

GREEN TEA

**SECRETS REVEALED
THAT CAN IMPROVE
YOUR HEALTH**

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INTRODUCTION

It seems like lately when you go to the grocery store or convenience store, you can see displays offering green tea beverages for sale. Even though green tea has been around for years and years, it seems as if there is a current push for people to start drinking green tea, but why?

The truth is that nutritionists are starting to make it known to the general public that green tea has certain healing properties that just can't be ignored. We are a health conscious nation, and green tea contributes greatly toward a person's overall well-being and can even promote healing for some pretty serious diseases.

The Chinese have known about the medicinal benefits of green tea since ancient times, using it to treat everything from headaches to depression. In fact, green tea has been used as a medicine in China for at least 4,000 years.

Of course, tea has been a staple in countries – especially England – and is consumed daily as part of life. All around the world, people drink tea and in Japan, tea is even revered in its own ceremonial rite. The Japanese tea ceremony is often performed to achieve a sense of peace as outlined in Zen Buddhism.

Heck, even here in the United States, we like our tea whether it is iced or hot. Some people love to relax with a nice hot cup of tea and a good book just to relax and gain some peaceful insight into life. I personally love to have a cold glass of iced tea as I relax on my back deck and enjoy nature.

But lately, people are discovering what the Chinese have known for years. Green tea not only provides peace and serenity, it can actually make you healthier and fight diseases. It can even help with weight loss.

Since this seems to have become a relatively new phenomenon, at least here in the United States, this book will help educate you about the amazing ways green tea can help your health. You may be surprised as I was when I began researching this book. It's amazing what such a small thing can make such a huge difference.

Because when you drink green tea, you will reveal hundreds of secret ways that it can improve your health. When you're done reading this book, we're relatively sure you'll agree that the green tea phenomenon is here to stay – and it probably should be!

WHAT IS GREEN TEA?

You would think that the definition would be self-explanatory – it's tea that's green. But that doesn't really cover it.

All true teas - as distinct from herbal and flower infusions, which tea lovers call *tisanes* - are made from the leaves of a magnolia-related evergreen tree with the botanical name of *Camellia sinensis*. Although reaching a height of 30 feet in the wild, on tea plantations, the plant is kept as a shrub, constantly pruned to a height of about 3 feet to encourage new growth and for convenient picking.

Tea plants grow only in warm climates but can flourish at altitudes ranging from sea level to 7,000 feet. The best teas, however, are produced by plants grown at higher altitudes where the leaves mature more slowly and yield a richer flavor. Depending upon the altitude, a new tea plant may take from 2 ½ to 5 years to be ready for commercial picking, but once productive, it can provide tea leaves for close to a century.

Tea plants produce abundant foliage, a camellia-like flower, and a berry, but only the smallest and youngest leaves are picked for tea: the two leaves and bud at the top of each young shoot. The growth of new shoots, called a flush, can occur every week at lower altitudes but takes several weeks at higher ones. The new leaves are picked by hand by "tea pluckers," the best of whom can harvest 40 pounds per day, enough to make 10 pounds of tea.

All tea plants belong to the same species-*Camellia sinensis*-, but local growing conditions (altitude, climate, soils, etc.) vary, resulting in a multitude of distinctive leaves. The way the leaves are processed, however, is even more important in developing the individual characteristics of the three predominant types of tea: green, black and oolong.

Green tea is the least processed and thus provides the most antioxidant polyphenols, notably a catechin called epigallocatechin-3-

gallate (EGCG), which is believed to be responsible for most of the health benefits linked to green tea. We'll talk about EGCG a little bit later, but it is this component of green tea that makes it such a healing and advantageous drink.

Green tea is made by briefly steaming the just harvested leaves, rendering them soft and pliable and preventing them from fermenting or changing color. After steaming, the leaves are rolled, then spread out and "fired" (dried with hot air or pan-fried in a wok) until they are crisp. The resulting greenish-yellow tea has a green, slightly astringent flavor close to the taste of the fresh leaf.

Green tea has always been, and remains today, the most popular type of tea from China where most historians and botanists believe the tea plant originated throughout all of Asia. Why is this so? Perhaps because green tea not only captures the taste, aroma and color of spring, but delivers this delightful bouquet along with the highest concentration of beneficial phytonutrients and the least caffeine of all the teas.

The key to the amazing health benefits that are derived from consuming green tea is that the leaves are steamed which preserves the EGCG compound from being oxidized. Other teas are fermented which breaks down the natural EGCG and takes away from its healing properties.

In fact, green tea has very long and storied history dating back thousands and thousands of years. It can be quite fascinating to know what the Chinese have known for centuries.

THE HISTORY OF TEA

The origin of tea can be traced back to over 4000 years ago in China. No one is sure where and when tea was first brewed, and, in fact, stories about tea's origins are more myth than reality. One story tells that a legendary Chinese leader and medical expert, Sheng Nong, discovered tea as a medicinal herb in 2737 B.C. One day while he was boiling water under a tea tree, some tealeaves fell into Sheng's pot of boiling water. After drinking some tea, he discovered its miraculous powers and immediately placed tea on his list of medicinal herbs.

Initially used as an offering and as medicine, tea became the most commonly used beverage during western Han dynasty. Buddhist monks started growing it around monasteries. Later, during the Ming dynasty, the tea trade took an upper share in the state economy and the "Tea and Horse Bureau" was set up to supervise tea trade.

A Buddhist Monk introduced tea to Japan in the 6th Century and later in the 16th Century a Portuguese missionary introduced it to Europe. There began the history of Tea as an international drink. Trade between China and the western world grew considerably with the beginning of the Ching Dynasty.

As the Emperor of China was taking his first snuff of tobacco brought from Europe, the Queen of England was sipping her first cup of tea. As early as 1615, English traders with the East India Company were aware of the existence of tea. Tea quickly spread throughout Europe and in less than 100 years, England's import of tea rose from 100 pounds a year to over 5 million pounds per year. This demand for tea meant many voyages to bring shiploads of tea from China.

Green tea has been the beverage of choice among the Chinese elite intellectuals and bureaucrats who usually have the means to maintain an affluent dining habit. Historically, freshly plucked tea leaves were used directly for tea brewing or lightly heat-processed for preservation of the "health ingredients" if not consumed immediately. The word "tea" always means green tea in the "Middle Kingdom".

Tea was an expensive beverage in ancient China. Its use was confined to the wealthy segments of the population. Only in Ming dynasty after the fall of the Mongolian empire in 1368 A.D., tea drinking spread from the elite to the populace.

When China was the sea power of the world (1405-1433), tea was among the indispensable supplies for the seamen. The amount of vitamin C in the tea drink consumed by the seafarers at that time was enough to prevent scurvy which would kill many European sailors more than 100 years later, but was essentially unknown to the medical officers assigned to the fleet of more than 27,000 men on their round voyage from China to Africa.

In a famous painting titled "Drinking Tea" (a poor English translation of the original elegant title in Chinese, meaning "Tea Tending Event"), which is now on display in the Palace Museum, Beijing, the most admired and envied painter of Ming dynasty, Tang

Yin (1470-1523), recorded the traditional method for tea preparation at the time when China was the most prosperous nation on earth.

As described in the poem written on the painting, an affluent intellect actually plucked fresh leaves from the tea trees growing on the southern hillside below his house to brew tea. This document recorded the fact that fresh or non-oxidized tea leaves, i.e., green tea, were used in the prosperous Chinese society at least until the latter part of Ming dynasty.

Emperor Chien-lung of the Ching Dynasty who reigned from 1736 to 1796 A.D. disguised himself as a commoner, traveling with two cabinet ministers *incognito* to the countryside. Since the Manchu Imperial family originally came from a northern minority, Chien-lung was used to drinking black tea only.

When his entourage was passing a tea plantation in south-central China, the servants offered him a cup of choice green tea. After a few sips, the emperor commented: "Too bland. Tasteless," and continued his journey on horseback. Riding about half of a mile later, the emperor turned to his ministers and said, "Good tea." The perceptive king suddenly realized that the characteristic soothing savory sweet tea-taste of a choice green tea only comes a few minutes after the sip. Since then, green tea was introduced to the Manchu ruling family as the beverage of choice and a special misty hillside in Zhejiang Province was designated as the Imperial Tea Plantation.

Tea consumption was introduced to the United States by Europe, as a part of the worldwide tea trade, and also by Chinese immigrants who owned Chinese restaurants in the United States and served their tea. This dates back before 1945.

As we've said, green tea has been used for thousands of years in Asia for its medicinal properties. The Kissa Yojoki, or Book of Tea was written a Zen priest names Eisai in 1191. This book describes how drinking green tea can have a positive effect on the five vital organs of the body – especially the heart.

The book discusses tea's medicinal qualities which include easing the effects of alcohol, acting as a stimulant, curing "blotchiness", quenching thirst, eliminating indigestion, curing beriberi disease, preventing fatigue and improving urinary and brain function. Part one of the book also explains the shapes of tea plants, tea flowers, and tea leaves. It also covers how to grow tea plants and process tea leaves.

Part Two of the book discusses the specific dosage and method required to use green tea for individual physical ailments. Because of this book, we know that the Chinese and Asian people have long known that green tea can be used in many ways to promote healing and ward off health problems.

The reason that green tea is such a healing drink is because of the way the leaves are processed. They are steamed as opposed to fermented which leaves its most potent element intact and ready to heal. That element is EGCG.

What is EGCG? This is the most important component of green tea that makes it such a therapeutic and healing drink.

EGCG

When I think about defining EGCG and how to convey what exactly it is, I think about the commercial on television with the guy who hikes into the mountains of China to find a wise man to explain the exact concept to him. At the end of the commercial, the guy asks the wise man, "How did you know that?" the wise man replies, "It's on the back of the bottle."

To speak technically, EGCG stands for epigallocatechin gallate. Aren't you glad you know that now? Speaking in layman's terms, EGCG is what makes green tea so healing. It is a derivative of the enzyme called catechin which is found in plant matter, but mostly in tea plants. Catechins are also found in chocolate, fruits, vegetables, and wine.

Actually, EGCG is only one of four major catechins present in teas, but it definitely is the most healing of all them. That's probably because the EGCG catechin makes up about thirty-percent of the weight of green tea leaves.

