

# The Beneficial Effects of Black and Green Tea

## A Review of the Literature

Colleen Puzas

### **Abstract**

This review displays the benefits and the disadvantages of the consumption of green and black tea. The first section of this review examines the background and world-wide consumption of tea, then it goes onto explain the components contained in the tea leaves. Throughout scientific studies of the tea leaves, researchers found that the difference of tea types, such as black or green, is in the fermentation or oxidation processes used during production. The second section explains how differing amounts leaf exposure to oxygen affects antioxidant and important catechins called ECGC levels and also how the altered levels affect the body after consumption. ECGC helps to prevent DNA damages from carcinogens, reduce blood pressure, lessen the chances of HIV and include many more beneficial qualities. Tea also contains trace elements of caffeine, tannin, and fluoride which affect the body in unwanted ways by decreasing sodium levels, stimulating the nervous system, and increasing the chances of iron deficiency. This review examines both beneficial and negative sides of tea as well as the effects imposed on the body by the consumption of tea's components. The last section describes the reasoning why scientists fail to come to conclusive results.

### **Introduction**

Life brings with it many stressors, so most people rely on a crutch to bring them back to good health and positive thinking. One of these helpful alleviators could be tea. A warm cup of tea can be used to soothe or calm the body and mind in hopes to relieve the daily stressors as well as provide other helpful effects on the body. Even though a simple beverage containing just water and plant leaves may seem like an unreliable source when trying to fight off diseases and depressing situations, think again. Over time tea has been cultivated and studied by many countries worldwide in order to find the real answers behind tea's natural mysteries. Since 5000 years ago, China, Japan, India, Russia, and Britain uncovered personal and economic advantages of tea. The vicious trade business between some of these countries proved and continues to prove

tea as a high demand import. With that said, it is no surprise that tea is the second most consumed drink in the world ranked after water (Sinija; Unbricht; Taylor; Neithercott).

Many people question the beneficial significance between green and black tea. The truth of the matter is green and black tea differs only in their processing methods but not in leaf itself. Because of the oxidation methods during manufacturing, green tea contains more antioxidants and free radical fighting abilities than black tea. Believe it or not, all tea comes from a perennial evergreen shrub called *Camellia Sinesis*. Tea leaves, no matter what the kind, are part of the same plant but contain different levels of antioxidants, catechins, ECGC. Aside from the oxidation processes, tea also contains caffeine and tannin. This review will explore how each component found in tea reacts with the human body. Depending on their significance, one can determine the benefits and negatives of consuming tea on a daily basis and throughout one's lifetime.

Throughout the researching world, different standpoints about the health effects of tea drinking accumulated amongst scientists. There are two types of general theories. One theory supported by researchers such as Taylor and Neithercott consider tea without any negative effects. Other scientists such as Sinija and Ulbricht disagree with Taylor and Neithercott and instead believe more research and human studies needs to be done on the beneficial effects of tea before determining a concise answer. Then there are researchers like Tufts who look at both sides of the spectrum and believe tea is a beneficial drink, but like anything else, it has its downfalls.

## **Background and Legends of Tea**

The consumption of tea dates back centuries ago. As time goes on, the findings about the tea leaves continues to expand, even though the centuries old plant remains the same. As legends say, the Chinese Emperor Shen-Wung known as "Divine Healer" described tea to "quench thirst. It lessens the desire for sleep. It gladdens and cheers the heart," after tea leaves miraculously blew into his hot water pot (Taylor). Not until around 350 A.D, the first cultivation started and tea became a medicine used to cure digestive disorders and nervous conditions (Taylor). From generations to generations the Chinese passed on the manufacturing and cultivation methods, so therefore, by the 5<sup>th</sup> century farmers cultivated their own tea plants on small plots of land (Taylor). As Chinese consumption and distribution of tea became more expansive, in 780 A.D

the government levied the price of tea and it became a part of the trading industry (Taylor). That same year Lu Yu wrote the “tea bible” called *Cha-Ching*, which describes special methods of cultivation, production, and the ways to serve tea (Taylor). As the word spread about tea, other countries demanded to have some of this mysterious product. As a result, China opened up its trading routes to Mongolia but with difficulty since as Taylor describes it:

Porters, who were treated as human “beasts of burden,” had to carry 300-pound loads on their backs while hiking through steep mountain passes, some of which were 5,000 feet high. The weights of these packs were so unbearable that the porters had to put opium behind their ears to kill the pain and keep themselves from collapsing.

