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Dietetic Corollary & Revitalizing Wealth of Green Tea for Conviviality & Cheerfulness

Priyanka Singh¹, Sabiha Khan², Rajnee³, Bhanwar Lal Jat⁴, Neetu Singh⁵,
CR Chaudhary⁶, Raaz K Maheshwari*⁷

¹Department of Pharmaceutical Science, MDU, Rohtak, Haryana, India

²Department of Zoology, Govt PG College, Ajmer, Rajasthan, India

³Department of Physiology, SNMC, Jodhpur, Rajasthan, India

⁴Department of Botany, SBRM Govt PG College, Nagaur, Rajasthan, India

⁵Department of Biotechnology, Vasundhara, Mewar University,, Ghaziabad, UP, India

⁶Pro-President, Mewar University, Gangrar, Chittorgarh, Rajasthan, India

⁷Department of Chemistry, SBRM Govt PG College, Nagaur, Rajasthan, India

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Abstract

Green tea has many health benefits, some have been proven and some may just be folklore. Just like black tea, it comes from the *Camellia sinensis* plant. Some of the various chemical compounds in green tea: polyphenols and flavonoids; alkaloids, such as caffeine and theobromine; carbohydrates; tannins; minerals, such as F and Al are higher than black tea because the fermentation process alters their composition. Of all the different polyphenols, one seems to stand out above the rest. Epigallocatechin gallate is a very powerful antioxidant and is believed to be an important player in the therapeutic qualities of green tea. Along with the natural fluoride found in tea, polyphenols and catechins are associated with killing bacteria that cause tooth decay, bad breath, and gum disease-the number one cause for tooth loss. The catechins found in tea prevent cell mutation, deactivate certain carcinogens, and reduce the formation and growth of tumors. It's thought that tea helps diminish bone loss through antioxidant and anti-inflammatory activity. Additionally, tea's health-promoting properties are thought to suppress the breakdown of bone while increasing the amount and activity of bone building cells. Evidence is still inconclusive in this area, but it's thought that the catechins found in tea, specifically green tea, create thermogenesis-the production of heat within the body which is related to burning calories. For people who are at-risk for developing cancer, it might be a worthwhile avenue to pursue. The strong antioxidant potential of catechins, and especially EGCG, are widely demonstrated *in vitro* and in animal studies. In addition, catechins possess antimutagenic, antidiabetic, anti-inflammatory, antibacterial and antiviral properties. Recent human studies suggest that green tea may contribute to reduce the risk of cardiovascular disease and has another beneficial effect on health. Although research of green tea is very promising, future studies considering dietetic, environmental and life style factors, are necessary to fully understand its contribution to human health.

Keywords: Antioxidant activity, EGCG; HDL, LDL, Metalloenzymes, Glucose tolerance, Insulin sensitivity, Cytotoxicity, Polyphenols, Catechins FRAP assay, Lipid peroxidation

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***Corresponding author**

Raaz K Maheshwari

Department of Chemistry

SBRM Govt. PG College,

Nagaur, Rajasthan, India

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1. Introduction

Tea, a product made up from leaf and bud of the plant *Camellia sinensis*, is the second most consumed beverage in the world, well ahead of coffee, beer, wine and carbonated soft drinks^{1,2}. In vitro and animal studies, and clinical trials employing putative intermediary indicators of disease, particularly biomarkers of oxidative stress status, provide strong evidence that green tea polyphenols (GTP) may play a role in the risk and pathogenesis of several chronic diseases, especially cardiovascular disease and cancer, and related pathologies. In addition, several studies suggest a beneficial impact of green tea intake on bone density, cognitive function, dental caries and kidney stones, among other effects [4,5]. Over the last years, numerous epidemiological and clinical studies have revealed several physiological responses to green tea which may be relevant to the promotion of health and the prevention or treatment of some chronic diseases.