Studies have shown that EGCG is responsible for the healing properties of green tea and has been found to prevent cancer, heart disease, and even aid in weight loss. We'll address each of the healthful properties of green tea and EGCG in later chapters, but this is the component of green tea that makes it such a wonderful dietary supplement for nearly everyone.

EGCG is a very powerful antioxidant. Essentially, it prevents oxidization in the body which, although it is a necessary bodily process, over-oxidization can also speed up the process of disease taking over the body. Thus if you consume anti-oxidants, you can hinder the progress of the disease significantly.

So, let's get a little technical here when it comes to how EGCG is produced in tea leaves. You may have to re-read this part a few times, but really it can be fascinating to understand why green tea and the green tea leaves can be so beneficial to your body.

The process of EGCG forming in the tea leaves begins with a product of glycolysis (the breakdown of sugar by an enzyme named enolase): phosphoenolpyruvate (PEP). PEP then enters into the Shikimate enzymatic pathway to yield phenylalanine. Interestingly enough in the pharmaceutical industry this pathway is used to produce shikimic acid from the "star anise" plant that is used as a substrate in the production of the popular anti-flu drug oseltamivir (Tamiflu).

From Phenylalanine the process continues through the phenylpropanoid metabolic pathway from which 4-Coumaryl-CoQ is produced. When this compound combines with Malonyl-CoA it yields the true backbone of the flavonoid group known as the chalcones. Three-ring phenolic structures (what is commonly recognized and hence given the name poly-phenol) are produced when ring-closure occurs within these chalcone molecules.

The metabolic pathway continues through a series of several more enzymatic modifications to yield flavanones that yield dihydroflavonols that go on to produce anthocyanins. Along this enzymatic highway other products are formed, including the flavonols, flavan-3-ols, proanthocyanidins (the tannins) and of course the all-important polyphenolic EGCG.

Nevermind about the big words, just know that it's a very important process that helps give green tea that extra boost that makes it so wonderful for the body. Fascinating, isn't it? Well, maybe not so much, but now you can say you know why green tea is so good for your health. But what exactly does green tea and the EGCG do for the human body?

HEALTH BENEFITS OF GREEN TEA

There are so many proven benefits of drinking green tea as a regular part of your diet, it can be mind-boggling. Many, many studies have been done and the results are more than encouraging!

Green tea is particularly rich in health-promoting flavonoids (which account for 30% of the dry weight of a leaf), including catechins – anti oxidants - and their derivatives. The most abundant catechin in green tea is epigallocatechin-3-gallate (EGCG), which is thought to play a pivotal role in the green tea's anticancer and antioxidant effects. Catechins should be considered right alongside of the better-known antioxidants like vitamins E and C as potent free radical scavengers and health-supportive for this reason.

Most of the research showing the health benefits of green tea is based on the amount of green tea typically consumed in Asian countries-about 3 cups per day (which would provide 240-320 mg of polyphenols – also an anti oxidant). Just one cup of green tea supplies 20-35 mg of EGCG, which has the highest antioxidant activity of all the green tea catechins.

The health benefits of green tea have been extensively researched and, as the scientific community's awareness of its potential benefits has increased, so have the number of new studies. As of November 2004, the PubMed database contained more than 1,000 studies on green tea, with more than 400 published in 2004!

Green tea drinkers appear to have lower risk for a wide range of diseases, from simple bacterial or viral infections to chronic degenerative conditions including cardiovascular disease, cancer, stroke, periodontal disease, and osteoporosis. The latest studies provide a deeper understanding of the ways in which green tea can heal.

In August, 2006, a European study found that tea is a healthier choice than almost any other beverage including pure water. This is because tea not only re-hydrates as well as water, but it also provide a rich supply of polyphenols which help protect against heart disease and other ailments. Now, a Japanese study done in September of 2006 suggests that drinking green tea lowers the risk of death due to all causes!

In 1994, a Japanese scientist conducted a study following over 40,000 adults ranging in age from 40 to 79. This study went on for eleven years and was conducted in northeastern Japan. Within this

region, 80 percent of the population drinks green tea with more than half consuming at least three cups per day.

Compared with participants who drank less than one cup of green tea per day, those drinking five cups or more had a significantly lower risk of death from all causes. Specifically, the risk from cardiovascular disease was dramatically lowered with women receiving even stronger protection than men.

Consider the following table which shows some of the results:

| Green Tea Benefits | |
|--|--|
| In Women | In Men |
| 23% lower risk of dying from any cause | 12% lower risk of dying from any cause |
| 31% lower risk of dying from CVD | 22% lower risk of dying from CVD |
| 62% lower risk of dying from stroke | 42% lower risk of dying from stroke |

While this study found no cancer-preventative benefit from drinking green tea, other large studies, especially one done in 2006, suggested that green tea reduced the risk of other types of cancer including breast cancer. This study compared women who did not drink green tea to those consuming green tea. Results showed that those consuming the most green tea were 22 percent less likely to develop breast cancer.

Often in studies, the effects of a certain health-promoting behavior are likely to be complicated by the fact that those who try to follow a healthy lifestyle practice a variety of health habits normally. In the study mentioned above, however, since green tea is the most commonly consumed beverage in Japan, it is unlikely that study participants were choosing to drink green tea primarily for their health. It is also thus unlikely that the significant drop in risk of death to all causes was due to other habits related to health consciousness.

Given that, it is obvious that green tea can provide significant health benefits even to those who are not especially health

consciousness, just think about how it can protect your health when you are following a healthy lifestyle!

If you generally start your day with a cup of coffee, try instead having a cup of tea. You'll quickly discover green tea's irresistible combination of invigorating and calming qualities – especially if you consume it throughout the day. It could become one of your most favorite healthy habits quite quickly!

When you consider the studies that have been done in the 21st century regarding the healing properties of green tea, it certainly can be fascinating to stand up and take notice of what exactly it is that green tea can do for you, your body, and preventing diseases. Let's now get specific.

WHAT CAN GREEN TEA HEAL?

The whole concept behind the green tea phenomenon is that studies have proven that it can help offset devastating symptoms from some serious diseases and, in some cases, even heal health problems. It's amazing the healing properties that can be found in green tea. Let's explore just how putting green tea into your everyday diet can address specific health problems.

Atherosclerosis

Population-based studies indicate that the antioxidant properties of green tea may help prevent atherosclerosis, particularly coronary artery disease. (Population-based studies are those that follow large groups of people over time and/or studies that are comparing groups of people living in different cultures or with different dietary habits, etc.)

In May 2006, however, the U.S. Food and Drug Administration (FDA) rejected a petition from tea makers to allow tea labels to claim that green tea reduces the risk of heart disease. The FDA concluded that there is no credible evidence to support qualified health claims for green tea or green tea extract reducing the risk of heart disease.

In Japanese studies, however, green tea consumption has been found to be an independent predictor for risk of coronary artery disease. In one study, those drinking 5 or more cups of green tea each

day were found to be 16% less likely to suffer from coronary artery disease. The relationship was so significant researchers concluded, "The more green tea patients consume the less likely they are to have coronary artery disease."

An elevation in the amount of free radicals in the arteries is a key event in many forms of cardiovascular disease. The latest research shows that green tea catechins inhibit the enzymes involved in the production of free radicals in the endothelial lining of the arteries.

The arterial endothelium is a one-cell thick lining that serves as the interface between the bloodstream and the wall of the artery where plaques can form. By protecting the endothelium from free radical damage, green tea catechins help prevent the development of cardiovascular disease.

Green tea has been shown to effectively lower risk of atherosclerosis by lowering LDL cholesterol, triglycerides, lipid peroxides (free radicals that damage LDL cholesterol and other lipids or fats) and fibrinogen (a protein in the blood involved in the formation of blood clots), while improving the ratio of LDL (bad) to HDL (good) cholesterol.

In animal studies in which green tea was given in human equivalent doses to hamsters, atherosclerosis was inhibited 26-46% in those receiving the lower dose (equivalent in humans to 3-4 cups per day) , and 48-63% in those receiving the higher dose (10 cups a day in humans).

Blood sugar tends to increase with age thus accelerating aging by cross-linking with proteins. Green tea can lower serum glucose levels with is an important anti-aging benefit. What does this have to do with lower the incidence of cardiovascular disease?

For seventy-five days, scientists fed green tea and black tea to aged rats. The study found that the green tea lowered blood sugar slightly more than black tea, but it was markedly superior in reducing triglycerides. High triglycerides are strongly associated with a high risk of cardiovascular disease. A low ratio of triglycerides to HDL cholesterol is an excellent marker of cardiovascular health.

Cholesterol

Research shows that green tea lowers total cholesterol and raises HDL ("good") cholesterol in both animals and people. One population-based study found that men who drink green tea are more likely to have lower total cholesterol than those who do not drink green tea.

Results from one animal study suggest that polyphenols in green tea may block the intestinal absorption of cholesterol and promote its excretion from the body. In another small study of male smokers, researchers found that green tea significantly reduced blood levels of harmful LDL cholesterol.

When rats were fed 2.5 percent green tea leaves in their diet, the experimental group showed a drop in total cholesterol, low-density cholesterol, and triglycerides. The body weight of green tea-fed rats was 10 to 18 percent lower of those rats who were not consuming green tea.

Plus, the activity of anti-oxidant enzymes called superoxide dismutase (SOD) and catalase. The anti-carcinogenic phase II enzyme glutathione S-transferase (GST) were significantly higher in the green tea group as was the glutathione level in the liver. There was no liver or kidney toxicity. Therefore, the study demonstrated combined cardiovascular and anti-cancer effects of green tea.

The cholesterol-lowering (hypocholesterolemic) effects of green tea (as well as black tea) have been confirmed by both animal and human epidemiological studies. In addition to lowering the atherogenic index as expressed by the HDL/total cholesterol ratio in rats, green tea and jasmine green tea also reduced the increase of liver weight that results from fat deposition.

High consumption of green tea by humans, especially more than 10 cups a day, was found to be associated with higher HDLs and lower LDL and VLDL cholesterol, as well as with various bio-markers indicating better liver health. Lower levels of lipid peroxides in the liver are one well-confirmed benefit of green tea supplementation, found in study after study.

