

Green Tea Benefits

Consumption of green tea beverage or extracts confers a wide range of possible health benefits. Below is a summary of 69 medical studies that we reviewed.

- Antioxidant - Anti-aging
- Anti-Mutagenic
- Cancer Prevention
- Cancer Treatment Adjunct
- Heart Disease Prevention
- Stroke Prevention
- Metabolic Effects & Weight Loss
- Glucose (Blood Sugar) Homeostasis
- Neuro-Protective
- Protective of Membrane Fluidity
- Anti-Bacterial
- Skin-Protective

Antioxidants Slow Aging and Enhance Longevity

- Total antioxidant capacity of plasma in healthy volunteers was significantly increased after drinking green tea.
- Plasma total antioxidant capacity values in healthy volunteers is enhanced by green tea consumption. It also protects low-density lipoprotein from oxidation.
- Some researchers are even recommending green tea as a health-optimizing agent.
- Some population studies are suggestive that consistent consumption of substantial amounts may increase longevity.
- Green tea has 2.5 to 6 times greater in vitro antioxidant capacity than black tea. The rapidity of the human in vivo response suggests absorption in the upper GI tract.
- It has the ability to increase the activity of antioxidant enzymes, according to animal research models.
- It has shown strong antioxidant activity during in vitro research using lipid peroxidation testing methods. Particular effectiveness was noted for extracts containing the higher levels of (-)-epigallocatechin-3-gallate and (-)-epigallocatechin.
- Green tea catechins may offer a protective effect against chemically-induced **acute pancreatitis**, according to animal models.

Anti-Mutagenic Effects

- Green tea extracts, in concentrations customarily consumed by humans, possess significant antimutagenic potential against a variety of dietary and environmental mutagens.
- Green tea epicatechins inhibit the mutagenicity and/or chromosomal damage caused by different carcinogens in both bacterial and mammalian cells. Camellia may be useful to prevent some kinds of cancers and many oxidation-related diseases.

- In vitro studies have repeatedly documented its anti-mutagenic, anti-proliferative and anti-neoplastic activities. Researchers suggest that these anticancer mechanisms may be responsible for the cancer preventive efficacies appearing in human studies.

Cancer Prevention

- “Green tea is the most effective beverage for cancer prevention in humans,” according to one research study.
- The consumption of tea is associated with a lowered risk of cancer.
- Green tea consumption in smokers and non-smokers decreases oxidative DNA damage in both groups, plus lipid peroxidation and free radical generation in smokers. Nonsmokers also benefit from a decrease in overall oxidative stress.
- An inverse association with pancreatic and colorectal cancer has been observed with increasing amounts consumed. Researchers conclude that green tea drinking may lower the risk of colorectal and pancreatic cancers.
- Population studies suggest that the greater the intake of tea, the lower the risk of lung cancer.
- Prospective cohort studies indicate decreased relative risk of cancer incidence in both sexes for those consuming more than 10 cups a day for. Significant delay in cancer onset is linked to its increased consumption.
- High intake (more than 10 cups per day) has a negative correlation with the risk of chronic atrophic gastritis. Researchers hypothesize that high consumption may prevent this condition, which is a known precancerous lesion. However, a very recent, large-scale prospective study could not confirm that green tea has an overall protective effect against stomach cancer when consumed in the amounts typical of the average Japanese or Chinese person (less than 10 cups per day).
- The induction of cell suicide (apoptosis) selectively among cancer cells, but not in normal cells, is a consistently observed effect. EGCG and other polyphenols exhibit apoptosis-inducing effects on several cancer cell lines in vitro.
 - Green tea extract suppresses the growth and induces apoptosis in **human prostate cancer cells**. The mechanism appears to be an increase in reactive oxygen species and mitochondrial depolarization.
 - Green tea catechin extract inhibits growth and induces programmed cell death (apoptosis) in human **stomach cancer cells**. The effect is concentration- and time-dependent. Consumption of large amounts may be protective against stomach cancer.
 - Green tea outperformed a conventional chemotherapy agent in preventing and / or inhibiting tumor growth in mice transplanted with **human non-Hodgkin’s lymphoma** cell lines. The frequency of apoptosis among tumor cells was significantly increased compared to controls.
 - Camellia polyphenols may dysregulate and arrest the metabolic and reproductive processes in cancer cells in an irreversible manner that ultimately leads to apoptotic cell death.
- Animal studies have demonstrated the ability of EGCG to inhibit carcinogenesis. The molecular mechanism may be related to the “antioxidative activities, modulation of xenobiotic metabolite enzymes and inhibition of tumor promotion” by polyphenols. Cancer chemoprevention may also arise from modulation of mitotic signal transduction.

