Green Tea Catechins Reduce Body Fat and LDL Oxidation

By James P. Meschino, DC, MS

The catechins found in green tea have been shown to promote weight loss and reduction of body fat in human subjects, independent of any effects of caffeine. Researchers have examined the possible mechanisms of action through which green tea catechins promote fat burning and weight loss without producing adverse stimulation to the central nervous system.

Green tea contains low-molecular-weight polyphenols consisting mainly of flavanol (flavan-3-ol) monomers, which are referred to as catechins. There are several isomers of this compound: catechin, catechin gallate (Cg), gallocatechin, gallocatechin gallate (GCg), epicatechin, epicatechin gallate (ECg), epigallocatechin, and epigallocatechin gallate (EGCg).

Under experimental conditions, the ingestion of catechins exhibit antioxidant, antiviral and anti-plaque-forming activities, while epidemiological evidence suggests green tea catechins are associated with decreased risk of certain cancers and important anti-cancer properties. Animal studies also suggest a role in reducing high blood pressure and high blood sugar. Lipid metabolism studies in animals, tissues and cells have found that catechins reduce blood levels of triglycerides and total cholesterol. Catechins also inhibit fat accumulation in the liver and body fat, and stimulate thermogenesis (increased fat-burning and calorie burning at rest).

Catechins and Body Fat Reduction

In one open trial with human subjects, individuals ingesting catechins showed a reduction in body weight and waist circumference, but no comparative controls were included in the study. As a follow-up to this initial study, Nagao, et al., investigated the effect of green tea catechins on body fat reduction, waist circumference and other end points. The researchers gave one group of men a catechin-enriched, decaffeinated green tea (690 mg per day of catechins), while the control group received a decaffeinated green tea that contained only 22 mg catechins. All men had similar BMI scores and were either at the upper limit of their normal weight or slightly above.
After 12 weeks, the men receiving the catechin-enriched green tea showed a significant reduction in body weight, waist circumference and body fat as compared to men given the catechin-depleted green tea. Average weight loss in the catechin-enriched group was 5.3 lbs, as compared to 2.9 lbs in subjects ingesting the catechin-depleted product. Waist circumference was reduced by 1.36 inches in the catechin-enriched group compared to a reduction of only 0.64 inches in the catechin-depleted group. Decrease in hip circumference was also greater in the catechin-rich group as compared to the catechin depleted group.

In addition, the group receiving the catechin-enriched tea showed a reduction in LDL cholesterol from 3.38 mmol/L (130 mg/dl) to 2.99 mmol/L (115 mg/dl) during the 12-week trial period. They also had elevated HDL cholesterol. LDL-cholesterol reduction in the catechin-depleted group was much less pronounced.

A study by Maki, et al., showed that during a 12-week trial involving overweight subjects, a catechin-enriched supplement (625 mg per day) enhanced the weight-reduction effects of exercise (180 minutes per week) as compared to a control group. Reduction in abdominal fat was more noteworthy, and a more significant reduction in serum fasting triglycerides was also seen in the catechin-enriched group.

**Fat-Burning Effects of Catechins**

Experimental studies suggest a number of ways in which green tea catechins can reduce body fat and act as a weight loss aid. Dulloo, et al., reported that certain green tea catechins increased thermogenesis in brown fat tissue of rats. They also found that consumption of green tea catechins increased energy expenditure in a human study. The authors suggested that one of the effects of catechins is due to the inhibitory activity of catechol-O-methyltransferase (COMT), which is a catecholamine-degrading enzyme. As a result, more sustained activity of catecholamines, such as epinephrine and norepinephrine, may encourage greater release of fat from fat cells and may upregulate the activity of brown fat, increasing the total amount of fat burned at rest and increasing the total number of calories burned on a daily basis.

Catechins have been shown to decrease lipid oxidation in the body via antioxidant properties. Studies suggests obesity might be related to an increase in oxidized lipids, which have been shown to activate certain transcription factors (nuclear factor- B and peroxisome proliferator-activated receptors) that regulate body fat metabolism. As such, green tea catechins may discourage fat accumulation by decreasing fat oxidation in the body. An indirect marker for fat oxidation (lipid peroxidation) in the blood is malondialdehyde-modified LDL-cholesterol (MDA-LDL). A number of studies link higher MDA-LDL blood levels with higher incidence of obesity. The results in Nagao, et al., may have occurred through signal
transduction pathways involving transcription factors (nuclear factor- B and peroxisome proliferator-activated receptors), which have been a factor in suppressing fat accumulation and triggering body fat reduction.1 The authors conclude that further investigation is needed to clarify the relation between a redox regulatory system (lipid oxidation signaling mechanism) and the body-fat-reducing mechanism.

To summarize, catechin has been shown to inhibit the formation of oxidized lipids such as MDA-LDL, which is an established risk factor for developing arteriosclerosis. Moreover, catechin has been shown to decreases body fat without any untoward side effects and adverse events. Studies suggest that catechins contribute to the prevention of and improvement in various lifestyle-related diseases, particularly obesity and cardiovascular disease. As such, high-catechin green teas (either caffeine-reduced or decaffeinated) can help patients reduce body fat, improve other anthropometric indices and improve biomarkers related to atherosclerosis.

References


Resources

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