In a double-blind, randomized, placebo-controlled trial done by Division of Cardiovascular Medicine, Vanderbilt University Medical Center, Nashville, Tennessee, 240 adults were given either theaflavin-enriched green tea extract in form of 375mg capsule daily or a placebo. After 12 weeks, patients in the tea extract group have

significantly less low-density lipoprotein cholesterol (LDL-C) and total cholesterol (16.4% and 11.3% lower than baseline, $p < 0.01$) than the placebo group. The author concluded that theaflavin-enriched green tea extract can be used together with other dietary approaches to reduce LDL-C.

Green tea may also lower intestinal fat absorption. One animal study found that rats fed a diet containing a significant amount of catechin had a higher excretion of fat in the feces compared to the control group on a polyphenol-free diet. If this holds for humans who take the green tea extract, then it's good for weight-loss, cardiovascular, and lower cholesterol levels.

Supplementation with antioxidants is important in part because by protecting cholesterol from oxidation, antioxidants help protect against atherosclerosis. In an animal study comparing the effectiveness of various antioxidants in preventing the oxidation of VLDL and LDL cholesterol, vitamin E, genistein (phytoestrogen found chiefly in soy products) and green tea were found to be effective antioxidants, with genistein being particularly effective, but green tea also exerted considerable activity.

It would be interesting to see the results of combined genistein and green tea supplementation, particularly in humans. On the other hand, it could be argued that this is precisely the case of the Japanese diet. Japan enjoys the longest life expectancy in the world, and the lowest cardiovascular mortality for men, in spite of heavy smoking.

Diabetes

Green tea has been used traditionally to control blood sugar in the body. Animal studies suggest that green tea may help prevent the development of type 1 diabetes and slow the progression once it has developed. People with type 1 diabetes produce little or no insulin, a hormone that converts glucose (sugar), starches, and other foods into energy needed for daily life. Green tea may help regulate glucose in the body.

Population studies suggest that green tea consumption may help prevent type 2 diabetes as well. A number of animal studies are beginning to explain why. New studies suggest that green tea may improve glucose tolerance and insulin sensitivity in individuals with diabetes.

In one study, after receiving green tea for 12 weeks, diabetic rats had lower fasting blood levels of glucose, insulin, triglycerides and free fatty acids compared to controls, and the ability of their adipocytes (fat cells) to respond to insulin and absorb blood sugar greatly increased.

In another study by the same research group, diabetic rats were separated into three groups and followed for 12 weeks. One group was given with standard rat chow and water (the control group), the second group received a high fructose diet and water (fructose group), and the third group got the same high fructose diet and green tea (green tea group). By the end of the study, the fructose group had high blood sugar, high insulin levels, and high blood pressure, while the animals receiving green tea along with a high fructose diet showed improvement in all three.

A study published in the August 2004 issue of *BMC Pharmacology*, in which oral glucose tolerance tests were given to healthy humans after they consumed green tea, showed that it increased the body's ability to utilize blood sugar.

Another interesting animal study compared the effects of a Western diet, a vegetarian diet and a Japanese diet, each with or without green tea. Blood sugar concentrations were highest in the animals on the Western diet followed by the Vegetarian diet with the Japanese diet producing the lowest blood sugars.

When supplemented with green tea, blood sugar levels dropped in rats on all three diets, with those on the Japanese diet having not only the lowest blood sugars but also rating the best on other risk factors for type 2 diabetes. Rats on the Japanese diet that also were given green tea had the lowest triglycerides and cholesterol as well as the highest ratio of beneficial omega-3 fatty acids to potentially inflammatory omega-6 fatty acids. The researchers concluded that Japanese eating habits combined with drinking green tea might help prevent type 2 diabetes.

One of the mechanisms through which green tea improves insulin sensitivity has recently been identified in laboratory studies that show that epigallocatechin 3-gallate (EGCG) does a good deal more to prevent type 2 diabetes than lower the production of free radicals. EGCG also works on the genetic level, causing a reduction in the number of messenger RNAs that direct liver cells to produce the enzymes involved in the creation of glucose (sugar).

The ability to significantly lower blood glucose has been confirmed also in studies using diabetic rats. Both green and black teas possess anti-diabetic activity, and are effective in the prevention and treatment of diabetes.

The fact that aged rats responded so dramatically to these polyphenols implies that it is possible to reverse the age-related rise in glucose intolerance and the resulting degenerative cascade of atherosclerosis and other degenerative disorders.

How do the polyphenols in green tea able to lower serum glucose? The main method seems to be the inhibition of the activity of the starch digesting enzyme amylase. Tea inhibits both salivary and intestinal amylase so that starch is broken down more slowly. The rise in serum glucose is thus minimized. Plus, according to one recent study, green tea may reduce the intestinal absorption of glucose.

A relatively little known compound found in onions and green tea called diphenylamine seems to have a strong sugar-lowering action. However, please keep in mind that people are just beginning to identify significant phenolic compounds and their interactions. It's best not to rely on a single ingredient like EGCG to get the best results.

Thanks to the serum glucose-lowering effect of tea, we thus obtain significant anti-aging benefits of calorie restriction, reduced glycation, and lower insulin secretion. If you drink tea with a carbohydrate-rich meal, you slow down the release of glucose and reduce its absorption (you also reduce the absorption of iron, another anti-aging benefit). Thus, you prevent the harmful spiking of insulin. Since insulin is our most fattening hormone and, with cortisol, our most pro-aging hormone, you also derive the substantial range of benefits that go with calorie restriction and insulin control.

Liver Disease

Population-based studies have shown that men who drink more than 10 cups of green tea per day are less likely to develop disorders of the liver. Green tea also seems to protect the liver from the damaging effects of toxic substances such as alcohol. Animal studies have shown that green tea helps protect against the development of liver tumors in mice.

Results from several animal and human studies suggest that one of the polyphenols present in green tea, catechin, may help treat viral

hepatitis (inflammation of the liver from a virus). In these studies, catechin was isolated from green tea and used in very high concentrations. It is not clear whether green tea (which contains a lower concentration of catechins) confers these same benefits to people with hepatitis.

Green tea can also aid in preventing transplant failure in patients who have had a liver transplant. The reason for this is probably also the presence of catechin.

Alcohol metabolism results in the production of damaging free radicals that can overwhelm the liver's supply of antioxidants, resulting in liver injury. In a study published in the January 2004 issue of *Alcohol* in which rats were chronically intoxicated with alcohol for 4 weeks, green tea prevented damage to their livers.

Other animal research shows that epigallocatechin-3-gallate (EGCG) protects the liver against the free radicals generated when mice are exposed to carbon tetrachloride, a toxic chemical solvent. Without the protection afforded by EGCG, carbon tetrachloride exposure resulted in the production of numerous free radicals that destroyed a significant amount of the animals' liver cells. With EGCG, free radical production and liver injury was so greatly reduced that researchers suggested green tea should be used in the treatment of liver disease.

Unlike some herbs, green tea's protective effects do not appear to affect two of the liver enzymes most often responsible for detoxifying and eliminating drugs, cytochrome P-450 2D6 and 3A4. This suggests that green tea might be safely consumed when taking medications primarily dependent upon the CYP2D6 or CYP3A4 pathways of metabolism. Hopefully, future research studies will bear out this potential benefit.

On the other hand, one study found that Japanese green tea did increase the activity of the CYP1A1 enzyme. Researchers hypothesized that the increase in activity of this liver enzyme may be one of the ways in which green tea helps protect against cancers caused by various dietary carcinogens.

Studies have shown that people who consume green tea on a regular basis can help reverse the damage that liver and medications can do to the liver. Because the liver is an organ that can regenerate itself, putting a substance in your body that can aid in that

regeneration – such as green tea – can not only speed up the process, but it can also aid in healing the damage.

Cancer

For proponents of green tea and the advantages of such, probably the most exciting findings have been the effects of green tea on people who have cancer. The healing properties of green tea have shown to have some very, very encouraging results on people with all types of cancer.

Several population-based studies have shown that green tea helps protect against cancer. For example, cancer rates tend to be low in countries such as Japan where people regularly consume green tea. However, it is not possible to determine from these population-based studies whether green tea actually prevents cancer in people. Emerging studies suggest that the polyphenols in green tea may play an important role in the prevention of cancer. Researchers also believe that polyphenols help kill cancerous cells and stop their progression.

In the last ten years, green tea's cancer-preventive effects have been widely supported by epidemiological, cell culture, animal and clinical studies. For cancer prevention, the evidence is so overwhelming that the Chemoprevention Branch of the National Cancer Institute has initiated a plan for developing tea compounds as cancer-chemopreventive agents in human trials.

When confronted with a cancerous cell, green tea becomes the plant kingdom's Arnold Schwarzenegger, helping to terminate cancer cells in a remarkable number of ways. Green tea is a very powerful weapon against preventing cancer and even reducing the growth of cancer cells.

Laboratory cell culture studies show that green tea polyphenols are powerful triggers of apoptosis (cell suicide) and cell cycle arrest in cancerous but not in normal cells. Cell cycling is the process cells go through to divide and replicate.

These anticancer actions have been assumed to be due to the powerful antioxidant effects of green tea's catechins, especially epigallocatechin-3-gallate (EGCG). This is a reasonable assumption, given that a number of studies have shown that green tea possesses remarkable antioxidant properties. In one study published in the November 2004 issue of *Mutation Research*, EGCG's protective

antioxidant effects against several carcinogens were found to be 120% stronger than those of vitamin C.

But while green tea's antioxidant prowess is impressive, recent studies show it is far from the only way in which this multi-talented beverage protects us against cancer.

One of these mechanisms is green tea's ability to inhibit angiogenesis, the development of new blood vessels. Cancer cells, which are constantly attempting to divide and spread, have an endless appetite that can only be temporarily quieted by increasing the number of blood vessels that supply them with nutrients. By inhibiting angiogenesis, green tea helps starve cancer.

Studies also show that green tea works at the genetic level, shutting off genes in cancerous cells that are involved in cell growth, while turning on those that instruct the cancer cells to self-destruct. EGCG has even been found to work as a pro-oxidant or free radical, but just inside cancer cells, where it causes so much damage that the cancer cells' self-destruct mechanisms are triggered.

A study of EGCG's effects on keratinocytes (the major type of epidermal or skin cell) found that this green tea compound has yet another means of correcting cancer—that of turning on the genes that direct the cancer cell to return to normal.

