ETHICAL NUTRIENTS
PROFESSIONAL NATURAL MEDICINES

Green Tea for Weight Management

Green Tea for Weight Management contains green tea and is designed to improve weight loss via enhancement of thermogenesis and the oxidation of body fat, with evidence for particular benefits for visceral adipose tissue – the fat that contributes the greatest health risk. Green tea may also possess the benefit of reducing appetite.

HERBS THAT MAY ASSIST

Camellia sinensis (Green tea) leaf, dry
providing Epigallocatechin-3-0-gallate

CLINICAL APPLICATIONS

Key Applications

- For overweight and obesity:
  - To improve weight loss
  - To increase thermogenesis
  - To increase fat oxidation
  - To improve body composition
  - Appetite regulation

BACKGROUND/TECHNICAL INFORMATION

***Camellia sinensis* (Green tea) leaves** are rich in antioxidant flavonoids, including the strongly antioxidant catechins, the most abundant of which is epigallocatechin gallate (EGCG). There is evidence that green tea catechins have a role in the protection against degenerative diseases. Tea polyphenols may act as antioxidants by scavenging reactive oxygen and nitrogen species and by chelating redox-active transition metal ions. They may also inhibit pro-oxidant enzymes and induce antioxidant enzymes. These antioxidant effects have the potential to protect tissues against oxidative damage.[1]

In addition to EGCG, green tea contains at least three other polyphenols that demonstrate the ability to scavenge hydroxyl radicals and lipid free radicals: epicatechin gallate (ECG), epigallocatechin (EGC) and epicatechin (EC) (Figure 1). Each compound contributes to the antioxidant activity of green tea, with their antioxidant active positions varying from one to the other. The stability of their semiquinone radicals (formed through their antioxidant activity), along with their iron-chelating and free-radical scavenging abilities, contribute to green tea's significant protective antioxidant mechanisms.[2]

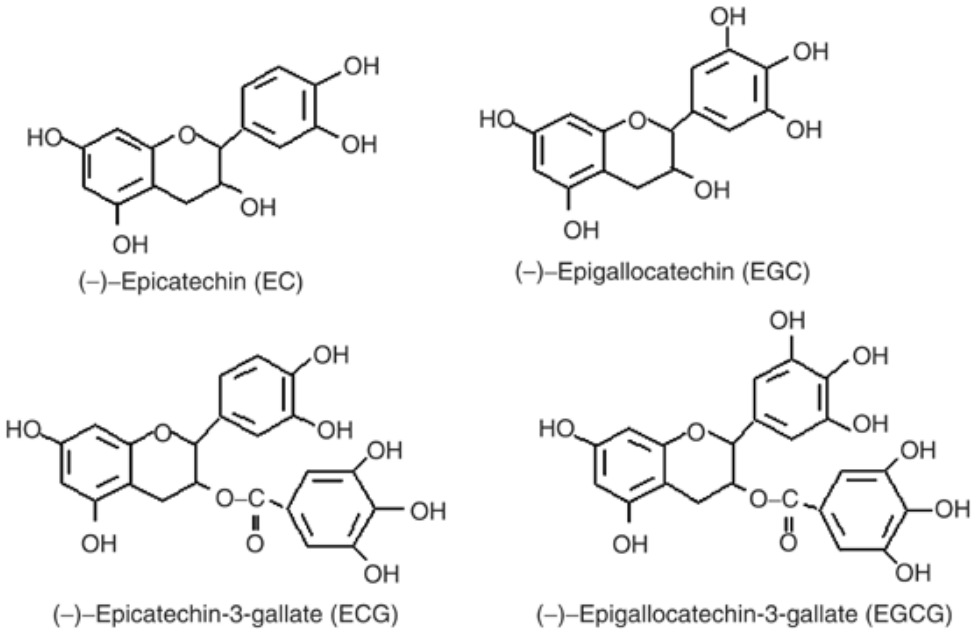

Figure 1: Major catechins in green tea.[3]

RESEARCH

WEIGHT LOSS AND IMPROVED BODY COMPOSITION

Green tea may stimulate fat oxidation and assist with fat loss via thermogenic mechanisms. Thermogenesis is the process of heat production in organisms and occurs via many different mechanisms. Beyond the basic thermogenesis that occurs with all basic metabolic processes, there is a level of thermogenesis that can be increased and decreased by different factors. Shivering thermogenesis is involved in thermal balance – balancing control of heat loss. Diet and exercise can both induce thermogenesis to help balance control of energy intake and energy stores. Reduced energy expenditure for thermogenesis may be a factor in obesity,[4] and increasing energy expenditure via thermogenesis is an approach for treating obesity. In addition to their effects on thermogenesis, the sympathetic nervous system and its neurotransmitter noradrenaline have an important role in the control of fat metabolism.[5]

