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File: ■ Green Tea (*Camellia sinensis*)
■ Obesity
■ Type 2 Diabetes

HC 051031-401

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RE: Control of Obesity and Diabetes among Health Benefits of Green Tea

Chacko SM, Thambi PT, Kuttan R, Nishigaki I. Beneficial effects of green tea: a literature review. *Chinese Medicine*. 2010;5:13. DOI:10.1186/1749-8546-5-13.

Tea (*Camellia sinensis*), which is usually consumed as green (unfermented), black (fully fermented), or Oolong (partially fermented) tea, is associated with many health benefits. The most significant effects have been reported with the consumption of green tea.¹ Among those health benefits are the prevention of cancer and cardiovascular diseases, as well as anti-inflammatory, antiarthritic, antibacterial, antiangiogenic, antioxidative, antiviral, neuroprotective, and cholesterol-lowering effects. These authors researched the available literature to highlight the efficacy, mechanisms of action, and adverse side effects of green tea and its constituent catechins.

Green tea is composed of proteins (15%-20% dry weight); amino acids (1%-4% dry weight); carbohydrates (5%-7% dry weight); minerals and trace elements (5% dry weight); and trace amounts of lipids, sterols, vitamins, xanthic bases, pigments, and volatile compounds. The health benefits of green tea are attributed to its polyphenol content. Most of the polyphenols are flavonols, commonly known as catechins (epicatechin, epigallocatechin, epicatechin-3-gallate, and (-)-epigallocatechin-3-gallate [EGCG]).

For this review, the authors searched PubMed, EMBASE, AMED, and China Academic Journals Full Text Database. They included articles about green tea's health benefits in humans and animals, absorption of metal ions and drug-metabolizing enzymes, antioxidation and inhibition of oxidative stress, carbohydrate metabolism and diabetes mellitus, and adverse effects. The authors selected 105 peer-reviewed articles in English for this review.

Cited in this review are animal studies reporting that green tea catechins provide some protection against degenerative diseases; that green tea has an antiproliferative activity on hepatoma cells and hyperlipidemic activity in hepatoma-treated rats; that green tea catechins could act as antitumorigenic agents and as immune modulators in immunodysfunction caused by transplanted tumors or by carcinogen treatment; and that green tea is effective in preventing oxidative stress and neurological problems.

Green tea has been linked to the prevention of certain types of cancer. The antioxidant, antimutagenic, and anticarcinogenic effects of green tea could offer protection against cancer caused by environmental agents. Tea's anticarcinogenic effects against breast

cancer have been reported in experimental studies; however, say the authors, epidemiologic evidence is inconsistent. Several epidemiological studies and clinical trials have shown that green tea may reduce the risk of chronic diseases, particularly hypertension and coronary heart disease. Other cited animal and human studies report an inhibitory effect of green tea on *Helicobacter pylori* infection and on the influenza virus as well as an antifungal activity against *Candida albicans*.

Green tea consumption has also been associated with increased bone mineral density and protection against hip fractures.

The authors report that tea catechins can affect iron absorption, particularly in those at risk for iron deficiency. Noting that the catechins' effects on other ions are not well understood, the authors suggest that they may affect absorption and metabolism of ions because flavonoids interact with various metal ions.

Green tea catechins, along with the antioxidant vitamins C and E and the tea's enzymes, are hypothesized to contribute to the total antioxidant defense system. In vivo studies have reported that green tea catechins increase total plasma antioxidant activity. The content of the oxidative stress marker malondialdehyde has been shown to decrease after green tea intake. One cited study of 25 patients with different gastrointestinal complaints measured the tolerance of green tea tablets and their effect on antioxidant status indices. A decreased level of all antioxidant status indices was seen in the treatment group.

Tea catechins, especially EGCG, appear to have antiobesity and antidiabetic effects. Recent data from human studies indicate that the consumption of green tea or green tea extracts may help reduce body weight, mainly body fat, by increasing postprandial thermogenesis and fat oxidation. One cited study of six overweight men given 300 mg EGCG daily for two days suggests that EGCG alone has the potential to increase fat oxidation in men and may thereby contribute to the antiobesity effects of green tea. (See HC 041031-399 for Consumption of Green Tea May Help Prevent Obesity)

Cited studies in animal models of diabetes reported reductions in serum glucose levels with the administration of green tea polyphenols. In normal rats, green tea catechins reduced plasma triglyceride levels in an oral glucose-tolerance test. Green tea and green tea extracts have been demonstrated to modify glucose metabolism beneficially in experimental models of type 2 diabetes mellitus. A human study reported that green tea promoted glucose metabolism in healthy human volunteers as shown in oral glucose-tolerance tests.

The authors point out that the effects of green tea and its constituents may be beneficial up to a certain dose and may cause some as yet unrecognized adverse effects at higher doses. Also, the effects of green tea catechins may vary from person to person. The harmful effects of too much tea are mainly due to its caffeine content, the presence of aluminum, and the effects of tea polyphenols on iron bioavailability.

The authors conclude that long-term consumption of tea catechins could be beneficial to high-fat diet-induced obesity and type 2 diabetes and could reduce the risk for coronary disease. Further research should focus on the pharmacological and clinical effects of green tea and its mechanisms of action.

—Shari Henson

Reference

¹Cabrera C, Artacho R, Gimenez R. Beneficial effects of green tea: a review. *J Am Coll Nutr*. 2006;25:79-99

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