Green tea's anticancer effects include its ability to inhibit the overproduction of the enzyme cyclooxygenase (COX)-2, a protein whose overproduction has been implicated as a factor in many diseases, including arthritis and cancer. COX-2 has an enzyme counterpart, called COX-1, which may be helpful to leave untouched when preventing overproduction of COX-2.

Nonsteroidal anti-inflammatory drugs (NSAIDs) such as aspirin and ibuprofen (which inhibit both COX-1 as well as COX-2), and specific COX-2 inhibitors such as Vioxx and Celebrex (which inhibit only COX-2), have been considered as possible agents in the prevention of some forms of cancer, but their severe toxic side effects on normal cells limit their usefulness. In studies of prostate cancer cells, EGCG appears to block only COX-2 and to have no negative side effects.

Spanish and British scientists have discovered at least one of the mechanisms through which green tea helps to prevent certain types of

cancer, according to a study published in the March 2005 issue of *Cancer Research*. Again, this is related to the presence of EGCG in green tea.

EGCG, a catechin present in green tea in amounts about 5 times higher than in black tea, inhibits the enzyme dihydrofolate reductase (DHFR), which cancer cells need to be able to grow, and which is a well recognized target of anti-cancer drugs.

Scientists decided to look at EGCG after they realized the green tea catechin looks a lot like the cancer drug methotrexate, which prevents cancer cells from making DNA by inhibiting the DHFR enzyme. They discovered that EGCG kills cancer cells in the same way as the drug.

Although EGCG binds strongly to DHFR, which is essential in both healthy and cancerous cells, it does not bind as tightly as methotrexate, so its side effects on healthy cells are less severe than those of the drug.

EGCG's binding to DHFR may also explain why women who drink large amounts of green tea around the time they conceive and early in their pregnancy may have an increased risk of having a child with spina bifida or other neural tube disorders.

In the fight against cancer, green tea polyphenols are team players, helping cancer-killing drugs do their job. In a study published in the October 2004 issue of the *Journal of Pharmacy and Pharmacology*, green tea polyphenols caused drug-resistant cancer cells, which were able to extrude or push out one of the most commonly used cancer drugs, doxorubicin, to retain the drug, which could then destroy them.

In addition, another study published in the August 2004 issue of *Cancer Letters*, found that another compound in green tea, the amino acid theanine, reduces the negative side effects of doxorubicin by increasing the level of one of the body's most important internally produced antioxidants, glutathione, in normal tissues in the liver and heart-but not in tumors.

Prostate Cancer

EGCG provides other benefits specific to prostate cancer prevention. A study published in the December 2004 issue of the

International Journal of Cancer found that EGCG significantly inhibited, in a dose-dependent manner, the production of prostate-specific antigen (PSA), a marker for prostate cancer risk. Not only did EGCG lower PSA levels, but it also suppressed all the activities of PSA which were examined that promote prostate cancer.

The polyphenols in green tea help prevent the spread of prostate cancer by mobilizing several molecular pathways that shut down the proliferation and spread of tumor cells, while also inhibiting the growth of blood vessels that supply the cancer with nourishment, according to research published in the December 2004 issue of *Cancer Research*.

In fact, green tea polyphenols:

- Decrease insulin-like growth factor-1 (IGF-1), while increasing levels of IGF binding protein-3, which binds IGF-1, further diminishing its activity. (Increased levels of IGF-1 are associated not only with prostate cancer, but cancers of the breast, lung and colon.)
- Inhibit key cell survival proteins, promoting apoptosis or programmed cell death in cancer cells.
- Reduce the expression of several compounds (urokinase plasminogen activator and matrix metalloproteinase 2 and 9) involved in the metastasis and spread of cancer cells.
- Reduce the amount of vascular endothelial growth factor (VEGF), which develops new blood vessels to carry nutrients to developing tumors.

All these effects were seen in this animal study within 6 months of continuous infusion. While obviously impractical for humans, the study suggests that daily consumption of green tea may be highly protective.

Laboratory studies have found that green tea extracts prevent the growth of prostate cancer cells in test tubes. In a large study conducted in Southeast China researchers found that the risk of prostate cancer declined with increasing frequency, duration and quantity of green tea consumption.

However, both green and black tea extracts also stimulated genes that cause cells to be less sensitive to chemotherapy drugs.

Given this potential interaction, people should not drink black and green tea (as well as extracts of these teas) while receiving chemotherapy.

Ovarian Cancer

Green tea consumption has been shown to enhance survival in women with ovarian cancer. In a study published in the November 2004 issue of the *International Journal of Cancer*, women with ovarian cancer who drank at least 1 cup of green tea daily had a 56% lowered risk of death during the 3 years of the study compared to non-tea drinkers.

A laboratory study of human ovarian cancer cells published in the September 2004 issue of *Gynecologic Oncology* explains why green tea helped these women. EGCG not only suppresses the growth of ovarian cancer cells, but also induces apoptosis (cell suicide) in these cells by affecting a number of genes and proteins.

A population study published in the December 2005 issue of the *Archives of Internal Medicine*, adds more evidence that enjoying a cup or two of tea each day may significantly lower a woman's risk of ovarian cancer.

Data from numerous other studies has suggested that both green and black tea may offer protection against various cancers, with tea polyphenols thought to be the most likely protective agents. In this research, Susanna Larsson and Alicja Wolk from the National Institute of Environmental Medicine, Stockholm, Sweden, decided to look specifically at the relationship between tea consumption and ovarian cancer.

Participants in their study were 61,057 Swedish women aged 40-76 years who were in the Swedish mammography cohort and had completed a validated 67 item food frequency questionnaire at baseline (between 1987-1990), after which the women were followed an average of 15.1 years.

Analysis of the data found that even women who averaged less than one cup of tea per day had an 18% lower risk of ovarian cancer than non-tea-drinkers. Those who drank one cup per day had a 24% lower risk, and those who drank two or more cups of tea per day had a 46% lower risk of ovarian cancer than non-tea-drinkers.

Each additional cup of tea per day was associated with an 18% lower risk of ovarian cancer. Although higher tea consumption was generally associated with other health-promoting behaviors, including higher consumption of fruits and vegetables, when compared to the lifestyle behaviors of those who seldom or never drank tea, the large drop in ovarian cancer risk seen as tea consumption increased does suggest that tea is likely to offer significant protection.

. In a study conducted on ovarian cancer patients in China, researchers found that women who drank at least one cup of green tea per day survived longer with the disease than those who didn't drink green tea. In fact, those who drank the most tea, lived the longest

Breast Cancer

Recent studies have also identified two mechanisms through which green tea works against breast cancer. Not only does EGCG inhibit the activity of telomerase, an enzyme that plays a key role in cell division, in breast cancer cells, but it also offers help to women with estrogen-negative breast cancer, a form of breast cancer that is very hard to treat successfully.

Estrogen-negative breast cancer cells express high amounts of the epidermal growth factor Her-2/neu, while in the more treatable estrogen-positive form of breast cancer, estrogen-receptor alpha (ERalpha) is expressed. According to a study published in the October 2004 issue of *Molecular and Cellular Biology*, EGCG induces the expression of ERalpha rather than Her-2/neu in breast cancer cells.

Studies in animals and test tubes suggest that polyphenols in green tea inhibit the growth of breast cancer cells. In one study of 472 women with various stages of breast cancer, researchers found that women who consumed the most green tea experienced the least spread of cancer (particularly premenopausal women in the early stages of breast cancer).

They also found that women with early stages of the disease who drank at least 5 cups of tea every day before being diagnosed with cancer were less likely to suffer recurrences of the disease after completion of treatment. However, women with late stages of breast cancer experienced little or no improvement from drinking green tea.

In terms of breast cancer prevention, the studies are inconclusive. In one very large study from Japan, researchers found

that drinking green tea was not associated with a reduced risk of breast cancer. However, there is more and more research being done in this area that actually point to green tea inhibiting the growth of cancerous cells in the breast.

Colon Cancer

Green tea may also reduce the increased risk for colon cancer caused by a high fat diet. An animal study published in the journal *Nutrition and Cancer* in 2003 found that when green tea was given along with a diet high in omega 6 fat (in the form of corn oil), the amount of pro-inflammatory compounds produced in the colon (5-lipoxygenase, leukotriene A4 hydrolase, and leukotriene B4) was significantly lower, as was the resulting number of precancerous colon cells (aberrant crypt foci). Green tea consumption even reduced the amount of abdominal fat produced in the animals that received it compared to controls.

Studies on the effects of green tea on colon or rectal cancer have produced conflicting results. Some studies show decreased risk in those who drink the tea, while others show increased risk. Further research is needed before researchers can recommend green tea for the prevention of colorectal cancer.

Lung Cancer

While we certainly do not recommend smoking, if you or someone you love smokes, or if you must be around smokers and are exposed to second hand smoke, drinking green tea can offer some protection against lung cancer. A human pilot study recently confirmed the protective effects of green tea against lung cancer seen in cell culture and animal studies.

The study, published in the November 2004 issue of *Molecular Nutrition and Food Research* evaluated the effect of green tea (5 cups per day) on 3 heavy smokers (over 10 cigarettes a day) and 3 individuals who had never smoked. When the study subjects were drinking green tea, DNA damage caused by smoking was decreased, cell growth was inhibited, and cellular triggers for apoptosis (cell suicide) in abnormal cells increased.

Another larger four month study of heavy smokers involving 100 women and 33 men found that levels of urinary 8-hydroxydeoxyguanosine, a marker of free radical damage to DNA,

dropped significantly in individuals drinking decaffeinated green but not black tea.

Decaffeinated green tea was especially effective in reducing DNA damage in individuals who lack the genetic ability to produce normal amounts of an enzyme called glutathione S-transferase, which plays a key role in the liver's ability to detoxify many of the carcinogens found in cigarette smoke.

Individuals whose genetic inheritance does not include the GSTM1 and GSTT1 variants of the genes that instruct the cell to produce glutathione S-transferase are more susceptible to developing many different cancers. For these individuals, green tea may be especially beneficial.

While green tea polyphenols have been shown to inhibit the growth of human lung cancer cells in test tubes, few studies have investigated the link between green tea consumption and lung cancer in people and even these studies have been conflicting.

