



A Brief Review on Green Tea

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ABSTARCT:

Green tea, extracted from the leaves of the *Camellia sinensis* plant and belonging to the Theaceae family, is one of the most popular beverages worldwide. In this paper, the phytochemistry, pharmacology, and toxicology of green tea are systematically and comprehensively reviewed. The main findings of green tea indicate that it is good for human health. Today, several pharmacologically active constituents have been isolated and identified from green tea, including tea polyphenols, alkaloids, amino acids, polysaccharides and volatile constituents. Recent studies have shown that green tea has a wide range of pharmacological activities, including: B. Antioxidant, anticancer, hypoglycemic, antibacterial, antiviral, neuroprotective. Studies on the toxicity of green tea extract and its major components have also raised concerns such as liver toxicity and DNA damage. In addition, green tea polyphenols induce autophagy, thereby activating the overall health of organisms that consume them. This manuscript describes the reported anti-photoaging, stress tolerance, neuroprotective and autophagic properties of one of the best known functional foods, green tea

Keywords : Medicinal Plants, Green Tea, Pharmacology, Human Health, Antioxidant Activity, Green Tea, Unfermented tea, Medicinal Plants

INTRODUCTION:

According to legend, tea was accidentally discovered in by a man named Shen Nongshei or Emperor Shennong. In any event, green tea quickly became popular among wealthy Chinese aristocrats. (1) The first green tea was exported from India to Japan in the 17th century. (2), a popular drinking plant with medicinal, antioxidant and antibacterial properties; The tea tree has been cultivated in Asia for 4,444,000 years. Green tea consumption has a history of over 5000 years. Traditionally, it was formulated into a variety of foods, but was also consumed for its refreshing properties and prevention of future health problems. This growing popularity is due to the many health benefits of green tea. This is partly due to the growing awareness of Tea is an aromatic beverage commonly prepared by pouring hot or boiling water over the dried leaves of the *Camellia sinensis* tea plant. (3)

HISTORY

"Tea" is the most common. Green tea is widely consumed in East Asia (especially China and Japan), while black tea is preferred in the West. The use of tea leaves is believed to have started over 3,000 years ago in southwestern China, where 4,444 people first used it just to chew and eat, much like coffee was first used. (4)

CULTIVATION OF GREEN TEA

Camellia sinensis is native to East Asia, Southeast Asia, and the Indian subcontinent (Tables 4 and 5), and is now cultivated in tropical and subtropical regions worldwide. Tea trees thrive in a sunny climate with warm temperatures, regular and abundant rainfall, and a growing season that spans at least eight months of the year. There are usually three bursts of growth during the growing season, with spring shoots growing from his late March to early May, when he plants are most lush. From early June to early July, a second growth phase occurs, ending the season with a final growth flow from mid-July to October. *Camellia sinensis* grows best in acidic conditions and grows on a wide variety of soils. The perfect soil mixture is 'sandy loam'. This is roughly 40% sand, 40% silt, and 20% clay, allowing water to be well drained from the soil while allowing for all the vital nutrients that plants need. . trapped in the soil. (5)



(Green Tea Leaves)

METHODS

Data were collected by searching PubMed, Google Scholar, Web of Science, and CNKI. The keywords used as search terms were green tea, phytochemicals, chemical composition, EGCG, pharmacology, tea polyphenols, antioxidants, cancer, diabetes, antibacterial, antiviral, AD, PD, immune T cells, and toxicology. Many related articles and websites are also posted. His references of some selected articles were also searched for further research. Selection criteria for this review were his systematic reviews and experimental studies on green tea. However, studies on other types of tea were also excluded, including yellow tea, strong tea, other natural botanicals, conference reports, case reports, and simple communication. Time limits were not considered in this review.

PHYTOCHEMISTRY

Tea is rich in health and pharmacologically active ingredients. Out of 500 chemical constituents, over 500 were reportedly isolated from tea, with containing over 400 organic compounds and over 40 inorganic compounds (6).