Figure.1

However, the results from epidemiological and clinical studies of the relationship between green tea consumption and human health are mixed. For example, conflicting results between human studies may arise in part, from ignoring socioeconomic and lifestyle factors as well as by inadequate methodology to define tea preparation and intake [2,4,7]. Green tea is a type of tea that is harvested and then quickly preserved. Whereas black tealeaves are allowed to oxidize after they are picked, green tealeaves are immediately heated to prevent oxidation. (Oxidation is a natural process. It's the same thing that happens when you slice an apple and it begins to turn brown and taste sweeter as it is exposed to oxygen.)



Figure.2

Depending on where they were grown, how they were processed, when they were harvested, etc., good green teas can have a range of tastes. Common descriptors for good quality green tea include: sweet, bittersweet, nutty, vegetal, buttery, floral, swampy, fruity and oceanic. Steamed green teas tend to taste bittersweet (especially in the after taste), while other green teas tend to taste sweet. It is safe to drink green tea during pregnancy, as long as you don't drink too much. That's because green tea contains caffeine. Experts recommend sticking to 200mg of caffeine a day, which is about three to four cups of green tea. Bear in mind that this limit includes all sources of caffeine. So you'll need to count coffee, cola, energy drinks, chocolates and soft drinks. Green tea has been thought to be a health-promoting drink, because it is rich in antioxidants. Antioxidants are chemical compounds that can help to prevent cell damage in our bodies. Research suggests that green tea may help protect you against a number of diseases, including heart disease, high blood pressure and some forms of cancer. Drinking green tea may also be good for your teeth and bones and strengthen your immune system.

However, drinking an extremely large amount of green tea can prevent you from absorbing folic acid properly. Folic acid is an important nutrient, particularly during the first 12 weeks of your pregnancy. One small study suggests that babies can develop neural tube defects, such as spina bifida caused by the lack of folic acid, if their mums drink lots of green tea around the time of conception. It's unlikely you'd want to drink that much green tea every day so enjoy a mug or two if you want. Green tea can also prevent your body from absorbing iron. So it is best not to drink tea with your meals.

What Makes Green Tea So Special

The secret of green tea lies in the fact it is rich in catechin polyphenols, particularly EGCG. Which is a powerful anti-oxidant: besides inhibiting the growth of cancer cells, it kills cancer cells without harming healthy tissue. It has also been effective in lowering LDL cholesterol levels, and inhibiting the abnormal formation of blood clots. The latter takes on added importance when you consider that thrombosis (the formation of abnormal blood clots) is the leading cause of heart attacks and stroke. Links are being made between the effects of drinking green tea and the "French Paradox." For years, researchers were puzzled by the fact that, despite consuming a diet rich in fat, the French have a lower incidence of heart disease than Americans.



Figure.3

The answer was found to lie in red wine, which contains resveratrol, a polyphenol that limits the negative effects of smoking and a fatty diet. In a 1997 study, researchers from the University of Kansas determined that EGCG is twice as powerful as resveratrol, which may explain why the rate of heart disease among Japanese men is quite low, even though approximately seventy-five % are smokers. Why don't other Chinese teas have similar health-giving properties? Green, oolong, and black teas all come from the leaves of the *Camellia sinensis* plant. What sets green tea apart is the way it is processed. Green tea leaves are steamed, which prevents the EGCG compound from being oxidized. By contrast, black and oolong tea leaves are made from fermented leaves, which results in the EGCG being converted into other compounds that are not nearly as effective in preventing and fighting various diseases [29]. If you want to cut those extra inches around your tummy, switching to green tea could be a simpler way. A new study shows that green tea extract increases the rate of calorie burning by the body. It reduces blood fat, cholesterol, bloatedness, detoxifies the body and suppresses untimely food cravings. Enabled with diuretic properties, it also eliminates excess water and thereby reduces excess weight. So the best way to get rid of that paunch is to have green tea along with the right amount of bodily exercise. Boosts exercise endurance: Antioxidants present in green tea extracts increase body's ability to burn fat as fuel which accounts for improved muscle endurance. It also enhances energy levels and boosts your metabolism. Reduces the risk of heart attack: Drinking green tea rapidly improves the health of body cells lining the blood vessels and also helps in lowering one's risk for heart disease. The flavonoids present in this tea protect the heart by relaxing the blood vessels so blood can flow more easily. So, protect your heart and have green tea on a regular basis.