As one can tell, something about tea was worth the blood, sweat, and tears.

Worldwide consumption of tea began to expand. The Japanese nobility held tea tournaments which involved them sitting on tiger or leopard rugs and taste-testing different types of tea to find out where they came from (Taylor). On a different social class level, some of the Japanese monks found tea to be a “pick me up” in which “relieved fatigue, strengthened the will, and lifted the spirit” (Taylor). Russia also opened a trade route with China that stretched across the Gobi desert with 300 to 400 camels carrying three chests each (Taylor). The camel journey took three years, the journey was well worth the wait (Taylor). Due to their obsession with tea, they constructed a forty cup capacity, gigantic tea pot called a samouar consisting of one fourth tea leaves, three fourths water (Taylor). India’s addiction to become part of the growing tea business as well, and resulted in them stealing 80,000 seeds from China in order to develop their own manufacturing business (Taylor).

### **Tea’s Chemical Structure**

India with 831 thousands of tons produced per year is the number one producer of tea. China follows with 649, Sri Lanka 272, Kenya 270, and Indonesia 147 thousands of tons (Taylor). Out of the 2.5 million metric tons of tea produced, there are three major types: black, oolong, and green (Taylor; Tufts; Sinija; Unbricht; Sharma). The type of tea depends on the amount of fermentation or oxidation the tea leaves undergo during cultivating and manufacturing as well as the soil the tea plants are grown in (Tweed).

Because of the manufacturing style, the major difference between green and black tea is the antioxidant quantities (Taylor; Sharma; Sinija, Tufts; Unbricht). For tea in general, tea composition and taste depends on the soil, season, horticulture practices, and location. The location gives the tea its different names such as Assam (India), Ceylon (Sri Lanka), Darjeeling (India), Yunnan (China), and Rize tea from Turkey (Taylor).

Green tea has more antioxidants than black tea. Flavonoids, derived from antioxidants, are broken down into subgroups called catechins. The most impressive general catechin, ECGC, is found in tea. Catechins have been known to prevent the binding of damaged DNA to carcinogens and also aid in the unclogging of blood vessels. Tea also contains caffeine, tannin and vitamins A, C, and E (Taylor; Unbricht). Some of the components contained in tea result in a consensus among scientists and researchers. For example, caffeine consumed in great quantities is a topic of concern for tea drinkers and scientists studying its effects. Whether tea is a positive or negative beverage, a top consumer ranking in as number one with 7 pounds of dry tea per year, Ireland takes the lead followed by the Great Britain (Taylor).

### **Differing Opinions between Scientists**

The study of the structural components of tea is important. According to Tufts, Neithercott, and Taylor, the most essential components are the catechins. The catechin, EGCG, is a flavonoid that aids in the process of interrupting the binding of singlet oxygen to normal damaged or broken DNA strands (Taylor). EGCG also strengthens cell membranes, helps blood vessels dilate to prevent heart attacks, and fights multiple types of cancer (Taylor; Sinija, Sharma). The antioxidants and vitamins A, C, and E give tea its beneficial title. With the combination of all four components, tea can help the immune system, prevent normal cells from being turned into cancer, suppress tumors, control blood pressure, slow aging, promote weight-loss, and regulate cholesterol (Taylor; Unbricht; Sinija; Sharma; Tweed). Taylor describes tea as “the divine elixir of the gods,” because of its cure-all abilities. Tufts backs Taylor up with a study found on Japanese smokers and lung cancer; Japanese people have twice as many smokers in their region, but compared to the United States, the amount of people who develop lung cancer is 50% less. One of the leading explanations is that they are heavy consumers of tea (Tufts;

Taylor). Although these facts may seem reasonable enough, there are scientists and researchers who do not believe tea to be a miracle drug.

With background knowledge on agriculture and engineering, Sinija and Mishra hold mixed viewpoints about the qualities of tea as a healing drug. Throughout their article, they distinguish the benefits as well as the downfalls of drinking tea. Sinija leaves the reader with a lasting thought about the downside to consuming tea by listing and explaining some of the negative components found in tea. Caffeine, fluoride and tannin are amongst the components that give tea a bad reputation (Sinija; Sharma, Neithercott). An overdose of tea can lead to a decrease in sodium levels, stimulation of the nervous system, and increases in the desire to urinate. Withdrawals from a caffeine overload can also cause (Unbricht). The fluoride found in tea reduces the anti-cancer properties, and tannin may cause iron deficiency (Neithercott; Unbricht). With these types of the components found in tea, a conclusion about whether tea is beneficial or harmful is a difficult decision to make.