Tea Polyphenols

Tea polyphenol is a general term for polyphenols contained in tea. There are about 30 different compounds, mainly composed of catechins, flavonoids, anthocyanins, and phenolic acids. (7)

Catechins

The catechins contained in tea mainly include catechin (C), epicatechin (FC), epigallocatechin (EGC), epicatechin gallate (ECG), and epigallocatechin gallate (EGCG). (8)

PHARMACOLOGY:

Antioxidant Effects:

As early as 1997, it was reported that green tea extract and its three major components, including tea polyphenols, theanine and caffeine, have the ability to potently inhibit copper-catalyzed lipid peroxidation of low-density lipoproteins (LDL). was reported. Furthermore, Yokozawa T. et al. We found that the antioxidant activity of green tea extract was dose-dependent, and the antioxidant activity of green tea extract was dose-dependent, and the antioxidant activity of the three components was tea polyphenols>theanine>caffeine. . Ultimately, they concluded that chelated mentalion copper could be one of green tea's possible mechanisms against peroxidation.(9) As early as 1997, it was reported that green tea extract and its three major components, including tea polyphenols, theanine and caffeine, have the ability to potently inhibit copper-catalyzed lipid peroxidation of low-density lipoproteins (LDL). was reported. Furthermore, Yokozawa T. et al. We found that the antioxidant activity of green tea extract was dose-dependent, and the antioxidant activity of green tea extract was dose-dependent, and the antioxidant activity of the three components was tea polyphenols>theanine>caffeine. . Ultimately, they concluded that chelated mentalion copper could be one of green tea's possible mechanisms against peroxidation.(9)

Anti Diabetic Effects

Improving glucose metabolism. Sandra Metal Al. (2013) showed that green tea extract (75 mg/kg for 30 days) had a significant hypoglycemic effect in streptozotocin-induced diabetic rats. Furthermore, the ability to lower blood sugar levels was comparable to the oral hypoglycemic drug metformin. The mechanism of this effect was associated with increased liver glycogen content and altered activity of key enzymes in glucose metabolism. (11)

Anticancer Effects

Inhibition of tumor cell growth. Studies have shown that EGCG can dose-dependently inhibit the proliferation of androgen-sensitive human prostate cancer (PCA) cells. This effect may be mediated by cell cycle arrest in the G0/G1 phase caused by WAF1/p21. (Ten)

Effects on the Immune System

So far, there have been small pharmacological studies on the immune system of green tea. EGCG (2.5 μ M to 10 μ M) was able to dose-dependently inhibit the proliferation of splenic T cells in C57BL mice. This mechanism may be related to inhibition of IL-2/IL-2 receptor signaling. (12) 2014, Balaji J et al. We found that green tea water extract could significantly reduce the mortality rate of mice with anaphylactic shock induced by compound C48/80. provided backing. (13)

Other Pharmacological Effects

Separately, it was observed in vivo experiments that the activities of thyroid peroxidase and 50-deiodine I were reduced in male albinism rats after treatment with high doses of green tea and catechins. , suggesting that catechins in green tea extract may play an antithyroid role.(14) In vivo experiments in rats showed that green tea polyphenols were associated with ovarian growth with cancellous and cortical bone compartments. It

has been shown to have beneficial effects on skin. Green tea is an “unfermented” beverage. Additionally, the content of certain

Health benefits

The most important chemopreventive agent in green tea is epigallocatechin-3-gallate. Understanding the molecular mechanism of action of EGCG (17) Green tea, oolong tea, and black tea are processed. Steaming the green tea leaves, which converts EGCG is superior to black tea in terms of antioxidant

consumed beverage in the world after tea. It is rich in antioxidants in vitro and in vivo.

Anticancer effects of (-)-epigallocatechin-3-gallate have been investigated in many laboratories. One of the most interesting findings is the way it is processed. Oolong teas are made by fermenting green tea leaves. It has been found to be



Green tea for skin treatment

A study that used pooled human keratinocytes (skin cells) to study normal growth of skin cells alone and compared it to cell growth when exposed to EGCG found that EGCG was associated with dying skin cells. EGCG was found to reactivate cells. Cells that migrate to the surface of the skin typically live for about 28 days, and by day 20 they remain in the epidermis, ready to die and slough off. Current research appears to indicate that EGCG reactivates epidermal cells.