Green tea contains two major active ingredients: catechin polyphenols and caffeine. These work in two different ways to increase thermogenesis. One mechanism is via elevation of levels of catecholamines, which promotes energy expenditure via thermogenesis. Catechin polyphenols inhibit the action of catechol-O-methyltransferase (COMT), the enzyme which metabolises catecholamines, resulting in a prolonged action of the catecholamines. Caffeine increases thermogenesis via inhibition of the phosphodiesterase-induced degradation of intracellular cyclic AMP (cAMP), which is a critical intracellular mediator for the action of catecholamines on thermogenesis.5 Furthermore, catecholamines in the brain may play a major role in satiety.[6]

Another mechanism of the action of green tea has been indicated *in vitro*, where green tea extract was found to directly inhibit gastric and pancreatic lipases.[7]

Clinical trials with green tea have shown weight-reducing and thermogenic benefits. In a randomised placebo-controlled study of 60 overweight subjects with an average body mass index (BMI) of 27.7 kg/m^2, all subjects were maintained on a 8373 kJ/day diet (which contained 65% carbohydrates, 15% protein, and 20% fat) for 12 weeks. At a dose of green tea containing approximately 100 mg of epigallocatechin gallate (EGCG) daily (divided into 3 daily doses), there was a 3.3 kg greater weight loss than in the placebo group (p<0.05; Figure 2), with no difference between the groups in food intake or physical activity during the study period. Additionally, the calculated resting energy expenditure was greater in the green tea group (183.4 kJ/day, p<0.001); while the respiratory quotient was decreased, indicating greater fat

oxidation (metabolism) in the green tea group (p<0.05). These results indicate that green tea can reduce body weight by increasing energy expenditure (thermogenesis) and fat oxidation.6

EGCG is believed to be the most pharmacologically active tea catechin. In a second study, which was a randomised, blind, placebo-controlled crossover trial, 10 healthy men consumed a green tea extract containing 50 mg caffeine and 90 mg EGCG three times daily for 1 day prior to each testing day. This was compared to placebo and to 50 mg caffeine alone. Relative to placebo, treatment with the green tea extract resulted in a significant increase in 24-hour energy expenditure (4%; p<0.01), reflecting an increase in thermogenesis; and a significant decrease in 24-hour respiratory quotient (from 0.88 to 0.85; p<0.001) without any change in urinary nitrogen, which indicates no increase in protein oxidation and a shift in substrate utilisation from carbohydrate to fat oxidation. As treatment with caffeine in amounts equivalent to those found in the green tea extract had no effect on these parameters, it was concluded that epigallocatechin gallate from green tea was responsible for the thermogenic properties and promotion of fat oxidation observed in this study. Twenty-four–hour urinary noradrenaline excretion was higher during treatment with the green tea extract than with the placebo (40%, p<0.05), indicating increased sympathetic activity. Green tea extract may therefore play a role in the control of body composition via sympathetic activation of both thermogenesis and fat oxidation. No alteration in heart rate was observed in this study, indicating that administration of EGCG was not accompanied by adverse cardiovascular effects.5

These data are supported by other studies. In an open study involving moderately obese individuals, green tea extract delivering 270 mg of EGCG daily for a period of 3 months was found to significantly affect weight loss, decreasing weight by 4.6% and waist circumference by 4.5%.7

Green tea may have some very desirable benefits on areas of problem fat in the body. Green tea catechin consumption may enhance exercise-induced changes, particularly in abdominal fat and serum triglycerides as indicated in a more recently published study. A randomised controlled trial of 132 overweight and obese adults undergoing exercise-induced weight loss compared the consumption of 625 mg catechins (containing 214.4 mg EGCG) daily in a beverage with 39 mg of caffeine for 12 weeks, to a control condition consisting of the caffeine-containing beverage with no catechins. There was a trend (p=0.079) toward greater loss of body weight in the catechin group compared with the control group. Percentage changes in total abdominal fat area (-7.7 vs. -0.3; p=0.013), subcutaneous abdominal fat area (-6.2 vs. 0.8; p=0.019; Figure 3), and fasting serum triglycerides (-11.2 vs. 1.9; p=0.023) were greater in the catechin group.[8]

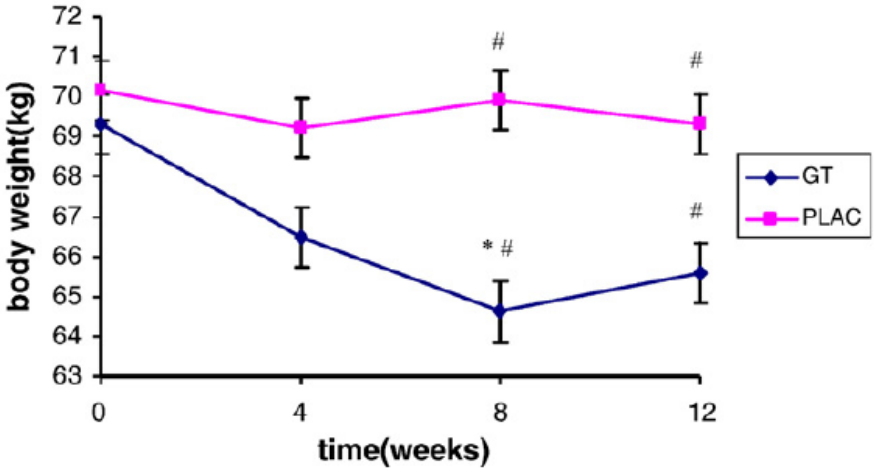

Figure 2. Mean body weight of subjects in green tea group (GT) and placebo group (PLAC) over the 12 weeks of treatment.
* significantly different from baseline (p<0.05); # significantly different between groups, (p<0·05)6