One population-based study found that Okinawan tea (similar to green tea but partially fermented) was associated with decreased lung cancer risk, particularly among women. A second study revealed that green tea and black tea significantly increased the risk of lung cancer.

As with colon and esophageal cancers, further studies are needed before researchers can draw any conclusions about green tea and lung cancer.

Bladder Cancer

Research by a multi-departmental team from UCLA has produced valuable insights into how green tea extract might be capable of acting against the invasive growth of bladder cancer tumors. Green tea extract has been shown, via a mechanism that affects cell movement, to target cancer cells while leaving healthy cells alone.

For cancer to grow and spread, the malignant cells must be able to move, and their movement depends on a process called actin remodeling, which itself is carefully regulated by complex signaling pathways, including the Rho pathway.

By inducing Rho signaling, green tea causes cancer cells to mature more rapidly and to bind together more closely, a process

called cell adhesion. Both their increased maturity and cell adhesion inhibit cancer cells' mobility, according to Rao, senior author of the study, published in the February 2005 issue of *Clinical Cancer Research*, in which green tea's effects on Rho signaling were noted.

"Cancer cells are invasive and green tea extract interrupts the invasive process of the cancer...In effect, the green tea extract may keep the cancer cells confined and localized, where they are easier to treat and the prognosis is better," explained Rao.

About 56,000 new cases of bladder cancer are diagnosed each year, making it the fifth most common cancer in the United States. About half of all bladder cancers are believed to be related to cigarette smoking.

Bladder cancer can be difficult to detect in the early, most treatable stages, yet, when not found early, the tumors can be aggressive, and more than half of patients with advanced cancers experience recurrences. In the next phase of his research, Rao and his team will analyze urine from bladder patients, looking particularly for biomarkers associated with actin remodelling and the activation of the Rho pathway, to determine which subset of patients might benefit most from green tea.

Only a few studies have examined the relationship between bladder cancer and green tea consumption. In one study that compared people with and without bladder cancer, researchers found that women who drank black tea and powdered green tea were less likely to develop bladder cancer. A follow-up study by the same group of researchers revealed that bladder cancer patients (particularly men) who drank green tea had a substantially better 5-year survival rate than those who did not.

Weight Loss

There are also some other very advantageous benefits to green tea. Studies have proven that this healing beverage can also aid in weight loss for people who are dieting or want to shed a few pounds.

Studies suggest that green tea extract may boost metabolism and help burn fat. One study confirmed that the combination of green tea and caffeine improved weight loss and maintenance in overweight and moderately obese individuals.

However, a second study found that weight maintenance following weight loss was not affected by green tea. Some researchers speculate that substances in green tea known as polyphenols, specifically the catechins, are responsible for the herb's fat-burning effect.

Green tea not only promotes fat loss, but specifically, the loss of visceral fat which is fat that accumulates in the tissues lining the abdominal cavity and surrounding the intestines (viscera) and internal organs. Unlike fat deposits on the hips and thighs (which result in the so-called "pear" body shape), visceral fat (which produces the "apple" body shape) is highly associated with increased risk for metabolic syndrome and type 2 diabetes.

Green tea contains three major components that promote fat loss: catechins, caffeine and theanine. Studies suggest that green tea compounds promote fat loss by inhibiting both gastric and pancreatic lipase, the enzymes that digest triglycerides, and fatty acid synthetase, the enzyme responsible for synthesizing fatty acids into the form in which they can be stored in the body's adipose (fat) cells.

In a study published in the January 2004 issue of *In Vivo* in which mice were fed diets containing 2% green tea powder for 16 weeks, visceral fat decreased by 76.8% in those receiving green tea compared to the control group. Green tea also decreased blood levels of triglycerides (the chemical form in which most fats exist in the body).

A human study, published in the January 2005 issue of the *American Journal of Clinical Nutrition*, confirms green tea's ability to not only reduce body fat, but it also confirmed damage to LDL cholesterol as well. After 12 weeks of drinking just one bottle of green tea each day 38 normal-to-overweight men in Tokyo had a significantly lower body weight, BMI, waist circumference, body fat mass and amount of subcutaneous fat compared to men given a bottle of oolong tea each day.

After a 2 week diet run-in period, the men were divided into two groups, one of which drank a bottle of green tea containing 690 mg of catechins, while the other group drank a bottle of oolong tea containing 22 mg catechins.

Not only did the men drinking green tea lose weight and fat, but the amount of their LDL cholesterol damaged by free radicals also

dropped significantly. Since atherosclerotic plaques develop when cholesterol circulating in the bloodstream is damaged or oxidized, green tea's ability to prevent these oxidation reactions may explain some of its protective effects against cardiovascular diseases.

We all know that when trying to lose weight, an effective exercise regimen should also be added to your lifestyle. Amazingly enough, green tea can help in this capacity as well! Green tea extract given to lab rats over a 10-week span increased the amount of time the animals could swim before becoming exhausted by as much as 24%.

Green tea's catechins appear to stimulate the use of fatty acids by liver and muscle cells. In muscle cells, the ability to burn more fat translates into a reduction in the rate at which glycogen, the form in which carbohydrates are stored for ready access in muscle, is used up, thus allowing for longer exercise times. Green tea's effect on muscle cells' ability to take in and burn fatty acids, speeding up fat breakdown, is also thought to be the reason why it helps weight loss.

The idea for the experiment came from the fact that skeletal muscles utilize carbohydrates, lipids (fats) and amino acids (protein) as energy sources, but the ratio in which they are used varies with the intensity and type of the exercise, and the level of the individual's fitness.

During endurance exercise, the use of too much carbohydrate is undesirable because it triggers insulin secretion, which, in turn, both inhibits the burning of fatty acids and stimulates lactic acid production. Lactic acid buildup is what causes that sore achy feeling in your muscles when you exercise.

Conversely, enhanced availability and utilization of free fatty acids reduces carbohydrate utilization, which in turn spares glycogen (the form in which carbohydrates are stored in muscle for quick use) and suppresses lactic acid production, resulting in an increase in endurance."

Drinking a single cup of green tea before exercise, however, will not be effective. One single, higher "dose" of green tea did nothing to improve lab rats' performance. The animals had to receive green tea daily, and endurance increased gradually over the 10 weeks of the study. To match the beneficial effect on test animals' endurance

capacity seen in the experiments, the researchers estimate a 165-pound athlete would need to drink about 4 cups of green tea daily.

Parkinson's and Alzheimer 's disease

Damage to brain cells in Parkinson's, Alzheimer's and other neurodegenerative diseases seems to result from the combination of a number of damaging factors including excessive inflammation and increased levels of iron, both of which lead to increased free radical production, exhaust the brain's supply of protective antioxidants and trigger the production of certain proteins, such as amyloid-beta, which promote apoptosis (cell suicide).

Green tea catechins, until recently thought to work simply as antioxidants, are now known to invoke a wide spectrum of neuroprotective cellular mechanisms. These include iron chelation, scavenging of free radicals, activation of survival genes and cell signaling pathways, and regulation of mitochondrial function.

The mitochondria are the energy production factories inside our cells. When they are not working properly, they generate many free radicals and little energy. The end result is a significant lessening of damage to brain cells.

Iron accumulation in specific brain areas and free radical damage to brain cells are considered the major damaging factors responsible for a wide range of neurodegenerative disorders including both Parkinson's and Alzheimer's disease.

In the brain, epigallocatechin-3-gallate (EGCG) has been shown to act as an iron chelator, binding to and removing iron, thus preventing it from contributing to the production of free radicals. In addition to removing iron, EGCG also increases the activity of two major antioxidant enzymes, superoxide dismutase (SOD) and catalase, further helping to decrease free radical damage.

Another active compound in green tea, epicatechin (EC), reduces the formation of a protein called amyloid-beta. Plaque-like deposits of amyloid-beta in the brain are a defining characteristic of Alzheimer's disease.

Animal studies conducted at the Douglas Hospital Research Center in Canada suggest that a daily cup or two of green tea may

reduce the risk of age-related degenerative brain disorders such as Alzheimer's disease.

The researchers looked at the protective effects of two tea extracts and their main constituents: epigallocatechin gallate and epicatechin gallate. Both of these elements are highly concentrated in green tea and the researchers wanted to see what effect these elements would have on dying nerve cells.

Green tea extracts and catechins strongly block the death of the brain nerve cells. When researchers exposed cultured neurons to amyloid alone, its effects were so toxic that the brain cells died. However, when the cell cultures received amyloid immediately followed by tea extracts and catechins, the neurons were rescued and survived.

Green tea polyphenols have also demonstrated the ability to affect cell signaling pathways, in particular the MAPK pathways, which are triggered by oxidative stress (free radicals), and themselves set in motion a series of chemical reactions so damaging that they can result in brain cell death.

MAPK signaling pathways inside brain cells are thought to play a critical role in neurodegenerative diseases. Another important cell signaling pathway beneficially affected by EGCG, the PKC pathway, is also thought to play an essential role in the regulation of cell survival and programmed cell death.

Although no human studies on Alzheimer's disease have yet reported benefit from tea consumption, recent population studies have shown that simply consuming 2 or more cups of green tea daily reduces risk of cognitive decline and Parkinson's disease.

Even before the devastating effects of Alzheimer's set in, elderly people can also keep their minds sharp and more cognitive.

Green tea helps slow the age-related decline in brain function which is seen as declining memory, cognitive impairment, dementia, and Alzheimer's. This is shown in a human study done in 2006.

Researchers at Japan's Tohoku University studied 1,003 subjects over the age of seventy. They compared their green tea intake along with their mental sharpness using a Mini-Mental State Examination

which is a well-accepted standardized test meant for measuring cognitive function.

What they found was drinking more than two cups a day of green tea slashed odds of cognitive impairment in elderly Japanese men and women by 64 percent. This is even more amazing because a cup of Japanese green tea is much smaller than its American counterpart – only about 3.2 fluid ounces.

At every level of cognitive impairment – from minimal to severe – those drinking the most green tea experienced significantly less mental decline than those drinking the least. Compared with elderly people who drank less than three cups a week, those drinking more than two cups a day had a 54% lower risk of age-related declines in memory, orientation, ability to follow commands, and pay attention. Those drinking four to six cups of green tea a week had a 38 percent lower risk of declines in brain function.