The antioxidants in tea helps protect against a shiplot of cancers, including breast, colon, colorectal, skin, lung, esophagus, stomach, small intestine, pancreas, liver, ovarian, prostate and oral cancers. Green tea extract is reported to induce cancer cell death and starve tumors by curbing the growth of new blood vessels that feed them. Hydration benefits: If you love drinking green tea then there is good news for you. Contrary to common belief that tea dehydrates, green tea provides hydration benefits similar to water. Tea not only rehydrates as well as water does, it also has many other health benefits. Protection from harmful ultraviolet rays: The sun's UV rays in summer act as a constant threat. Green tea is rich in antioxidants that scavenge harmful free radicals in the body according to researches. Also using green tea extracts along with your sunscreen could afford you the greatest level of sun protection. Green tea can do wonders to a person suffering from diabetes. Green tea apparently helps regulate glucose levels slowing the rise of blood sugar. It also triggers and stimulates insulin production and activates the functioning of pancreas to some extent. Blood sugar level in the body is also normalized and regularized by the use of green tea.

Polyphenols in green tea may help maintain the parts of brain that regulate learning and memory. So, regular consumption of green tea could help in prevention of degenerative and neurological diseases like Alzheimer's and Parkinson's. Antioxidants found in green tea fight free radicals thereby keeping a check on ageing and promoting longevity. Because it contains high levels of oligomeric proanthocyanidins one of the most powerful antioxidants,



Green Tea is thought to help slow down the premature ageing process. Polyphenols and Flavonoids present in green tea boost the immune system to make the human body stronger in fighting various infections. Also, Vitamin C present in green tea keeps cold and flu away. New evidence is emerging that green tea can even help dieters. In November, 1999, the American Journal of Clinical Nutrition published the results of a study at the University of Geneva (UOG) in Switzerland. Researchers found that men who were given a combination of caffeine and green tea extract burned more calories than those given only caffeine or a placebo. Green tea can even help prevent tooth decay! Just as its bacteria-destroying abilities can help prevent food poisoning, it can also kill the bacteria that causes dental plaque [30-34].

2. Green Tea & Its Nutritional Value

Green tea consumption contributes to the overall daily fluid intake, and if sugar is not added, the calories intake is insignificant; besides, the caffeine intake is lower than in coffee, black tea or cola soft-drinks. In addition, green tea contribution to the dietary intake of antioxidant compounds (catechins and other phytochemical substances, certain vitamins as vitamin C, and minerals as Mn, Cr, Se, Zn) is very interesting to promote human health and well being, and more relevant than that other non-alcoholic beverages widely consumed. The Mn content is high, and tea is considered a rich source of this essential element^{12,13}. Manganese is a constituent of three metalloenzymes (i.e., arginase, pyruvate carboxylase, and Mn-superoxide dismutase) and it activates a large number of enzymes, such as glycosyl transferases, involved in mucopolysaccharide synthesis¹⁴. Manganese deficiency can cause abnormalities in the metabolism of carbohydrates, glycosaminoglycans, and cholesterol Chromium (Cr), selenium (Se) and zinc (Zn) play also an important role in human metabolism, and interest in these elements is increasing since there are reports relating trace element status and oxidative diseases. Chromium is involved in carbohydrate and lipid metabolism; the most frequent sign of Cr deficiency is altered glucose tolerance; this nutrient has been associated with diabetes and cardiovascular diseases [15-17].