The achievement of abdominal fat loss is crucial in obesity, as excess abdominal adiposity is an important risk factor for cardiovascular disease. Visceral fat has the highest rate for triglyceride turnover, and excess visceral fat is the most closely related to metabolic disturbances, particularly insulin resistance and hypertriglyceridaemia. Findings from animal studies suggest that mesenteric and hepatic fat accumulation are markedly reduced by catechin (and caffeine) feeding.8

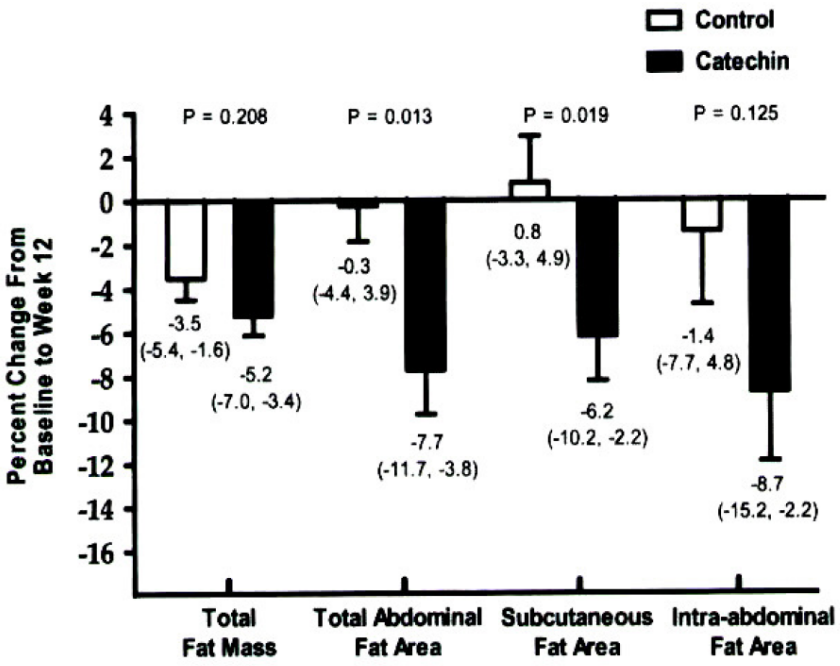

Figure 3. Percentage change from baseline in measures of fat area – catechin group vs. control. Values are adjusted for baseline value, age, sex.8

CAUTIONS AND CONTRAINDICATIONS

Contraindications:

- **Reports of green tea and hepatotoxicity:** There have been reports of hepatotoxicity in individuals using green tea supplements. In most cases, causality has been unable to be determined as green tea was not administered alone.

  In determining the impact of these reports on the use of this product, other factors must be considered. Firstly, animal studies indicate hepatoprotective effects of green tea extracts in a number of models.[9,10,11] Additionally, toxicity to green tea has been found to be more likely to occur in a fasting state, and many of the cases of possible hepatotoxicity occurred with the use of green tea in weight loss products.[12]

  The United States Pharmacopoeia has recently conducted a systematic review, and, in consideration of the low incidence of a causal relationship between green tea consumption and hepatotoxicity and with the wide usage of green tea as a beverage, it was determined that green tea was safe to be used with a warning. They recommend the following:

  - The use of green tea supplements **with food**, and
  - Discontinuation of use and consultation of a healthcare practitioner if patients have "**a liver disorder or develop symptoms of liver trouble such as abdominal pain, dark urine, or jaundice**." [12]

Further Contraindications:

- **Hepatitis**
- **Hepatotoxic drugs:** Theoretical caution with green tea extracts.[13]
- **Ephedrine and Amphetamines:** Theoretically, the caffeine in green tea might increase the risk of additive CNS effects.[13]
- **Sensitivity to caffeine**
- **Pregnant and lactating women**

Cautions:

- **Anticoagulant/antiplatelet medications, and bleeding disorders:** Both green tea catechins and caffeine are reported to have antiplatelet activity. However, these interactions have not been reported in humans; and a contradictory case report suggests that green tea might actually decrease the anticoagulant effect of warfarin. This could be due to vitamin K or other constituents contained in green tea. Monitor.[13]
- **Monoamine oxidase inhibitors:** Large amounts of caffeine may precipitate a hypertensive crisis. Caution.[13]
- **Theophylline:** Concomitant use with caffeine can reduce theophylline clearance and increase the effects. Caution.[13]

Surgery: Discontinue at least 2 weeks prior to elective surgical procedures.

Pregnancy and lactation: Contraindicated.

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