HippEvo
Hippocrates Evolution

Green tea (*Camellia sinensis*)

Common Indications:

- Anti-cancer element
- Chemotherapy enhancing and radioprotective effects
- Antioxidant
- Cardiovascular health - reduce LDL oxidation
- Decreases platelet aggregation/ improves blood flow
- Endothelial dysfunction
- Balance Th1/Th2 Immune function
- Improve blood sugar regulation
- Metabolic Syndrome
- Weight loss, enhances fat burning via AMPK
- Exercise benefits
- Wart treatment - topical

General Comments:

Green tea is one of the most amazing foods on this planet. It is the second most consumed beverage in the world behind water, yet just starting to make an impact in the U.S. There are more than 2,500 scientific studies involving green tea with such impressive findings that the National Cancer Institute is working to develop new cancer fighting drugs using green tea compounds.

The magic in green tea appears to come from a compound called epigallocatechin-3-gallate (EGCG) which is a type of antioxidant and just one of several polyphenols found in green tea. I generally hate broad medical claims but I have to say that there are hundreds and yes even thousands of studies to back up this next statement: green tea polyphenols reduce bacterial and viral infections; they greatly impact chronic degenerative diseases like heart disease, cancer, stroke, osteoporosis, and dementia and much, much more.

Green tea, black tea and oolong tea all come from the same plant but difference lies in how it is dried and processed. Green tea offers less caffeine, roughly 30-35 mg per 8 ounce cup whereas black tea can range from 50-100 mg of caffeine per cup. Coffee by comparison has 120mg of caffeine per 8 ounce cup unless you're talking Starbucks in which case you can double that number.

Benefits & Mechanism of Action:

Anti-carcinogenic:

- The polyphenols in green tea are very unfriendly to cancer cells:
    - They trigger apoptosis in cancer cells but not in normal healthy cells.
    - Inhibit angiogenesis, cutting off the blood supply to cancer cells
    - Shut off the growth genes in cancer cells
    - Inhibit overproduction of cyclooxygenase (COX)-2 which plays a part in cancer growth.
    - Decreases insulin-like growth factor-1 (IGF-1) which is a compound linked to breast, prostate and colon cancer.
    - Reduces the production of several compounds in cancer cells that are linked to cancer spread or metastasis.

- Studies show green tea helps protect against various forms of cancer, including colon, endometrial, rectal, bladder, breast, stomach, pancreatic, lung esophageal and prostate.[1,2] Japan's consumption of EGCG as one of the many polyphenols in green tea has been studied as one reason for Japans lower overall cancer rates compared to other developed nations. Green tea polyphenols are reported to:
    - Enhance antioxidant (glutathione peroxidase, catalase and quinone reductase) and phase II (glutathione-S-transferase) enzyme activities
    - Reduce lipid peroxidation
    - Inhibit irradiation and TPA-induced epidermal ornithine decarboxylase (ODC) and cyclo-oxygenase activities
    - Inhibit protein kinase C and cellular proliferation
    - Have anti-inflammatory activity

    - Studies on tea consumption show that 1 cup of tea contains a mere 0.5 mg of catechins (polyphenols) yet consuming just 2 cups/day of green tea was associated with an 18% decrease risk of developing lung cancer.[3] A 2006 meta-analysis of epidemiological studies found green tea consumption was correlated with a decreased risk for breast cancer.[4] A 2009 meta-analysis found that green tea consumption (2 cups/day) decreases the risk of endometrial cancer.[5] The Cochrane Database System Review in 2009 states that the use of standardized extracts is needed in order to generate more compelling and consistent results.[1] More studies are needed to define use and dose but the effects of these polyphenols shows great promise.[6,7]

    - Green tea is reported to help protect against chemotherapy and radiation damage, including UV radiation from the sun.

Antioxidant:

- Green tea possesses strong antioxidant properties that lend protection to our

cardiovascular system.[8] The polyphenols of green tea inhibit lipid peroxidation and alter iNOS ability to drive inflammatory cytokine production. It is this antioxidant capacity that decreases the reactive oxygen species generated by neutrophils in cancer patients.[9,10,11]

Cardioprotective:

- Green tea reduce oxidation of LDL, inhibits thromboxane and platelet aggregation. Studies demonstrate its anti-platelet activity and endothelial protection.[12] Green tea suppresses a fatty acid synthase gene which in turn down regulates EGFR/PI3K/Akt/Sp-1 signal transduction pathways, benefiting lipid levels.[13]

- Green tea has been shown in studies to reduce total lipids, enhance the beneficial HDL level, and more importantly lower triglycerides. In a 2009 study of 111 subjects, using randomized, double-blind, placebo-controlled design, green tea use lowered blood pressure, LDL cholesterol, and oxidative stress.[14]

Insulin Resistance/Blood Sugar Regulation:

- In both animal and human study, green tea improves insulin sensitivity and blood sugar regulation. This is one of it's mechanisms for success in weight loss programs. Its ability to stimulate AMP-kinase, an important cell regulator of energy, boosts the cells ability to utilize fat as fuel. A 2007 study looking at obesity found that green tea was supportive in reducing waist size and fat loss as well as increasing adiponectin levels.[15]

