

GREEN TEA



Scientific Names: *Camellia sinensis*, *Camellia thea*, *Camillellia theifera*, *Thea sinensis*, *Thea bohea*, *Thea viridis*¹

Common Names: Green Tea, Black Tea, Chinese Tea, Unfermented Tea, Sencha²

Active Ingredients²⁻³:

1. **Polyphenols** (*Catechins*)(10-25%):

a. **epigallocatechin-3-gallate (EGCG)**, epicatechin, epicatechin-3-gallate, epigallocatechin

2. **Purine Alkaloids** (*Methyl Xanthines*):

a. **caffeine** (2.9-4.2%), theobromine (0.15-0.2%), theophylline (0.02-0.04%)

3. **Anorganic Ions:**

a. **fluoride** (130-160 mg/kg), potassium, aluminum

4. **Other Ingredients:**

a. flavonoids (e.g. quercetin), caffeic acid derivatives, triterpene saponins, volatile oils

Mechanisms of Action:

1. **Anticarcinogenic** = antioxidant activity promotes inhibition of biochemical markers of tumor initiation and promotion, induction of apoptosis, and inhibition of cell replication rates thus retarding the growth of neoplasms⁴
2. **CNS Effects** = caffeine is centrally stimulating and causes antidepressant effect²
3. **Diuresis** = adenosine antagonism by caffeine leads to dilation of the renal vessels with a consecutive increase in the rate of filtration²
4. **Antidiarrheal** = tannin effect and polyphenols promote the growth of *Lactobacillus* and *Bifidobacter* while inhibiting the growth of *C. perfingens* and *C. difficile*²
5. **Decreased Cholesterol** = antioxidants have a direct effect on lowering LDL and TG's¹
6. **Anti-inflammatory** = bradykinin and prostaglandin antagonism causes a capillary sealing²
7. **Dental Hygiene** = large amount of fluoride and inhibition of the growth of cavity-associated bacteria such as *Streptococcus mutans* and *E. coli*.¹⁻³

Indications & Efficacy:

1. **Cancer Prevention** = likely effective

According to a review of the evidence for the efficacy of unconventional therapies used in cancer patients, several studies have demonstrated green tea polyphenols' preventative and inhibitory effects against tumor formation and growth. While the studies are not conclusive, green tea polyphenols, particularly EGCG, may be effective in preventing cancer of the prostate, breast, esophagus, stomach,

pancreas, and colon. Thus much of the research into the effects of green tea has focused on its potential to prevent cancer; however, there has been limited research

into its role in the actual treatment of the disease.⁴

A large (n= 2226) case-control study looking at green tea consumption and cancer was conducted in China, where recently diagnosed cancer cases (pancreas and rectum) among residents between the ages of 18 and 74 years were included. Controls (n=1552) were selected and matched to cases by age and gender and adjustments were made for age, income, education, and smoking. As tea consumption increased, the incidence of all cancers decreased. Women with the highest tea consumption (> 200 g/month) had a reduced risk for colon cancer and a 47% reduction in the risk for pancreatic cancer (p = 0.07 and 0.008 respectively). For men who consumed > 300 g/month of green tea, the incidence of colon cancer was reduced by 18%, colon cancer by 43%, and pancreatic cancer by 47% (p = 0.38, 0.04, and 0.04 respectively).²

2. *Antioxidant Applications* = likely effective

Many chronic disease states and inflammatory conditions are a result of oxidative stress and generation of free radicals. Such diseases include heart disease, renal failure, cancer, skin exposure damage, and several diseases associated with aging. Green tea polyphenols are potent free radical scavengers due to the hydroxyl groups in their chemical structure. Hydroxyl groups can form complexes with free radicals and neutralize them, preventing the progression of the disease process.² There have been conflicting studies in this area, however.⁵

3. *Dental Hygiene* = likely effective

Various components of green tea have properties to suggest an anti-cariogenic activity. Such activities include a direct bactericidal effect against *Streptococcus mutans* and *S. sobrinus*, prevention of adherence to teeth, inhibition of glucosyl transferase which limits the biosynthesis of sticky glucan, and inhibition of human and bacterial amylases. Studies in animal models show that these in-vitro effects can translate into dental caries prevention. In addition, there have been a few clinical trials in humans that suggest similar findings.⁶

An extract of oolong tea containing polymerized polyphenols was administered to 35 volunteers between the ages of 18 and 29 years of age to test the inhibitory effect of the tea extract on dental plaque deposition. The study showed significant inhibition of plaque deposition in the tea group vs. placebo.²

4. *Obesity & Weight Loss* = possibly effective

Recent studies on green tea's thermogenic properties have demonstrated a synergistic interaction between caffeine and catechin polyphenols that appear to prolong sympathetic stimulation of thermogenesis. A human study of green tea extract containing 90 mg EGCG taken three times daily concluded that men taking the extract burned 266 more calories per day than did those in the placebo group and that green tea extract's thermogenic effects may play a role in controlling obesity. Green tea polyphenols have also been shown to markedly inhibit digestive

lipases in vitro, resulting in decreased lipolysis of triglycerides, which may translate to reduced fat digestion in humans.²