Cholesterol reduction

Population-based clinical studies show that the antioxidant properties of green tea may help prevent atherosclerosis, especially coronary artery disease. It reduces the risk of coronary artery disease. Studies have found that drinking tea regularly can prevent heart disease, with one study showing that tea drinkers had a 36% lower risk. (20)

Other benefits

There is epidemiological evidence that drinking green tea (other than black or oolong) may help prevent diabetes (30), but it's worth noting that this suggests a link and further research is needed to confirm the effect. Green tea has traditionally been used to regulate blood sugar levels in the body. Animal studies suggest that green tea may help prevent and slow the progression of type 1 diabetes. (21) There is epidemiological evidence that drinking green tea (other than black or oolong) may help prevent diabetes (30), but it's worth noting that this suggests a link and further research is needed to confirm the effect. Green tea has traditionally been used to regulate blood sugar levels in the body. Animal studies suggest that green tea may help prevent and slow the progression of type 1 diabetes. (21) There is epidemiological evidence that drinking green tea (other than black or oolong) may help prevent diabetes (30), but it's worth noting that this suggests a link and further research is needed to confirm the effect. Green tea has traditionally been used to regulate blood sugar levels in the body. Animal studies suggest that green tea may help prevent the onset of type 1 diabetes and slow its progression once it develops. (21)

Anti-fungal activity

These results indicate that EGCG enhances the antifungal effect of amphotericin B or fluconazole against antifungal sensitive and resistant *C. albicans*. Combination catechin therapy allows the use of lower doses of antifungal agents and produces multiple antifungal effects. I hope this can help you avoid the side effects of antifungal medications. Antiviral Activity EGCG and EKG have been found to be potent inhibitors of influenza virus replication in cell culture. This effect was observed in all influenza virus subtypes studied, including A/H1N1, A/H3N2 and B viruses. Quantitative analysis showed that high concentrations of EGCG and ECG inhibited viral RNA synthesis in cells. (19)

Protective effect of green tea

Twenty Chinese women volunteered to analyze the effects of different concentrations of green tea extract (2–5%) on skin protection against UV-induced aging through application in place. (93) Along with the extent of erythema, the thickness of the stratum corneum and epidermis, as well as the levels of background metal proteases, were measured using microscopy and immunohistochemical analyses. On day one, 3% topically showed less erythema, while 5% showed media-controlled and non-localized lesions, which also showed post-inflammatory hyperpigmentation. The 3% topical use sample showed mild pigmentation, while the other samples (2 and 4%) showed moderate pigmentation. From 2 to 3% topical application shows a controlled thickening of the stratum corneum and epidermis compared with other samples. A significant decrease of

in matrix metal proteases was observed in applications 2 to 4. Overall, this study shows that an optimal concentration of green tea extract (3%) can protect skin from UV damage (22). In addition, EGCG suppresses AB-induced cytotoxicity by reducing ROS-mediated NF- κ B activation and mitogen-activated protein kinase (MAPK) signaling, including C-Jun N kinases. Concentrations of EGCG, e.g. 100 μ M in macrophage cell lines, can inhibit autophagy leading to apoptosis. (24) Atrazine is a widely used herbicide that is also neurotoxic and can induce cell death of deaminergic neurons, which can be overcome by autophagy. Green tea polyphenols, together with isoflavones resveratrol, quercetin and curcumin, were observed to activate autophagy in SH-SY5Y cells, with inhibition by atrazine (25).

Adverse effects of green tea

This high-level treatment altered plasma concentrations of thyroid hormones. However, it is unlikely that itself would consume very large amounts of green tea in the diet to cause these adverse effects in humans. (2) the presence of aluminum, and (3) the effect of tea polyphenols on iron bioavailability. Green tea should not be taken by patients with heart disease or severe cardiovascular problems. Pregnant and breastfeeding women should not drink more than 1-2 cups. This high-level treatment altered plasma concentrations of thyroid hormones. However, it is unlikely that itself would consume very large amounts of green tea in the diet to cause these adverse effects in humans. (2) the presence of aluminum, and (3) the effect of tea polyphenols on iron bioavailability. Green tea should not be taken by patients with heart disease or severe cardiovascular problems. Pregnant and breastfeeding women should not drink more than 1-2 cups. This is because caffeine can increase heart rhythm. It is also important to limit the combination of green tea and some medications, as caffeine is a diuretic. (29) The effects of green tea and its components are beneficial up to certain doses, but higher doses can cause unknown side effects. is not limited. EGCG from green tea extract is cytotoxic and high intake of green tea can induce acute cytotoxicity in hepatocytes, an important metabolic organ in the body. (30) Several studies have shown the ability of the tea tree to accumulate large amounts of aluminum. Since aluminum can accumulate in the body and cause neurological disease, this aspect may be beneficial for patients with renal failure. It is important. Therefore, the intake of foods high in this metal should be controlled. (31)

