducted in Asia, where green tea is consumed frequently and in large amounts, tend to show a beneficial effect on cancer prevention.

Drinking tea was associated with lower levels of dental caries in a cross-sectional study of 6014 secondary school children in England. Tea may have a beneficial impact on caries because of the presence of natural fluoride. In addition, extracts of green tea inhibit oral bacteria such as *E. coli*, *Streptococcus salivarius* and *Streptococcus mutans*. Oolong tea polyphenols appear to inhibit bacterial adherence to tooth surface by reducing the hydrophobicity of streptococci and to inhibit their carcinogenicity by reducing the rate of acid production.

Some studies have suggested tea consumption may affect the absorption of oxalates and contribute to the development of kidney stones, in an examination of the prospective Nurses' Health study, a cohort of more than 90000 women, 40 to 65 years of age found an inverse association between tea consumption and the risk of kidney stone formation.

As tea is already one of the most popular beverages worldwide, future studies, designed to accurately assess tea consumption and tea polyphenols status, should be directed to quantifying its role in the primary and secondary prevention of chronic diseases.

REFERENCES

1. C. Yang, J. Chung, G. Yang, S. Chhabra and M. Lee, *J. Nutr.*, **130**, 472S (2000).
2. Y. Kuroda and Y. Hara, *Mutat. Res.*, **436**, 69 (1999).
3. L. Kohlmeier, K. Weterings, S. Steck and F. Kok, *Nutr. Cancer*, **27**, 1 (1997).

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