

# GREEN TEA: A MIRACLE HERB CONTAINING POLYPHENOLS

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## ABSTRACT

Tea is one of the most widely consumed beverages in the world, next only to water for enjoyment and health. In general, green tea has been found to be superior to black tea in terms of health benefits. The major components of interest are the polyphenols which are responsible for the antioxidant and other health benefits of green tea. Green tea in its purest and most unadulterated form has always influenced human health from generations and day by day scientific evidences throughout the world are making people aware of health benefits associated with this herbal drink. Though Green Tea is not officially recognized as a medical agent, it is one of the most researched plant-based remedies whose possible benefits include promotion of cardio-vascular health, cancer prevention, skin protection, and antioxidant activity, to fight high cholesterol levels, infection, impaired immune function, diarrhoea, fatigue and many more.

**Key words:** *Green tea, health benefits, polyphenols.*

## INTRODUCTION

Tea is one of the most widely consumed beverages in the world, next only to water<sup>1,2</sup> and well ahead of coffee, beer, wine and carbonated soft drinks<sup>3</sup>. It can be categorized into three types, depending on the level of fermentation, i.e. green (unfermented), oolong (partially fermented) and black (fermented) tea. The term fermentation is often used incorrectly in tea processing. The more correct term should be oxidation, which means exposure to air while drying without any additives during the process. Green tea is the nature's treasure to the mankind. It is next to water as the most consumed beverage in the world<sup>4</sup>. Green tea is derived from the leaves of the plant *Camellia sinensis*.

## CHEMICAL CONSTITUTENTS OF GREEN TEA

The chemical composition of green tea varies with climate, season, horticultural practices, and age of the leaf (position of the leaf on the harvested shoot)<sup>5</sup>. The active constituents in green tea are powerful antioxidants called polyphenols. Tea is reported to contain nearly 4000 bioactive compounds of which one third is contributed by polyphenols<sup>6</sup>. Among the polyphenols in tea, is a family of compounds called the flavanoids. Flavanoids (and their fraction, catechins) are the basic phenolic compounds in green tea responsible for antioxidant activities such as neutralization of free radicals that are formed in the process of metabolism<sup>7</sup>. These flavanoids contains a substance called catechins. Major catechins present in green tea are epicatechin (EC), epigallocatechin gallate (EGCG), epigallocatechins (EGC) and epicatechin gallate (ECG).

## Nanoparticles

Nanotechnology has emerged as a promising technology that has been advocated for the delivery of antimicrobial phenolic compound extracts. There have been some recent efforts to enhance its bioavailability by delivering EGCG using lipid nanocapsules and liposome encapsulation, suggesting

the possibility of this molecule being developed further by medicinal chemists<sup>8</sup>. Phenolic compounds can be used as natural and safer alternatives to chemical disinfectants in food systems and delivery of antimicrobial agents using nanoparticles to better control pathogens for commercial food safety applications<sup>9</sup>. Green silver nanoparticles have been synthesized using various natural products like green tea *Camellia sinensis*<sup>10</sup> which is non polluted, environmentally acceptable, and safer for human health. Synthesis of nanoparticles using biological entities has great interest due to their unusual optical<sup>11</sup>, chemical<sup>12</sup>, photoelectro-chemical<sup>13</sup> and electronic properties<sup>14</sup>. The synthesis and assembly of such nanoparticles would benefit from the development of clean, nontoxic and environmentally acceptable 'green chemistry' procedure, involving organisms ranging from bacteria to fungi and even plants.

#### **Prevents Hair Loss**

So far, the benefit of green tea is known only to the body. But, green tea polyphenols are only recently understood as positive factors in hair growth and follicle health<sup>15</sup>. They possess some of the mechanisms of action as including inhibition of apoptosis (programmed cell death), radioprotection of follicle cells, profound antioxidant activity, and potential follicular inhibition of TGF-beta<sup>16</sup>.

#### **Anticarcinogenic activity**

Abundant experimental and epidemiological evidences accumulated mainly in the past decade from several research analysts worldwide provides a convincing argument that green tea polyphenols can reduce cancer risk in a variety of animal tumor bioassay systems<sup>17-19</sup>. In the last ten years, cancer preventive effect of green tea have been widely supported by epidemiological, cell culture, animal and clinical studies.