Even though studies have shown the effects of each component, both beneficial and harmful, a small percentage of the experiments occurred on humans. Studies with mice, bacteria, or other test subjects back up a majority of the scientific findings, so it is unclear if humans will react in the same way as the test subjects with increased tea consumption (Sinija; Sharma; Gardner). Until future studies are conducted on humans with varying amounts of ECGC, antioxidants, or caffeine is done, conclusive results remain open-ended.

## **Conclusion**

Centuries ago people used tea for multiple healing processes and traditional ceremonies amongst different countries. As the trading and cultivating of tea plants expanded so did the research about the chemical structure and components of tea. ECGC, as one of the most powerful flavonoids, places tea as a beneficial beverage. Caffeine and tannin result in an inverse effect towards the body. Due to the differing components found in the tea leaves, scientists have yet to come up a conclusive answer about whether or not tea is a beneficial beverage. Definite answers about tea can be determined through human testing instead of animal testing.

Humans do not like being used as “guinea-pigs” in an experiment. Due to the lack of human test subject information, there is not a conclusive and definite answer about the debate on tea’s benefits. The research found about the health benefits and negatives of tea consumption,

therefore, remains invalid until more human experiments are done (Sharma; Unbricht; Sinija). Future experiments might include isolating the EGCG from the other tea ingredients and injecting it into human test subjects (Gardner). Another idea is to study the side effects of caffeine, so evidence found from the tea drinkers can be isolated and determined accordingly. Studies on the beneficial components as well as the negative ones must be researched in order to eliminate the confusion of tea's qualities in the medicinal world. As Taylor described a helpful situation, researchers found a way to extract catechins and make it into a powder form. The powder was then mixed with food and drink and also made into an injection form. Since catechins of tea were singled out from the other components, this way of research is valid for improving research. Through the process of component elimination, scientists better understand the effects of tea consumption. Until research on humans is completed, the choice is up to the consumer whether or not tea should become a part of their daily lives (Taylor; Tufts). There is no harm done when trying something new, such as tea, when it is taken in moderation and the side effects are observed.

#### Works Cited

- Gardner, E. J., C. H. S. Ruxton, and A. R. Leeds. "Black tea – Helpful or Harmful? A review of the evidence." *European Journal of Clinical Nutrition* 61.1 (2007): 3-18. *Academic Search Premier*. EBSCO. Web. 27 Oct. 2010.
- Neithercott, Tracey. "Halt to the Leaf: A Guide to Making Tea Part of Your Healthy Diet (Food for Thought: TEA)(Report)." *Agriculture Collection*. American Diabetes Association. May 2009. Web. 7 Nov. 2010.
- "Reading tea leaves for health benefits." *Tufts University Diet & Nutrition Letter* 13.8 (1995): 4. *Academic Search Premier*. EBSCO. Web. 27 Oct. 2010.
- Sharma, Vasundhara, and L. Jagan Mohan Rao. "A Thought on the Biological Activities of Black Tea." *Critical Reviews in Food Science & Nutrition* 49.5 (2009): 379-404. *Academic Search Premier*. EBSCO. Web. 27 Oct. 2010.
- Sinija, V. R., and H. N. Mishra. "Green tea: Health benefits." *Journal of Nutritional & Environmental Medicine* 17.4 (2008): 232-242. *Academic Search Premier*. EBSCO. Web. 27 Oct. 2010.

Taylor, Nadine. *Green Tea: The Natural Secret for a Healthier Life*. New York, NY: Kensington Publishing Corp., 1998. Print.

Tweed, Vera. "A Toast to Tea." *Better Nutrition* 69.10 (2007): 34-37. *Academic Search Premier*. EBSCO. Web. 27 Oct. 2010.

Unbricht, Catherine E., and Ethan M. Basch. *Natural Standard Herb & Supplement Reference: Evidence-Based Clinical Reviews*. St. Louis, Missouri: Elsevier Mosby, 2005. Print.