Green tea's primary protective agent is in EGCG. Although we've already addressed EGCG in a previous chapter, when it relates to aging, research show this highly potent antioxidant exhibits the following advantages:

- Helps prevent the formation of B-amyloid which is a protein whose accumulation is recognized as causing Alzheimer's disease.
- Protects brain cells by removing iron which might otherwise produce destructive free radicals and inhibit brain function.
- Helps prevent oxidative stress-induced brain cell death by "talking" to the brain cells' genes responsible for cell cycling and survival.
- EGCG tells the genes in neurons to decrease production of caspase 3 which is an enzyme involved in initiating programmed cell death.
- Promotes memory-related learning abilities by protecting cells in the hippocampus. The hippocampus is the part of the brain involved in spatial cognition and memory-related learning abilities. EGCG keeps this area safe from damage by free radicals.

Osteoporosis and Periodontal Disease

Researchers have shown that drinking green tea may significantly increase bone mineral density. A study at the University of Tokyo included 655 women aged 60 years or older. Participants completed a questionnaire about their consumption of the following:

- Green tea
- Milk
- Cheese
- Yogurt
- Fish
- Vegetables
- Tofu
- Meat
- Coffee
- Smoking
- Alcohol

The questionnaire also included questions about the women's physical activity and use of anti-osteoporosis biophosphonate drugs like Fosamax.

For each dietary item, subjects were divided into two groups: those who consumed a specific item five or more days per week and those who consumed the item fewer than five days per week. Researchers then measured the bone mineral density (BMD) of the women's lumbar spines as well as blood markers for osteoporosis risk. That included levels of calcium, phosphorus, parathyroid hormone, alkaline phosphatase, osteocalcin, and Vitamin D.

The women who drank green tea five or more days per week had an average BMD significantly higher than those drinking green tea less than five days per week. The green tea drinkers' bone-density advantage persisted even after results were adjusted for age, body mass index, other dietary items, smoking, alcohol, physical activity, and the use of osteoporosis drugs.

The hypothesis formed said that the catechin flavonoids in green tea provided the benefits via estrogenic effects known to build bone strength and/or induce apoptosis ("suicide") in bone-destroying cells called osteoclasts. Both mechanisms are similar to the ways bisphosphonate drugs like Fosamax prevent bone loss.

While these potent drugs can provoke inflammatory eye disorders, abdominal pain, nausea, vomiting, and diarrhea, green tea is not only completely safe, but a delicious beverage that offers so many other health benefits.

Excessive bone loss is a characteristic feature not only of osteoporosis but of periodontal disease. Green tea supports healthy bones and teeth both by protecting osteoblasts (the cells responsible for building bone) from destruction by free radicals, and by inhibiting the formation of osteoclasts (the cells that break down bone).

Green tea also short circuits the damaging effects of the bacteria most responsible for gum disease, *Porphyromonas gingivalis*. *P. gingivalis* causes gum damage by producing toxic byproducts such as phenylacetic acid and by stimulating the activity and production of enzymes called metalloproteinases (MMPs), which destroy both the mineral and organic constituents that make up the matrix of our bones. Epigallocatechin-3-gallate (EGCG) inhibits *P. gingivalis'* production of both phenylacetic acid and MMPs.

This writer knows first hand the benefits of green tea to fight periodontal disease. After years of having no dental insurance, I went to have my teeth cleaned once we had a dental plan added. The "cleaning" took 2 ½ hours requiring my whole mouth to be numbed (try saying your "b's" with no feeling in your mouth!). The hygienist had to use a very ominous looking tool to clean under my gums and it was a very painful procedure.

Vowing never to have to go through that again, I investigated the possibility of putting green tea into my diet to combat what was the beginning stage of periodontal disease. I decided to give it a go. Two months later, my gums are healthier than they have ever been and my periodontal disease is in "remission" if you will!

Other Health Benefits

There are also some other benefits in green tea that can positively affect your health. We'll address some of these in this section.

Green tea may offer special heart-protective benefits for persons with high triglycerides. A series of experiments revealed that the mix of catechins naturally found in green tea dose dependently inhibit the

activity of pancreatic lipase, the enzyme secreted by the pancreas that digests fat.

As a result, the rate at which the body breaks down of fats into triglycerides, and the rise of triglyceride levels in the bloodstream that occurs after meals, is greatly slowed. Since a large rise in blood levels of triglycerides after a meal is a significant risk factor for coronary heart disease, drinking a cup or two of green tea along with your meals is a good idea, especially if your triglyceride levels are higher than normal.

Green tea catechins help thin the blood and prevent the formation of blood clots by preventing the formation of pro-inflammatory compounds derived from omega-6 fatty acids, which are found in meats and polyunsaturated vegetable oils such as corn, safflower and soy oil. These pro-inflammatory compounds cause platelets to clump together.

Research conducted over the last several years by Dr. Anastasis Stephanou and his team at the UK's Institute of Child Health and published in the *FASEB Journal*, the journal of the Federation of Experimental Biology and the *Journal of Cellular and Molecular Medicine* has focused on EGCG's ability to block the action of the protein, STAT-1. Normally activated in cells after a heart attack or stroke, STAT-1 plays a major role in inducing cell death.

Not only does green tea minimize heart cell death after a heart attack or stroke, EGCG also appears to speed up heart cells' recovery from damage, allowing the tissues to recover more quickly and alleviating damage to organs. Dr. Stephanou, a molecular biologist, noted: "We're extremely encouraged by these findings and hope to implement them in the clinical setting to minimize cell death activation in patients with acute coronary heart disease."

EGCG has also been shown to protect brain cells by these same mechanisms and thus may help minimize the brain damage that occurs after a stroke. In one animal study, green tea was so effective in reducing the formation of free radicals in brain tissue that the researchers concluded that daily intake of green tea catechins efficiently protects the brain from irreversible damage due to cerebral ischemia, and consequent neurologic deficits.

Another study found that among persons consuming tea regularly for at least one year, the risk of developing high blood

pressure was 46% lower among those who drank ½ cup to 2 ½ cups per day, and 65% less among those consuming more than 2 ½ cups per day.

In another study, this one of rats bred not only have high blood pressure but also to be prone to strokes, those rats given green tea had significantly lower systolic and diastolic blood pressure compared to controls, who received plain water. The animals in this study consumed the human equivalent of 1 liter (1.1 quarts or a little more than 4 cups) of green tea per day.

A cup of green tea may help prevent or lessen the duration of the flu. In a lab study, EGCG was shown to dramatically inhibit influenza virus replication in cell culture in all the subtypes of the flu virus tested. EGCG appears to suppress viral RNA synthesis by altering the properties of the viral membrane.

For those of us who suffer from an inordinate amount of stress and anxiety, green tea has also been shown to have a calming effect on the body. One study separated 50 people into two groups: those who had a cup of tea a day and those who didn't. The study showed that 50 minutes after a high stress event, subjects who drank the tea on a regular basis experienced an average drop of cortisol – a stress hormone - of nearly 50 percent!

So, it's obvious that green tea has many healing properties as well as ways to keep people healthier and ward off health problems. Are there any adverse effects to using green tea? The answer is – in a way, yes.

ADVERSE EFFECTS OF GREEN TEA

In general, adding green tea to your daily dietary routine is a great step toward a healthier lifestyle. However, there are some things to keep in mind before you jump right in and drink gallons of this beverage.

Green tea contains a large amount of caffeine and may be problematic if used by people with any of the conditions listed below. You may not be able to use green tea or your doctor or health care provider may recommend a lower dose or special monitoring.

- Heart problems or high blood pressure
- Kidney disease
- Overactive thyroid (hyperthyroidism)
- Anxiety or nervous disorder
- Bleeding or blood clotting disorder or if you take a blood thinner such as warfarin (Coumadin).

Before taking green tea, talk to your doctor, pharmacist, or health care professional if you have allergies (especially to plants), have any medical condition, or if you take other medicines or other herbal/health supplements. Green tea may not be recommended in some situations. We'll get a little more specific a little later.

In general, pregnant women should be cautious before starting or continuing the use of green tea in their diets. Talk to your doctor before doing so mainly because of the large amount of caffeine that is in green tea. Also talk with your doctor if you are breast feeding. The caffeine in green tea could cause restlessness, sleep disorders, and colic among other effects in your baby.

There is no information available regarding the use of green tea by children. As we've said, green tea contains a large amount of caffeine, which may cause anemia and other problems in children. Do not give any herbal/health supplement to a child without first talking to the child's doctor.

Although rare, allergic reactions to green tea may occur. Stop taking green tea and seek emergency medical attention if you experience symptoms of a serious allergic reaction including difficulty breathing; closing of your throat; swelling of your lips, tongue, or face; or hives.

Other less serious side effects have also been reported with the use of green tea. Talk to your doctor or health care provider if you experience any of the following on a regular basis:

- Heartburn
- Upset stomach
- Loss of appetite
- Constipation or diarrhea
- Nervousness, irritability, or anxiety
- Sleeplessness
- Irregular heartbeats
- Headache.

Side effects other than those listed here may also occur. Talk to your doctor about any side effect that seems unusual or that is especially bothersome.

There are some drugs that can interact with green tea consumption. If you are currently being treated with any of the following medications, you should not drink green tea or take green tea extract without first talking to your healthcare provider:

Adenosine - Green tea may inhibit the actions of adenosine, a medication administered in a hospital setting for an irregular (and usually unstable) heart rhythm.

Beta-lactam Antibiotic - Green tea may increase the effectiveness of beta-lactam antibiotics by reducing bacterial resistance to treatment.

Benzodiazepines - Caffeine (including caffeine from green tea) has been shown to reduce the sedative effects of benzodiazepines (medications commonly used to treat anxiety, such as diazepam and lorazepam).

Beta-blockers, propranolol and metoprolol - Caffeine (including caffeine from green tea) may increase blood pressure in people taking propranolol and metoprolol (medications used to treat high blood pressure and heart disease).

Blood Thinning Medications - Green tea should not be taken with warfarin, a blood-thinning medication, because the herb contains vitamin K and, thus, can render warfarin ineffective. Similarly, green tea and aspirin should not be mixed because they both prevent platelets from clotting. Using the two together, therefore, may increase your risk of bleeding.