Beneficial effects of dietary Cr supplementation, particularly in groups in which deficiencies are frequent, have been reported. Selenium functions through selenoproteins, several of which are oxidant defense enzymes; Se acts as enzymatic cofactor of glutathione peroxidase in the elimination of peroxide radicals from the organism. Epidemiological studies have shown the possible effects of Se in the prevention and regression of cancer. Most Se is ingested in food, but food derived from vegetables has a variable Se content depending on the zone where they have been cultivated. Zinc enzymes participate in a wide variety of metabolic processes including carbohydrate, lipid, and protein synthesis or degradation. This element is required for deoxyribonucleic and ribonucleic acid synthesis; it may also play a role in stabilizing plasma membranes. Zinc has been recognized as a cofactor of the superoxide dismutase enzyme, which is involved in protection against oxidative processes. Recently there has been a development of terminology and change in conceptual approaches towards setting nutrient recommendations from adequate to optimum nutrition. R

Regarding antioxidant minerals, the US Food and Nutrition Board (USFNB) has set an Adequate Intake for Mn at 2.3 and 1.8 mg/day for adult men and women, respectively, and a Tolerable Upper Intake Level (TUIL) at 11 mg/day for adults. Chromium Adequate Intake (CAI) values are 35 and 25 µg/day for young men and women, respectively. The Recommended Dietary Allowance for Zn is 8 and 11 mg/day for adult men and women, respectively; the TUIL for adults is 40 mg/day. The selenium Recommended Dietary Allowance (RDA) and TUIL for adults is 55 and 400 µg/day, respectively. In addition, green tea contains more vitamin C than black and oolong teas; the total content of vitamin C in tea leaves decreased during the manufacturing process of fermented teas however bibliographical data on vitamin C content in green tea are scarce. Due to the fact that green tea consumption in the occidental diets (except Morocco) is scarce and occasional, its contribution to the total antioxidant dietary intake is low For example, It's evaluated the contribution of the most consumed beverages to the antioxidant intake in the Spanish diet; the intake is estimated at 1623 mg of vitamin E and 598 mg of vitamin C by the ferric reducing ability of plasma (FRAP) procedure. Tea only contributes to 3–5% of the total, whereas coffee and red wine are the main contributors. However, all the above mentioned properties of green tea, demonstrate that it can be considered an alternative to other widely consumed drinks, which have a higher content of energy and/or caffeine, and are richer in sugars, alcohol, CO₂, etc. Besides, drinking tea is an optimum way of fighting thirst due to its refreshing properties, its slightly bitter taste, its low binding effect and its fruity and agreeable smell Its preparation is easy, uncomplicated and varied (lemon, mint, cinnamon, ... can be added to it)[18-23].

Green Tea & Its Composition

Green tea chemical composition is complex: proteins (15–20% dry weight) whose enzymes constitute an important fraction; aminoacids (1–4% dry weight) such as teanine or 5-N-ethylglutamine, glutamic acid, tryptophan, glycine, serine, aspartic acid, tyrosine, valine, leucine, threonine, arginine, lysine; carbohydrates (5–7% dry weight) such as cellulose, pectins, glucose, fructose, sucrose; lipids as linoleic and -linolenic acids; sterols as stigmasterol; vitamins

(B, C, E); xanthic bases such as caffeine and theophylline; pigments as chlorophyll and carotenoids; volatile compounds as aldehydes, alcohols, esters, lactones, hydrocarbons, etc.; minerals and trace elements (5% dry weight) such as Ca, Mg, Cr, Mn, Fe, Cu, Zn, Mo, Se, Na, P, Co, Sr, Ni, K, F and Al. Due to the great importance of the mineral presence in tea, many studies have been carried out to determine their levels in green tea leaves and their infusions. For example, Large variations of the mineral content have been observed (Al, Ca, Mg & Mn) in green tea from different origins. Fernández-Cáceres et al. [13] determined the content of Al, Ba, Ca, Cu, Fe, K, Mg, Mn, Na, Sr, Ti, and Zn in 46 tea samples, and no clear differences were found between mineral content of green and black teas. Shu et al.6 observed the great variations among different tea varieties in accumulating fluoride and aluminum. Fung et al.[7] indicated that black tea had higher Al and F concentrations than green tea. Xu et al.8 reported that the content of Se in green teas was greatly increased by foliar application of Se-enriched fertilizers; moreover, the selenium-enriched green tea exhibited significantly higher antioxidant activity than regular green tea [24-29].