CONCLUSION

The development of better predictive biomarkers, as well as more specific and sensitive methods using more representative models, will provide insight into how green tea interacts with endogenous systems and other exogenous factors. Deepen your understanding. In 2006, the FDA approved the clinical use of green tea extract topical "Veregen Ointment," which has already been launched in the United States. However, research into the pharmacological activities of green tea is still in the laboratory research stage. Preclinical studies of green tea and its polyphenolic constituents have shown antimutagenic and anticarcinogenic activity, as well as inhibition of growth of tumor cell lines and animal tumor models, including cancer. The development of biomarkers of green tea consumption and molecular markers of its biological effects will facilitate future research in this field.

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REFERENCES:

1. Acevedo S, Chen C, France E et al. Antimicrobial properties of various green tea products with and without the addition of sugar. (Internet). (Cited 1/3/2018). Available Form:
2. Chacko SM, Thambi PT. Beneficial effects of green tea : A literature review. *Chinese Med J* 2010;5;1-9
3. Kaur HP, Kaur S, Antibacterial activity and phytochemical profile of green tea, black tea and Divyapeya herbal tea. *Inter J Pure App Biosci* 2015;3;117-123.
4. Thiyam B, Ravindra SV. Green tea - A healthy Sip, *IJSS Case Rep Rev* 2015;3:1-14.
5. The Cultivation of green tea (Internat). (Cited 2/3/2018) Available
6. Fan, Z.Y.; Li, N. Analysis of various life elements in tea. *J. Jiangxi Univ. Chin. Med.* 1996;8;27-28
7. Du, J.Y.; Bai, L.; Bai, B.Z. The main chemical composition of tea. *Agric. Technol.* 2003;23;59-55
8. Hou, D.Y.; Hui, R.H.; Cuan, C.X.; Liu, X.Y. Spectral analysis of tea polyphenols in green tea and tea beverage. *Food Sci.* 2002;23;109-111
9. Yokozawa, T.; Dong, E. Influence of green tea and its three major components upon low-density lipoprotein oxidation. *Exp. Toxicol. Pathol.* 1997;49;329-335. (CrossRef)
10. Gupta, S.; Ahmad, N.; Nieminen, A.L.; Mukhtar, H. Growth inhibition, cell-cycle dysregulation, and induction of apoptosis by green tea constituent (-) -epigallocatechin-3-gallate in androgen-sensitive and androgen-insensitive human prostate carcinoma cells. *Toxicol. Appl. Pharmacol.* 200;164;82-90. (CrossRef)
11. Sundaram, R.; Naresh, R.; Shanthi, P.; Sachdanandam, P. Modulatory effect of green tea extract on hepatic key enzymes of glucose metabolism in streptozotocin and high fat diet induced diabetic rats. *Phytomedicine* 2013;20;577-584. (CrossRef)
12. We, D.Y.; Guo, ZY.; Ren, Z.H.; Guo, W.M.; Meydani, S.N. Green tea EGCG suppresses T cell proliferation through impairment of IL-2/IL-2 receptor signaling. *Free Radic. Biol. Med.* 2009;47;636-643 (CrossRef)
13. Balaji, J.; Chalamaiiah, M.; Hanumanna, P.; Vamsikrishna, B.; Jagadeesh Kumar, D.; Venu Babu, V. Mast cell stabilizing and anti-anaphylactic activity of aqueous extract of green tea (*Camellia Sinensis*). *Int. J. Vet. Sci. Med* 2014;2;89-94. (CrossRef)
14. Chandra, A.K.; De, N. Goitrogenic/ antithyroidal potential of green tea extract in relation to catechin in rats. *Food Chem. Toxicol.* 2010, 48;2304-

2311. (CrossRef)