Chemotherapy - The combination of green tea and chemotherapy medications, specifically doxorubicin and tamoxifen, increased the effectiveness of these medications in laboratory tests. These results have not yet been demonstrated in studies of people, however.

On the other hand, there have been reports of both green and black tea extracts stimulating a gene in prostate cancer cells that may cause them to be less sensitive to chemotherapy drugs. Given this potential interaction, black and green tea (as well as extracts of these

teas) should not be taken while receiving chemotherapy for prostate cancer in particular.

Clozapine - The anti-psychotic effects of the medication clozapine may be reduced if taken less than 40 minutes after drinking green tea.

Ephedrine - When taken together with ephedrine, green tea may cause agitation, tremors, insomnia, and weight loss.

Lithium - Green tea has been shown to reduce blood levels of lithium (a medication used to treat manic/depression).

Monoamine oxidase inhibitors (MAOIs) - Green tea may cause a severe increase in blood pressure (called a "hypertensive crisis") when taken together with MAOIs used to treat depression. Examples of MAOIs include phenelzine and tranylcypromine.

Oral contraceptives - Oral contraceptives can prolong the amount of time caffeine stays in the body and may increase its stimulating effects.

Phenylpropanolamine - A combination of caffeine (including caffeine from green tea) and phenylpropanolamine (an ingredient used in many over-the-counter and prescription cough and cold medications and weight loss products) can cause mania and a severe increase in blood pressure. The FDA issued a public health advisory in November 2000 to warn people of the risk of bleeding in the brain from use of this medication and has strongly urged all manufacturers of this drug to remove it from the market.

Due to their high tannin-content, teas, including green tea, have been shown to prevent iron absorption. While this effect is helpful in persons with too much iron, consuming several cups of green tea daily may not be a good idea for persons deficient in iron or susceptible to iron deficiency.

Essentially, if you are being treated for any medical condition, you should ask your doctor if it would be helpful for you to begin consuming green tea. He or she can advise you of the safety and help monitor your condition if necessary.

So, let's now look at how to use green tea.

CHOOSING GREEN TEA

There are many commercial varieties of green tea available in loose tea form, tea bags, and pre-made drinks. Any of these are fine for you to use, but there are some things that can help you choose which type of green tea you want to use. Today, you can find green tea products almost anywhere: grocery stores, convenience store, and specialty tea shops.

Whenever possible, ask for a sample of the tea before you buy it. This will probably only be available in a specialty tea shop, but it can truly help you find the best teas. Most high-quality teas will produce a pale green to yellow-green color.

Believe it or not, you actually have a lot of choices in what tea you pick for your dietary needs. While green tea is thought of primarily as a Chinese product, tea is grown in other places such as India as well. Let's take a look at a few different types of green teas.

Chinese Teas

The best Chinese green teas are thought to be those picked in early spring at the time of the Qing Ming festival, which takes place on April 5th of the solar calendar. These include:

After the Snow Sprouting: among the first tender sprouts available after the winter snows, these leaves produce a delicate tea with a fresh green scent.

Ching Ca: grown in mainland China, these teas include the famous Pi Lo Chun and Tai Ping Hou Gui.

Chun Mei (Precious Eyebrows): a name reflecting the fact that these springtime leaves are twisted into small curved shapes like lovely eyebrows. This high-grown tea from Yunnan province should be brewed lightly to produce an amber liquid with a wonderful aftertaste reminiscent of plums.

Dragonwell: with a fresh green taste, this is the favorite green tea of mainland China. The highest grade of this tea, Qing Ming, is named for the opening spring festival when the finest teas are picked.

Green Pearls: each pearl unfurls into three or four leaves that yield a lovely golden aromatic brew.

Gunpowder: a combination of buds and young green leaves rolled into balls reminiscent of gunpowder shot (hence its name), these also unfurl when infused. To test the freshness of gunpowder tea, pinch or squeeze a pellet. If fresh, it will resist; if stale, it will crumble. Two excellent gunpowder teas with a sweet, grassy taste are Gunpowder Pinhead Temple of Heaven and Gunpowder Temple of Heaven.

Guzhang Maohan (Mao Jin): these tea leaves from the Yellow Mountains of Anhui province produce a darker brew with a sweet, smoky flavor.

Pan Long Yin Hao: from Zhejiang province, this tea, a repeat winner in tea competitions conducted by the Chinese Ministry of Agriculture, is described as "a complex brew of multiple flavor notes."

Po Lo Chun: which translates to "Astounding Fragrance," aptly describes this slightly sweet yellowish tea with a lovely aftertaste.

Snow Dragon: grown near the border between Fujian and Zhejiang province, this tea is roasted in a large wok to produce a nutty, sweet flavor. Yunnan Green Needle: a pleasantly astringent clean-tasting tea made from delicate green buds.

Organic Teas

The most stringent standards for organic produce are found in California, Japan and Germany. Any tea that meets these standards is a high quality organic product. Of course, an organic product is one that is grown without the use of pesticides.

The two most respected organic tea farms are in India: the Oothu Tea Estate, the first organic tea farm in the world, and Makaibari Tea Estates, which follows Rudolph Steiner's principles of harmony with nature through organic, sustainable methods of agriculture.

When you drink green tea, you are doing your body a huge favor by providing it with many healing elements. When you choose an organic green tea, you are doubling the health effects because organic teas are grown without pesticides and are all-natural.

For many people, this is very important. It's even a lifestyle that they feel must be strictly adhered to. So, make sure that if you want an organic green tea that it is completely organic and grown in ways that make you comfortable as a health-conscious human being!

Indian Teas

Although green teas are a very small part of overall tea production in India, the following are notable.

Bherjan Estate: an organic green tea grown in Assam, India's most plentiful tea district. Assam teas are renowned for their hearty taste and "strength" in aroma and body.

Ambootia Tea Estate: a Darjeeling district organic green tea that produces a light, fragrant cup.

Makaibari Tea Estates: a multiple award winning Darjeeling green tea, flavorful but light.

Craigmore Estate: grown at high altitudes in the spectacular range of the Nilgiris, India's Blue Mountains, these green teas are exceptionally fragrant and sweet.

Japanese Teas

The best quality green teas are grown in the farmlands of Shizuoka and Uji in Japan. Here are some varieties that you may want to look at:

Ban-cha: an earthy brown tea with an astringent taste made from roasted green tea leaves, bancha should only steep two to three minutes or it will become bitter.

Houjica: a lightly roasted bancha tea with a nutty flavor. A good nighttime choice as it is very light and low in caffeine.

Sen-cha: about 75% of the green tea harvested in Japan is Sencha, making it the most commonly consumed green tea in Japan. Sencha is especially rich in vitamin C and provides a clear rich yellow-green liquor that is grassy sweet and cleanly astringent.

Made from a higher quality leaf than bancha or houjica, sencha

is often called "guest tea." The most delightful sencha is *Sencha Sakuro*, a spring green tea scented with cherry blossoms. Another cherry-scented sencha to try is *Spiderleg Sakuro* whose longer, more "spidery" leaves produce a rich flavorful bouquet.

Gyokuro: the highest quality Japanese green tea, gyokuro has been called "history, philosophy and art in a single cup." For three weeks before the spring harvest, gyokuro leaves are shaded from direct sunlight, leading to a slower maturation that enhances the leaves' content of flavonols, amino acids, sugars and other substances that provide green tea's health benefits, aroma and taste. Intensely green and sweeter than sencha, gyokuro leaves can serve as the base for *matcha*-the silky chartreuse tea powder used to make *chanoyu*, the tea of the Japanese tea ceremony.

Mat-cha: Matcha differs from gyokuro in that the leaves are not rolled. After steaming, they are immediately and thoroughly dried, after which they are called *tencha*. Tencha is then ground into the superfine powder known as matcha. Use about two level teaspoons of matcha to ½ cup water and whip into a thick, invigorating brew, wonderful as an energizing morning tea or before exercise.

Shin-cha: In Japanese, "shin" means new and "cha" means tea. Shincha is literally "new tea" as it consists of leaves very lightly steamed immediately after harvesting. Shincha, which is only sold from May through July, is a highly aromatic tea with the aroma of freshly picked leaves. Because it is quite perishable, only a very small percentage of the tea harvest is processed as shincha; most of the leaves are used for sencha.

Genmai cha: Made from sencha mixed with genmai (puffed brown rice), this tea may be made from lower quality second harvest sencha but can also be found made from premium first-leaf sencha. The rice supplies a slightly nutty taste. Some tea retailers also add a pinch of matcha to the blend, giving it a vibrant green color.

General Information

You can purchase pre-made green tea drinks which are great for convenience. You can also purchase loose teas that are brewed in tea balls. To test for freshness, tightly squeeze a small amount and smell the aroma. The freshest, most flavorful tea will smell sweet and grassy.

Besides pre-made teas, tea bags are easier to prepare for most people. You will want fresh tea bags to get the best brewed tea. To test tea bags for freshness, remove the tea from one bag, place the empty bag in a cup, pour hot water over it., and let it steep for 2-3 minutes. If the result tastes like plain hot water, the tea itself is likely fresh. If the tea bag water tastes like tea, the tea is old, and the paper has absorbed its flavor.

Since a single ounce of tea should produce 15 to 30 cups, the best way to ensure your tea is fresh is to purchase it in small amounts-two to four ounces at most. To retain freshness and flavor in both loose and bagged tea, store it in a tightly constructed opaque container to protect it from light, moisture and food odors.

Dark glass or ceramic containers are best; tins often leak as their seams are soldered. Use a small container just large enough to accommodate the amount of tea; tea exposed to the air in a half-empty large container will continue to oxidize.

It's best to store tea in a dark, cool, dry cupboard. Tea stored in the refrigerator is vulnerable to moisture and odors from other foods, and the water condensation that occurs when frozen tea is defrosted can ruin it.

Once you've got your green tea, the next step is to enjoy it!

PREPARING AND ENJOYING YOUR TEA

Green tea should be handled tenderly, just as you would fresh green leafy vegetables. You want to preserve the integrity and tenderness of the leaves if you have loose tea leaves so that you don't lose any of the healthful benefits.

Spring water is the ideal choice for brewing tea, followed by filtered water. Distilled water should never be used; the brew it produces will be flat since the minerals removed from it are essential to bringing out tea's flavor.