Figure.4

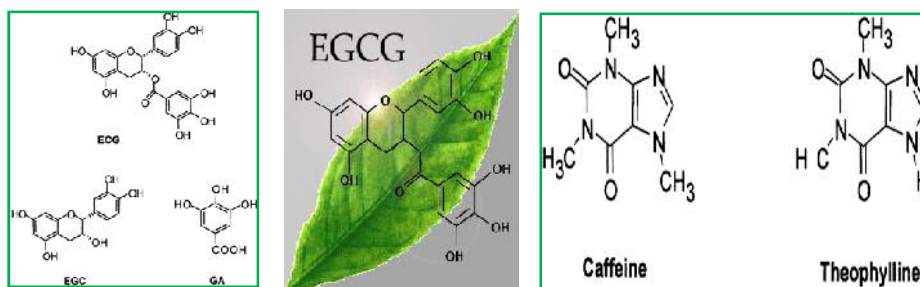


Figure.5

Polyphenols constitute the most interesting group of green tea leaf components, and in consequence, green tea can be considered an important dietary source of polyphenols, particularly flavonoids. Flavonoids are phenol derivatives synthesized in substantial amounts (0.5–1.5%) and variety (< 4000 identified), and widely distributed among plants⁹. The United States Department of Agriculture (USDA) has recently published a Database for the Flavonoid Content of Selected Foods (FSDSF). The main flavonoids present in green tea include catechins (flavan-3-ols). The four major catechins are (–)-epigallocatechin-3-gallate (EGCG), that represents approximately 59% of the total of catechins; (–)-epigallocatechin (EGC) (19% approximately); (–)-epicatechin-3-gallate (ECG) (13.6% ~); and (–)-epicatechin (EC) (6.4% approximately). Green tea also contains gallic acid (GA) and other phenolic acids such as chlorogenic acid and caffeic acid, and flavonols such as kaempferol, myricetin and quercetin¹⁰. In black tea the polymerized catechins such as theaflavins and thearubigins predominate. Black and green teas both contain similar amount of flavonoids, however they differ in their chemical structure; green tea contains more catechins (simple flavonoids), while the oxidation undergone by the leaves in order to make black tea, converts these simple flavonoids into theaflavins and thearubigins [11].

The relative catechin content of green tea depends on how the leaves are processed before drying (a certain grade of fermentation and heating of tea leaves during the manufacturing process can result in polymerization of monopolyphenolic compounds such as the catechins, leading to conformational changes and thus modifying its properties. Other factors influencing catechin content are the geographical location and growing conditions (soil, climate, agricultural practices, fertilizers), the type of green tea (e.g., blended, decaffeinated, instant, ...), and the preparation of the infusion (e.g., amount of the product used, brew time, temperature). McKay and Blumberg³ reported that decaffeinating reduces slightly the tea catechin content; also, instant preparations and iced and ready-to drink teas present less content of catechins. The production of bottled green tea beverage has encountered a browning problem mainly caused by the oxidation of catechins [12].

Antioxidant Commotion

Green tea is considered a dietary source of antioxidant nutrients; green tea is rich in polyphenols (catechins and gallic acid, particularly), but it also contains carotenoids, tocopherols, ascorbic acid (vitamin C), minerals such as Cr, Mn, Se or Zn, and certain phytochemical compounds. These compounds could increase the GTP antioxidant potential. GTP present antioxidant activity in vitro by scavenging reactive oxygen and nitrogen species and chelating redox-active transition metal ions; GTP can chelate metal ions like iron and copper to prevent their participation in Fenton and Haber-Weiss reactions. They may also function indirectly as antioxidants through 1) inhibition of the redox-sensitive transcription factors; 2) inhibition of 'pro-oxidant' enzymes, such as inducible nitric oxide synthase, lipoxygenases, cyclooxygenases and xanthine oxidase; and 3) induction of antioxidant enzymes, such as glutathione-S-transferases and superoxide dismutases.