#### **Green tea for skin treatment**

Treatment of green tea polyphenols to skin has been shown to modulate the biochemical pathways involved in inflammatory responses, cell proliferation and responses of chemical tumour promoters as well as ultraviolet light-induced inflammatory markers of skin inflammation. Topical treatment with EGCG on mouse skin results in prevention of UVB induced immunosuppression and oxidative stress. The protective effects of green tea treatment on human skin either topically or consumed orally against UV light-induced inflammatory or carcinogenic responses are not well understood. Based on documented extensive beneficial effects of green tea on mouse skin models and very little in human skin, many pharmaceutical and cosmetic companies are supplementing their skin care products with green tea extracts<sup>20</sup>.

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#### **Effective in Renal failures**

The renal failure is also a condition where green tea has shown to have protective effects. Decreased kidney function due to aging and kidney failure are a frequent cause of death. A preliminary study in Mansoura University in Egypt has explored the possibility to protect kidney function from life threatening failure with the frequent use of green tea<sup>21</sup>. They found that animals with kidney failure when treated with 50mg/kg EGCG from green tea showed significantly recovered glomerular filtration rate in 7 days, reduced malondialdehyde and inflammatory cytokines and increased glutathione (antioxidant levels) as compared to resveratrol and quercetin.

#### **Protects Against Cardiovascular Diseases**

Another gem associated with green tea is its ability to protect from cardiovascular diseases. Heart diseases and stroke are associated with a number of risk factors and are most prevalent in the Western world, probably as a result of the lifestyle in this part of the world, which includes a diet high

in saturated fats and low physical activity, and the large proportion of the population who smoke cigarettes and have high blood pressure. Green tea appears to be cardio-protective<sup>22,23</sup>.

#### **Antibacterial activity**

Polyphenols in green tea preferentially suppress the growth of pathogenic bacteria in the gut, but not the growth of friendly bacteria. Fairly high concentration of catechins does not harm bifidicts, bacillus (Probiotics), good bacteria which is necessary for the functioning of the intestinal tract. Green tea polyphenols are likely to benefit the host by inhibiting pathogens growth and regulating commensal bacteria including probiotics and therefore be considered as Prebiotic<sup>24</sup>. The inclusion of green tea showed positive effects on the increase of lactic acid bacteria and aerobic bacteria counts in ruminants<sup>25</sup>.

#### **Effect on obesity**

The effects of tea on obesity and diabetes have received increasing attention. Tea catechins, especially EGCG, appear to have antiobesity and antidiabetic effects<sup>26</sup>. Although few epidemiological and clinical studies have shown the health benefits of EGCG on obesity and diabetes, the mechanisms of its actions are emerging based on various laboratory data. These mechanisms may be related to certain pathways, such as through the modulations of energy balance, endocrine systems, food intake, lipid and carbohydrate metabolism, and redox status<sup>27</sup>.

#### **Harmful side effects**

To date, the only negative side effect reported from drinking green tea is 'insomnia' due to the fact that it contains caffeine. However, green tea contains less caffeine than coffee: there are , 30–60 mg of caffeine in 6–8 ounces of tea, compared to over 100 mg in 8 ounces of coffee. Green tea contains vitamin K and may interfere with warfarin<sup>28</sup>. However, that was based on one individual consuming a gallon of green tea daily while on the medication. Based on current literature, there does not appear to be any significant side effects or toxicity associated with regular green tea consumption. Patients sensitive to caffeine should use caffeine-free green tea or a caffeine-free extract.

Harmful effects of tea overconsumption (black or green) are due to three main factors: (1) its caffeine content, (2) the presence of aluminum, and (3) the effects of tea polyphenols on iron bioavailability. Green tea should not be taken by patients suffering from heart conditions or major cardiovascular problems. Pregnant and breastfeeding women should drink no more than one or two cups per day, because caffeine can cause an increase in heart rhythm. It is also important to control the concomitant consumption of green tea and some drugs, due to caffeine's diuretic effects<sup>29</sup>.

#### **CONCLUSION**

Green tea is consumed throughout the world in various forms. The years of safe consumption of this beverage, supported by numerous studies showing health benefits, warrant a general recommendation to consume it regularly. This article demonstrates the benefits of green tea for its various uses.

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