- Matrix metalloproteinases (MMPs) (gelatinases) are extracellular zinc-dependent stromal enzymes essential to the maintenance of the protein matrix between cells and wound healing. Excessive activity of these enzymes has been implicated in the pathologic angiogenesis, tumor invasion, and metastasis of cancer. Green tea catechins inhibit MMP activities. (Demeule) Epigallocatechin-3-gallate is considered to be a potent inhibitor of these gelatinases and an agent providing the antiangiogenic and antimetastatic activity associated with green tea.
- Its constituents inhibit prostaglandin PGE₂ synthesis in the colo-rectal mucosa of healthy volunteers. This evidence supports the use of green tea as a colorectal chemopreventive agent in future research.
 - Green tea polyphenols inhibit the expression, release, and activity of tumor necrosis factor-alpha (TNF-alpha), an essential factor in tumor promotion, in a dose-dependent fashion. EGCG has been shown to work synergistically with other cancer preventive agents, such as tamoxifen and sulindac. Researchers conclude that it is effective as a non-toxic cancer preventive for humans.
 - Nuclear factor kappaB (NFkB) is a transcription factor involved in immune and inflammatory response, apoptosis, and cell proliferation. The in vitro ability of EGCG to cause cell cycle deregulation and apoptosis in cancer cells may be mediated through NF-kappaB inhibition.
 - Constituents of green tea extracts can modulate in vitro the expression of genes linked to the carcinogenesis process and, therefore, may be chemopreventive against **pancreatic cancer**.
 - EGCG inhibits in vitro cell growth of oral leukoplakia cell lines, with a decrease in efficacy as cells progress from normal to cancer.

Cancer Treatment Adjunct

- Green tea may actually increase the efficacy of chemotherapy agents.
- It has been shown to enhance 2.5-fold the inhibitory effects of doxorubicin on tumor growth. Antitumor activity of doxorubicin was enhanced by green tea in some types of cancers. "Green tea can encourage cancer chemotherapy and may improve the quality of life of clinical patients."
- Increased consumption is closely associated with decreased numbers of axillary lymph node metastases among premenopausal women with stage I and II breast cancer. Consumption of over 5 cups QD is correlated with decreased recurrence of stage I and II breast cancer. No improvement in prognosis has been observed in stage III breast cancer. It seems to modify the pathological characteristics of some cancers.

Heart Disease Prevention

- Epidemiological studies have shown that tea catechin intake is associated with lower risk of cardiovascular disease.

- Epigallocatechin-3-gallate (EGCg) helps prevent oxidation of plasma low-density lipoprotein (LDL), a contributing factor in the formation of atherosclerotic plaques and consequent cardiovascular disease.
- Based on studies with healthy human volunteers, researchers conclude that it contributes to the prevention of cardiovascular disease by increasing plasma antioxidant capacity.
- EGCg is incorporated into the plasma of humans at concentrations sufficient to manifest anti-oxidative activity in the blood stream. This phenomenon may be the source of antioxidant protection for LDL-cholesterol.
- Based on human arteriographic evidence, its consumption tends to be inversely associated with coronary arteriosclerosis in men, but not in women. The protective effect seems to require the consumption of 4 or cups daily.
- Green tea catechins, especially epigallocatechin gallate and epicatechin gallate, seem to inhibit cholesterol oxidation in LDL. The mechanism appears to be the synergy of interfering with PUFA oxidation, scavenging free radicals, and reducing their generating agents.
- Green tea polyphenols render LDL resistant to ex vivo oxidation in healthy humans. Daily consumption of the equivalent of 7 to 8 cups (100 mL per cup) may increase resistance of LDL to in vivo oxidation.
- Green tea extracts reduce thromboxane levels (as well as cholesterol) in lab animals.
- Tea has relatively high levels of the lignans secoisolariciresinol and matairesinol, but only low levels of isoflavonoids. Plant lignans and their metabolites, enterolactone and enterodiol, have antioxidative properties. These mammalian lignans occur in high concentrations in plasma. Consequently, lignan polyphenols may contribute to the protective effect of tea on coronary heart disease.