The antioxidant capacity of GTP has been assessed by several methods. For example, oxygen radical absorbance capacity (ORAC) assay found that green tea has a much higher antioxidant activity against peroxy radicals than vegetables such as garlic, kale, spinach and Brussels sprouts. Using FRAP assay. It has been found that the total antioxidant capacity of green tea is more potent than that of black tea. Investigation of the antioxidant capacity of EGCG using erythrocyte membrane-bound, has been carried out. ATPases as a model, and the results indicated that EGCG is a powerful antioxidant that is capable of protecting erythrocyte membrane-bound ATP ases against oxidative stress.



Figure.6

Several studies have shown that EGCG can act in vitro as an antioxidant by trapping proxyl radicals and inhibiting lipid peroxidation. However, the antioxidant capacity of catechins determined in vitro is dependent upon the type of assay employed and it does not reflect factors such as bioavailability and metabolism. The fact that catechins are rapidly and extensively metabolized emphasizes the importance of demonstrating their antioxidant activity in vivo to better represent the physiological impact of green tea consumption. It has been] reported that in order to determine whether or not GTP act as effective antioxidants in vivo, future studies in animals and humans should employ sensitive and specific biomarkers of oxidative damage of lipids, proteins and DNA.

Nevertheless, a substantial number of human intervention studies with green tea demonstrate a significant increase in plasma antioxidant capacity in humans after consumption of moderate amounts (1–6 cups/day); there are also initial indications which show that the enhanced blood antioxidant potential leads to a reduced oxidative damage in macromolecules such as DNA and lipids⁵⁶. However, measurement of oxidative damage through biomarkers needs to be further established. It's reported that the repeated consumption of green tea and encapsulated green tea extracts for one to four weeks has been demonstrated to decrease biomarkers of oxidative status. Furthermore, It has been observed in a study with 40 male smokers in China and 27 men and women (smokers and non-smokers) in the United States, that oxidative DNA damage, lipid peroxidation, and free radical generation were reduced after consuming ~6 cups/day of green tea for seven days. Therefore, GTP may contribute to defenses against oxidative damages It's suggested that the ability of green tea, consumed within a balanced controlled diet, to improve overall the antioxidative status and to protect against oxidative damage in humans.

Ultraviolet Safeguard

Epidemiological, clinical and biological studies have shown that solar ultraviolet (UV) light is a complete carcinogen and repeated exposure can lead to the development of various skin disorders including melanoma and non-melanoma skin cancers. EGCG is considered to be a topic protector agent against some types of radiation, since it prevents skin disease, photoaging and potential cancer problems due to prolonged exposure. It seems that the rest

of catechins also favour this action. It has been indicated that topical treatment or oral consumption of GTP inhibits chemical carcinogen or UV radiation-induced skin carcinogenesis in different laboratory animal models.

Topical treatment of GTP or EGCG and oral consumption of GTP resulted in prevention of UVB-induced inflammatory responses, immunosuppression and oxidative stress, which are the biomarkers of several skin disease conditions. Topical application of GTP and EGCG prior to exposure of UVB protects against UVB-induced local as well as systemic immune suppression in laboratory animals. This fact was associated with the inhibition of UVB-induced infiltration of inflammatory leukocytes. The in vitro and in vivo animal and human studies have suggested that GTP are photoprotective in nature, and can be used as pharmacological agents for the prevention of solar UVB light-induced skin disorders including photoaging, melanoma and non-melanoma skin cancers.