15. Shen, C.L.; Wang, P.; Guerrieri, J.; Yeh, J.K.; Wang, J.S. Protective effect of green tea polyphenols on bone loss in middle-aged female rats. *Osteoporos. Int.* 2008, 19,979-990. (CrossRef) (PubMed)
16. Susilowati, A. Diuretic Effect of the Aqueous Extract of Green Tea Leaves. *Adv. Health Sci. Res.* 2019,15,33-36.
17. Katiyar SK, Elmets CA. Green tea polyphenolic antioxidants and skin photo protection (review). *Int J Oncol* 2001;18:1307-13
18. Cheng To. Tea is good for the heart. *Arch Intern Med* 2000;60:2397.
19. Lee MJ, Maliakal P, Chen L. Pharmacokinetics of tea catechins after ingestion of green tea and (-)-epigallocatechin-3-gallate by humans: formation of different metabolites and individual variability. *Cancer Epidemiol Biomarkers Prevent* 2002;11:1025-32
20. Song JM, Lee KH, Seong BL., Antiviral effect of catechins in green tea on influenza virus. *Antiviral Res* 2005;68:66-74.
21. Hirano-Ohmori R, Takahashi R, Momiyama Y. Green Tea consumption and serum malondialdehyde-modified LDL concentrations in healthy subjects. *J Am Coll Nutr* 2005;24:342-6.
22. Takatoshi M, Satoshi H, Akira S, Ichiro T, Tadashi H, Green Tea extract improves running endurance in mice by stimulating lipid utilization during exercise. *Am J Physiol Regular Integrat Comparat Physiol* 2006;290:R1550-6.
23. Li, Y.H.; Wu, Y.; Wei, H.C.; Xu, Y.Y.; Jia, L.L.; Chen, J.; Yang, H.S.; Dong, G.H.; Gao, H.H.; Chen, H.D. Protective effects of green tea extracts on photoaging and photomunosuppression. *Skin Res, Technol*, 2009, 15,338-345 (CrossRef) (PubMed)
24. Cascell, M.;Bimonte, S.; M.R.; Schiavone, V.; Cuomo, A. The efficacy of Epigallocatechin-3-gallate (green tea) in the treatment of Alzheimer's disease: An overview of pre-clinical studies and translational perspectives in clinical practice. *Infect, Agent Cancer* 2017,12,36. (CrossRef) (PubMed)
25. Hashimoto, K.; Sakagami, H. Induction of apoptosis by epigallocatechin gallate and autophagy inhibitors in a mouse macrophage-like cell line. *Anticancer Res.* 2008,28,1713-1718. (PubMed)
26. Li, P.; Ma, K.; Wu, H.Y.; Wu, Y.P.; Li, B.X. Isoflavones induce BEX2 Dependent Autophagy to Prevent ATR-Induced Neurotoxicity in SH-SY5Y Cells. *Cell, Physiol. Biochem.* 2017,43, 1866-1879. (CrossRef) (PubMed)
27. Shoji Y, Nakashima H. Glucose-lowering effect of powder formulation of African black tea Extract in KK-A(y)/TaJcl diabetic mouse. *Arch Pharmacol Res* 2006, 29(9): 786-794.
28. Dulloo AG, Seydoux J, Girardier L, Chantre P, Vandermander J: Green tea and thermogenesis: interactions between catechin-polyphenols, caffeine and sympathetic activity. *Int J Obes Relat Metab Disord* 2000, 24(2): 252-258
29. Hasegawa N, Yamada N, Mori M: Powdered green tea has antilipogenic effect on Zucker rats fed a high-fat diet. *Phytother Res* 2003, 17:477-480.
30. Bruneton J: Pharmacognosie. *Phytochimite, Plantes Me'dicinales Paris: Technique Documentation-Lavoisier* 2001.
31. Schmidt M, Schmitz HJ, Baumgart A, Guedon D, Netsch MI, Kreuter MH, Schmidlin CB, Schrenk D: Toxicity of green tea extracts and their constituents in rat hepatocytes in primary culture, *Food Chem Toxicol* 2005, 43:307-314.
32. Costa LM, Gouveia St, Nobrega JA: Comparison of heating extraction procedures for Al, Ca, Mg and Mn in tea samples, *Ann Sci* 2002, 18:313-318