5. *Antidiarrheal* = possibly effective, no definitive studies to prove it
6. *Diuretic* = possibly effective, lack of clinical trials
7. *Stomach Disorders* = unproven
8. *Vomiting* = unproven
9. *Headaches* = unproven
10. *Decreased Cholesterol* = unproven
11. *Anti-inflammatory* = unproven
12. *Antidepressant* = unproven
13. *Fatigue* = unproven
14. *Cardiac and Circulatory Conditions* = unproven

Contraindications/Allergies⁷:

1. Pregnancy Category B = safe in moderation
2. Lactation contraindication
3. Infants contraindicated

Dosage Forms²:

1. Infusion = 1:1
2. Tablets = 100 mg tablets
3. Capsule = 100, 150, 175, 333, 383, and 500 mg capsules
4. Filter Tea Bags = 1.8-2.2 grams of tea
5. Dried Extract (Instant Tea)

Recommended Dose/Duration¹⁻²:

1. A daily dosage of 300-400 mg (3 cups) of polyphenols is typical for most indications
2. The amount of polyphenols in 3 cups of Green tea is 240-320 mg
3. More than 5 cups/day (> 300 mg caffeine) is associated with adverse effects
4. Green tea should only be used on a short term basis as chronic use can lead to tolerance, habituation, and dependence
5. Doses of 3-10 grams caffeine/day can have toxicity and can be fatal
6. Withdrawal symptoms can result and include dizziness, headaches, nervousness, and anxiety

Drug/Food Interactions^{1-2, 7-8}:

1. Acid-Inhibiting Drugs = caffeine increases stomach acid and can interfere with antacids, H₂-Antagonists, and proton pump inhibitors
2. Adenosine = concomitant use might inhibit the hemodynamic effects of adenosine
3. Aspirin = caffeine can increase the effectiveness by as much as 40% by increasing overall pain reduction
4. Acetaminophen = caffeine can increase the effectiveness by as much as 40% by increasing overall pain reduction
5. Antipsychotic Agents = caffeine can decrease the metabolism of these agents
6. Barbiturates = can decrease the effects of caffeine

7. **Beta-Agonists = caffeine can increase the cardiac inotropic effect of these drugs**
8. **Benzodiazepines = concomitant use might reduce sedative effects of benzodiazepines**
9. **Beta-Blockers = concomitant use can increase blood pressure**
10. **Caffeine = concomitant use can increase the risk of adverse effects**
11. **Chlorpromazine = concomitant use inhibits the effects of this drug**
12. **Cimetidine = decreases caffeine clearance by 30-50%**
13. **Clozapine = caffeine can increase the effects and toxicity of this agent**
14. **CNS Depressants = can increase the toxic effects of caffeine**
15. **Diabetic Drugs = monitor blood glucose closely due to claims that caffeine has hyperglycemic effects**
16. **Disulfiram = decreases clearance and metabolism of caffeine**
17. **Ephedrine = concomitant use enhances side effects of agitation, tremors, and insomnia**
18. **Ergotamine = caffeine can increase the GI absorption of this drug**
19. **Fluconazole = inhibits the metabolism of caffeine**
20. **Grapefruit Juice = can increase caffeine levels, activity, and the risk of adverse events**
21. **Iron = concomitant use may reduce the absorption of iron**
22. **Lithium = abrupt caffeine withdrawal can increase serum lithium levels**
23. **MAO Inhibitors = concomitant use with large amounts of caffeine can cause a hypertensive crisis**
24. **Milk = may decrease the antioxidant effect**
25. **Oral Contraceptives = can decrease caffeine clearance by 40-65%**
26. **Quinolones = can decrease or increase caffeine clearance**
27. **Phenytoin = concomitant use might enhance metabolism and excretion of caffeine**
28. **Theophylline = caffeine can increase theophylline levels**
29. **Verapamil = can increase plasma caffeine levels by 25%**
30. **Warfarin = concomitant use can cause bleeding**

Drug-Disease Interactions¹⁻²:

1. **Gastric, Duodenal Ulcers = Caffeine can aggravate these conditions**
2. **Heart Conditions = Caffeine can induce cardiac arrhythmias in sensitive individuals**
3. **Depression, Anxiety Disorders = Caffeine can aggravate these conditions**
4. **Anemia = caffeine may reduce the absorption of already depleted iron stores**

Other Safety Issues¹:

1. **Pregnancy = possibly safe in moderation although caffeine crosses the placenta (Pregnancy Category B)**
2. **Lactation = caffeine should be avoided because it can cause sleep disturbances in breast-fed infants**

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