Glucose Tolerance And Insulin Sensitivity

Epidemiological observations and laboratory studies have shown that green tea has an effect on glucose tolerance and insulin sensitivity. It has been reported that green tea increases insulin activity, and that the predominant active compound is EGCG; these same authors indicated that addition of lemon to the tea did not affect the insulin-potentiating activity but the addition of 50 g of milk per cup decreased the insulin-potentiating activity similar to 90%. Effect of green tea supplementation on glucose tolerance and insulin sensitivity in rats has been well documents in literature. Rats were divided into two groups: a control group was fed with standard chow and deionized distilled water, while the other was fed with the same chow diet but with green tea instead of water (0.5 g of lyophilized green tea powder dissolved in 100 mL of deionized distilled water); after 12 weeks of green tea supplementation, this group had lower fasting plasma levels of glucose, insulin, triglycerides, and free fatty acid than the control rats. In addition, GTP significantly increased basal and insulin-stimulated glucose uptake of adipocytes. Some investigations have also shown that EGCG does not only regulate the glucose level in blood, but also may rehabilitate damaged β -cells, which are responsible for producing insulin.

Additional Upshots

Green tea catechins have been reported to have antibacterial and antiviral activity. Green tea effectiveness against any type of diarrhoea and typhoid has been known in Asia since ancient times. Nowadays it is also known that it inhibits the reproduction and growth of many bacteria, among which some types of Salmonella, Clostridium or Bacillus can be named. Number of the studies reported an inhibitory effect of green tea catechins on Helicobacter pylori infection. Moreover, it has been shown that green tea has not effect over intestinal flora, which is a great advantage against other bactericide agents. Regarding its antiviral action, green tea is well known for preventing tobacco crops from being invaded by the 'mosaic virus' of tobacco. Recent investigations have confirmed that catechins completely inhibit its growth and reproduction³. Effects of green tea against the influenza virus, especially in its earliest stage, as well as against the Herpes simplex virus have also been demonstrated. Furthermore, It has been observed that adenovirus infection is inhibited in vitro by green tea catechins.



Figure.7

Researcher have indicated the antifungal activity of green tea catechins against *Candida albicans*, and the convenience of a combined treatment with catechins and lower doses of antimycotics; this treatment may help to avoid the side effects of antimycotics. Green tea consumption has also been associated with increased bone mineral density, and it has been identified as an independent factor protecting against the risk of hip fractures; this fact has been considered independent of smoking status, hormone replacement therapy, coffee drinking and the addition of milk to tea. It has been observed the positive effects of green tea extracts and GTP on the proliferation and activity of bone cells. Wu and Wei⁴ indicated that bone mineral density may be influenced by several chemical compounds that are contained in tea extracts (i.e., caffeine, phytoestrogen, fluoride..etc).

Green tea polyphenols are known to have anti-fibrotic properties on the skin and on the arteries. The proliferation of hepatic stellate cells is closely related to the progression of liver fibrosis in chronic liver diseases, and EGCG has a potential inhibitory effect on the proliferation of these cells. Green tea strengthens the immune system action since



green tea protects it against oxidants and radicals. It has been suggested that oral intake of green tea could act as an adjunctive therapy for prevention of transplant rejection in humans. The neuroprotective power of complex extracts rich in flavonoids like those of Ginkgo biloba, green tea or lyophilized red wine have been demonstrated in several studies. Recent studies suggest that GTP possibly protect against Parkinson's and Alzheimer's diseases and other neurodegenerative diseases. GTP have demonstrated neuroprotectant activity in cell cultures and animal models, such as the prevention of neurotoxin-induced cell injury; the biological effects of GTP may benefit patients with Parkinson's disease, but further in-depth studies are needed to investigate the safety and effectiveness of green tea in humans and to determine the different mechanisms of green tea in neuroprotection. In the same way, the neuroprotective effects of the theanine contained in green tea are a focus of considerable attention, and further studies are warranted.

Finally, the following health effects of green tea consumption have also been described. Green tea is considered to be useful for insect stings due mainly to its antiinflammatory effects and its capacity to stop bleeding. Some studies have suggested an inverse association between green tea consumption and the risk of kidney stone formation. In addition, green and black tea extracts led to a retardation of the progression of lens opacity in rats with cataracts induced by selenite. It has been reported that green tea acts by preserving the antioxidant defense system of the lens. It's indicated a beneficial effect of green tea in alcohol intoxication. Besides all the above mentioned properties, which have helped to the recognition of green tea as functional food by some authors it is not to forget its current use in the preparation of a variety of food, pharmaceutical preparations, dentifrices and cosmetics. This additional use is mainly due to its antioxidant activity, which makes it a natural, efficient and safe preservative.