Stroke Prevention

- The consumption equivalent to 5 cups or greater daily may offer protection against cerebro-vascular accident (stroke).
- Nitric oxide (NO) is produced by the endothelium of arterioles, including cerebral vessels. NO is a major mediator of endothelium-dependent vasodilation (EDV), and helps prevent thrombosis and arteriosclerosis. Green tea polyphenols may help to prevent strokes by increasing the expression of endothelial NO synthase.

Metabolic Effects & Weight Loss

- Epigallocatechin gallate is a potent inhibitor of the enzyme acetyl-CoA carboxylase that is essential for fatty acid synthesis. This constituent inhibits triglyceride accumulation.

- Varieties of green tea may be an effective for the treatment of obesity and fatty liver caused by a high-fat diet, as suggested by animal studies.

Glucose (Blood Sugar) Homeostasis

- Specific sodium-dependent transporters facilitate intestinal glucose absorption. ECG inhibits glucose transporters in a competitive manner, but is not itself transported via the glucose transporters. It may play a role in controlling dietary glucose uptake and, thereby, contribute to blood glucose homeostasis.

NeuroProtective

- Eicosanoids accumulation and the formation of oxygen free radicals are associated with the pathogenesis of ischemia / reperfusion brain injury. Green tea pre-treatment may reduce the brain damage due to ischemia. It also reduces the accumulation of undesirable pro-inflammatory leukotrienes, prostoglandins, and thromboxanes. It also reduces hydrogen peroxide and lipid peroxidation products. Apoptosis (cell suicide) is also reduced. Green tea pretreatment promotes recovery from ischemia. **It has a minimizing effect on ischemia/ reperfusion-induced brain injury and behavior deficit.**
- Researchers suggest that green tea catechins ameliorate the injuries or impairments induced by active oxygens through the scavenging intracellular active oxygen species. Catechins may be useful for preventing or **delaying human senile disorders, such as dementia.**

Protective of Membrane Fluidity

- Catechins significantly reduce membrane fluidity in both hydrophilic and hydrophobic regions of lipid bilayers. This effect is similar to that of known anti-plaque agents. Catechin and epigallocatechin gallate significantly prevent the membrane fluidizing effect of hepatotoxins. Reducing membrane fluidity may be responsible for the anti-plaque and hepatoprotective effects of green tea catechins.

Anti-Bacterial Activity

- Green tea extracts inhibit the in vitro growth of bacteria associated with infectious diarrhea. Species affected are Staphylococcus aureus, S. epidermidis, Vibrio cholerae O1, V. cholerae non O1. V. parahaemolyticus, V. mimicus, Campylobacter jejuni and Plesiomonas shigelloides. The susceptibilities Salmonella, Shigella, S. aureus, V. parahaemolyticus, and enteropathogenic E. coli vary with the kind of tea used and the preparation method. "The bactericidal activity was shown even at the drinking concentration in daily life."
- Tea extracts are bactericidal against staphylococci and Yersinia enterocolitica at less than concentrations consumed in beverages. Researchers believe the antibacterial activity is based on the constituent's epigallocatechin, epigallocatechin gallate and epicatechin gallate.

Skin-Protective

- Application of green tea extracts to the skin of healthy human volunteers provided dose-dependent protection against the erythema induced by UV radiation. The constituents (-)-epigallocatechin-3-gallate and (-)-epicatechin-3-gallate were most efficient. Skin treated with green tea had a reduced number of sunburn cells, and epidermal Langerhans cells were protected from damage. Green tea also reduced DNA damage.