- A crossover study in healthy male subjects found that consuming green tea before exercise would enhance fat oxidation and insulin sensitivity.[16]

- There have been mixed findings in other studies on type 2 diabetics. Hemoglobin A1c was found to improve in one study while a second 3 month trial did not document improvement in in glucose control.[17]

Metabolic Syndrome/Weight loss:

- Green tea's thermogenic effect has been credited to its effect on AMPK. There seems to be a synergistic effect between caffeine and the catechins found in green tea that may prolong the thermogenic effect.[18] A European study in 2009 found benefits in fat metabolism and enhanced metabolic rate using green tea extracts alone without caffeine.[19] An exciting finding from 2007 is that green tea may in fact stimulate brown fat.[15] This double-blind parallel multicenter study found that green tea polyphenols given to 240 patients led to a reduction in body fat, systolic blood pressure, and LDL cholesterol.[15] Green tea activates changes to fat metabolism gene expression driven by PPAR-γ coactivator 1-α and PPARs.[22]

- A study of 45 elderly patients with MS reported that those who drank green tea had a statistically significantly more weight loss, decrease in BMI and waist circumference when compared to those who did not drink the tea.[26]

- Green Tea phytosome is a highly bioavailable complex of green tea polyphenols and phosphatidylcholine. Phosphatidylcholine is a phospholipid, which is a major part of the structure of cell membranes thus allowing greater absorption.[23] A human study reported that Green Tea phytosome was absorbed more completely than plain EGCG polyphenols.[24] The Green Tea phytosome peak blood concentration of EGCG, measured over a period of six hours, was approximately double that of the non-complexed green tea extract. Use of the phytosomal bound green tea in a study of 100 obese individuals found that using Green Tea phytosome plus a low calorie diet for 90 days resulted in a significant improvement in body mass index (BMI) and weight loss vs. using a low calorie weight loss regimen alone.[25]

Neurologic Effects:

- Green tea is thought to have some potential neurological benefits. For prevention of Parkinson's disease, caffeine in green tea may prevent adenosine's inhibition of dopaminergic transmission. This may result in a reduction in the clinical expression of Parkinsonism.[27] Green tea may also inhibit dopamine transport in vitro, as well as protect against effects of 6-hydroxydopamine.[28]

- Preliminary evidence also suggests that EGCG may prevent oxidation and apoptosis of neurons, which may protect people from developing Alzheimer's disease.[29]

- The green tea constituent EGCG may also directly affect brain function. In humans, EGCG increased alpha, beta, and theta activity, mainly in the frontal and medial frontal gyrus and brain theta waves in the temporal, frontal, parietal, and occipital areas.[30,31]

Oral Hygiene, Asthma and Bone

- Green tea also has anti-inflammatory activity and may help improve bone mineral density.[32]

- Green tea benefit oral health. Clinical studies report green tea leads to inhibition of attachment of oral bacterial to human gingival fibroblasts.[33]

- Green tea is also reported in laboratory and human studies to suppress IgE production by peripheral blood mononuclear cells in asthmatic patients.[34]

Dose:

- 250-500mg daily of a standardized extract. Phytosomal versions offer greater levels.

- Drinking green tea will provide 0.5mg of catechins per 8 ounce cup.

Standardization:

- Green tea supplements should be standardized to contain 90% polyphenols, of which 40-75% are catechins, specifically (-)epigallocatechin-3- gallate (EGCG). A mix of

catechins will outperform an isolated EGCG product. It is the other polyphenols that protect the EGCG and allow it function optimally.

Cautions & Side Effects:

- Green tea has been reported to be safe in recommended doses.

- There have been cases of hepatitis and one death reported from using concentrated green tea extract, although the data is inconclusive that the hepatotoxicity was actually from the green tea supplement.

- Caution is recommended when using concentrated, standardized green tea extracts in individuals with pre-existing liver damage. Hepatotoxicity has been reported in 7 case reports where green tea was a probable cause.[35,36] However, a placebo-controlled study using high polyphpenol green tea extract showed no impairment of liver function.[37]

- Green tea should not be used if there is an allergy to any component of this dietary supplement.

- In patients with anemia or trending low iron levels, green tea should be used with caution, as green tea has been reported to decrease serum iron levels.[38]

- Green tea and some green tea supplements contain caffeine. Caffeine may cause nervousness and/or insomnia in sensitive individuals. Caffeine-free supplements are available. If using green tea as an aid to weight loss, the caffeinated products are recommended.

- Caution should be use if taking the following medications with green tea:

  - Based on case reports, use with caution in individuals on anticoagulant and anti-platelet medications and those with bleeding disorders.[39]
  - Iron supplements, as green tea tannins may inhibit the absorption of iron.[38]

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Benefits and Mechanism of Action

Anti-carcinogenic

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Insulin Resistance/Blood Sugar Regulation

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