Food Additive and Deodorant Relevance

Because of the high antioxidant activity of green tea extracts, they are hopefully to be used as a kind of innovative food additive to preserve pork, chicken meat, vegetable oil, fish oil and fish flesh, food emulsions and animal fat. This alternative antioxidant is suggested to be a healthier choice; a fairly successful instance may well be the application in Moon cake – the extracts both increase the shelf life and improve the flavor. In addition, green tea extracts are a promising solution to prevent apple juice and other foods from microbial contamination. Japanese scientists even have discovered that tea extracts can be developed as dyes that are not susceptible to microbial contamination and possess strong deodorant activity

3. Conclusion

A study on the cancer-preventative qualities of green tea concluded that you could probably attain the desired level of polyphenols by drinking merely two cups per day. To date, the only negative side effect reported from drinking green tea is insomnia due to the fact that it contains caffeine. However, green tea contains less caffeine than coffee: there are ~ thirty to 60 mg of caffeine in 6 - 8 ounces of tea, compared to over one-hundred mg. in eight ounces of coffee. Green tea has been consumed in China and other Asian countries since ancient times in order to maintain and improve health. Nowadays, green tea is considered one of the most promising dietary agents for the prevention and treatment of many diseases and consequently, it is being studied extensively worldwide. Numerous studies in a variety of experimental animal models have demonstrated that aqueous extract of the mayor GTP designed as catechins (EGCG, EGC, ECG and EC) possess antioxidant, antimutagenic, antidiabetic, anti-inflammatory, antibacterial and antiviral, and above all, cancer-preventive properties. Epidemiological studies suggest that consumption of green tea may have a protective effect against the development of several cancers.

Preclinical studies of green tea and its polyphenolic components have demonstrated antimutagenic and anticarcinogenic activity, and inhibition of growth of tumor cell lines and animal tumor models, including cancer. Green tea may also have chemopreventive properties, and enhancement of chemotherapeutic agents has been demonstrated. In addition, several epidemiological studies with humans have demonstrated that regular green tea consumption has beneficial effects and it shows a significant rate of protection against the development of some oral diseases and against solar radiations. It also contributes to body weight control and to the rise of bone density as well as being able to stimulate the immune system. Furthermore, green tea consumption has been recently reported to act positively against neurodegenerative diseases such as Parkinson and Alzheimer disease. Catechin antioxidant power is also strengthened by the presence of other phenolic compounds, vitamin C and minerals such as Cr, Mn, Se, and Zn, although specific data regarding this fact are still scarce.

However, conflicting results between cohort studies conducted in different countries may also arise from confusion in the frequency and timing of intake, and the marked contrasts in the socioeconomic and lifestyle factors associated with tea drinkers. It is also important to consider the type of tea or its preparation (e.g., short time vs. long brewing time and hot tea vs. iced tea) due to the marked impact of these factors on polyphenol content and concentration. It is also important to draw attention on the need of further-in-depth studies on the nature and mechanisms of the active



green tea compounds, on the bioavailability of the different catechins in humans, and appropriate dose levels to act as functional food. Since green tea beneficial health effects are being increasingly proved, it could be advisable to encourage the regular consumption of this widely available, tasty and inexpensive beverage as an interesting alternative to other drinks, which do not only show the beneficial effects of green tea, but are also more energetic, do contain more caffeine (green tea contains less caffeine than black tea, coffee or cola soft-drinks), are rich in additives and/or CO₂. While no single food item can be expected to provide a significant effect on public health, it is important to note that a modest effect between a dietary component and a disease having a major impact on the most prevalent causes of morbidity and mortality, i.e., cancer and heart disease, should merit substantial attention. Taking all this into account, it would be advisable to consider the regular consumption of green tea in Western diets.

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