To prepare the best loose tea, we recommend using a small food scale. Use three grams of tea to five ounces of water if brewing tea in

a small teapot; four grams of tea to eight ounces of water for other methods.

As the size and shape of tea pots and cups varies considerably, it's a good idea to fill a measuring cup with 8 ounces of water and pour it into your tea pot or cup to determine how much water it really holds.

When making loose tea, remember that a teaspoon of small, dense leaves will weigh substantially more than a teaspoon of larger leaves, and the resulting tea will reflect this. A teaspoon of small dense leaves may be sufficient to produce a satisfying strong cup, while several teaspoons of larger leaves would be needed for a comparable brew.

Although heartily boiling water is used to brew black and oolong teas, green tea needs much lower temperatures (160-170 degrees F; 79-85 degrees C) and should be brewed for less time.

Let the water barely reach the boiling point to liberate its oxygen, then allow it to cool slightly before pouring over your tea. Until you are familiar with your tea kettle and the time it takes and sounds it makes when the correct temperature (170-185 degrees) has been reached, it's a good idea to check using a simple, inexpensive candy thermometer, available at any grocery store.

Brewing for 30 seconds to one minute is usually ideal; however, Nilgiri and Darjeeling greens can take several minutes, and Chinese Dragonwell teas are often best after 6-7 minutes of infusion.

Although good quality tea leaves will sink to the bottom after they have infused, it's a good idea to pour the tea over a small strainer if one is not built in to your teapot.

Obviously, preparing green tea in tea bags is pretty much a no-brainer. However, keep in mind that the best green tea isn't scalding hot. It is warmer than tepid but cooler than hot.

Iced green tea is also a great refreshing beverage, especially on a hot day! Take four tea bags and steep them in boiling water for 2 to 3 minutes. Let the water cool and place the brewed tea in a small pitcher. Add water until the color is a pale yellow. You can add a little bit of sugar if you desire, but not too much! Add ice and enjoy!

You don't have to just drink plain old tea either. You can supplement your tea in many ways to enjoy it diversely and have a new experience you could really enjoy!

Brew green tea with thinly sliced ginger and lemon, or sprigs of spearmint. Add one teaspoon of honey per cup, stir and serve hot or use half the amount of hot water (or twice the amount of tea), allow the tea to brew and cool, then pour over ice cubes.

Make a green tea chai by brewing green tea in hot vanilla soy milk and topping with a dash each of cinnamon, black pepper, ginger and allspice. This is utterly delicious!

Brew 1-2 teaspoons loose leaf green tea in 8 ounces cool water for 20-30 minutes to develop flavor without bitterness and add to stir-fries, marinades, dressings, soups and sauces. This is a great way to put green tea into your diet without drinking it. You'll still get the health benefits and your food will taste delicious! Here are some other options:

- Sprinkle gyokuro tea over a salad, stew or rice dish.
- Add ½ teaspoon gyokuro tea to an almost set omelet or scrambled eggs.
- Add crushed gunpowder tea and rice vinegar to sesame oil for delicious vinaigrette for your salad.
- Mix gyokuro tea with sesame seeds and sea salt and use to dredge shrimp or fish filets before lightly pan-frying them.
- Cook Japanese udon noodles in green tea for about 5 minutes, then remove from heat and leave noodles in tea until cool. Drain and toss lightly with soy sauce and sesame oil. Add thinly sliced tofu, scallions, mushrooms, and chopped cilantro, and serve.
- Poach Asian or Bosc pears in green tea with fresh thinly sliced gingerroot. Drizzle with honey and top with a sprig of fresh mint.
- Combine cooled green tea half and half with a fruit juice, such as peach, pineapple or papaya. Sweeten with a teaspoon of honey per cup. Blend and pour over ice.

Because green tea can be utilized in many different ways other than just as a beverage, we thought we'd have fun with the next section and show you more ways to use green tea in cooking as well as providing ideas for foods that go well with green tea!

RECIPES AND FOOD USING GREEN TEA

Because green tea is of Asian origin, it only goes to follow that many of the foods that are cooked with and go well with green tea will be Asian. We'll try to give you a variety of things to choose from, but Asian food is wonderful cuisine and we're sure you'll enjoy any of these suggestions!

Recipes

Green Tea Fettuccine Alfredo

Ingredients:

¼ c margarine or butter
1 ¼ c light cream
1 tsp roasted garlic
8 oz. fettuccine
¾ c Parmesan cheese
¼ tsp ground black pepper
1 tsp green tea powder
1/8 tsp Kosher salt

Cook fettuccine according to package directions. Drain and set aside. In a large skillet, melt margarine or butter over medium heat. Stir in ¾ cup of the cream. Stirring constantly, cook over medium heat 2-3 minutes. Stir in remaining cream, cheese, pepper, roasted garlic, green tea powder and Kosher salt; cook 1 minute. Toss with fettuccine.

Green Tea Lobster Bisque

Ingredients:

2 tbsp extra virgin olive oil
1 small white onion, minced
2 tbsp minced garlic
2 c green tea leaves
2 c heavy whipping cream
1 c Chardonnay (optional)
¼ tsp matcha powder
Dash of dried green tea loose leaves
Dash of ground basil
1 tbsso melted low-fat margarine with 1 tbsp flour cooked for 1 minute to make a roux
1 six-ounce can tomato paste
1 pound lobster meat

In large, heavy bottomed pot, heat the extra-virgin oil. Add white onion and garlic and cook over medium heat until translucent, about 3 minutes. Add green tea, cream, Chardonnay and base. Cook over medium heat 30 minutes, stirring frequently. Do not let mixture boil.

Add matcha powder, green tea loose leaves and basil, then slowly stir in roux. Add tomato paste and cook at low temperature 30 to 40 minutes, or until mixture thickly coats the back of a spoon.

Just before serving, cut warm, cooked lobster meat into cubes and add to bisque.

Green Tea Curry Fried Rice With Shrimp

Ingredients:

2 tsp soy sauce
1 tsp chile sauce
¼ tsp brown sugar
2 tbsp vegetable oil
1 tbsp low-fat margarine
1 tbsp curry powder
½ c medium diced onion
¾ c thinly sliced scallions

1 tsp minced garlic
3 c cooked rice
10 oz. shrimp
2 eggs, beaten
3 tsp loose green tea leaves
Kosher salt – to taste

Whisk together the soy sauce, chile sauce and brown sugar in a small bowl.

Place a wok over medium-high heat. When it's hot, add the vegetable oil and margarine. When the margarine is foaming, add the curry powder and onion and cook until the onion softens slightly, 3 minutes. Add the scallions, tea leaves, and garlic and cook another minute. Stir in the rice, and toss until the grains have separated and softened. Toss in the shrimp and stir briefly to heat through.

Drizzle the sauce over, and toss until it coats the rice evenly. Move aside the rice to expose a portion of the bottom of the wok or pan. Add the egg and allow it to set. Then scramble and chop up to toss into the stir fry. Season the rice to taste with kosher salt, if needed.

Green Tea New York Steak

Ingredients:

¼ c soy sauce
10 to 12 oz. New York strip steak cut to 1 inch wide strips
3 stalks leeks – white head only – sliced lengthwise into ¼" wide strips
1 small red bell pepper cut to ½" wide by 2" long strips
1 tbsp crushed loose green tea leaves
3 tbsp extra virgin olive oil

Cut and marinate steak with 1 Tbsp. of soy sauce and 1 Tbsp. olive oil for about one minute.

Cut and discard green part of leek and slice white leek heads into 1/4" wide strips.

Cut red bell peppers and set aside.

Heat a sauté pan at high heat about 30 seconds then add oil. When oil just begins to smoke, lay steak strips in pan evenly, do not stir for 45

seconds and sear the steak.

Add in leeks, bell peppers and crushed loose tea leaves; stir when steak is seared on one side. Sauté about 2 minutes for medium rare. Cook longer for more doneness.

Add 3 Tbsp. soy sauce and let sauce reduced slightly and become sticky then remove and serve with rice.

Green Tea Risotto

Ingredients:

5 c chicken stock
2 med. white onions, finely chopped
4 cloves of finely chopped garlic
1 head of celery finely chopped
14 oz. risotto
½ c of dry white wine (Chardonnay recommended)
½ c of green tea
Handful fresh thyme leaves
Handful dry sencha leaves
Sea salt
Ground black pepper
2 tbsp margarine
2 tbsp olive oil
3 oz. grate pecorino cheese
6 oz. Grated Parmesan cheese
8 slices prosciutto

Heat the stock first. Add the white onions, garlic and celery onto a separate pan and sauté at medium heat in 1 tablespoon of olive oil. When the onions start to become clear, add the rice and turn up the heat to medium-high.

Stir the rice constantly. When it looks translucent, add the white wine and green tea. As you stir, notice how the alcohol and tea evaporates and a great aroma permeates the rice.

When the white wine and green tea fully mingles into the rice, add the thyme leaves, green tea leaves and one ladle of stock to the pot. Reduce the heat to a simmer and continue adding stock until the rice

has absorbed the liquid. The entire thing should take about 15 minutes. Stop when the rice is soft but with a slight bite in the center. Add salt and pepper as you wish.

This last step is to add body, texture and flavor to rice. This is when the rice becomes 'risotto'. Remove the pot from the heat and toss in your margarine, pecorino and Parmesan. Incorporate it all together gently. Put a lid on the pot and let it sit for five minutes.

Serve the risotto on warm plates and if you prefer, you can lay some nice slices of prosciutto on top along with the crumbled white cheese. Some extra thyme leaves and black pepper on top would also make a nice addition.

Matcha Tofu Omelette

Ingredients:

1 c tofu
2 tbsp rice milk
2 tbsp whole wheat flour
½ tsp baking powder
½ tsp vanilla
1 tsp matcha powder
Low-fat fruit flavored yogurt – your preference

Put half the tofu in a blender with the rice milk and blend thoroughly. Put the other half of the tofu in a small mixing bowl and mash. Add the flour, baking powder, matcha powder, vanilla, and the blended tofu. Mix well.

Spread the mixture thinly in a baking dish and bake at 350 for 30-40 minutes.

With the help of a pancake turner carefully transfer the "omelette" onto a serving dish. Spread low-fat fruit yogurt, ketchup or jam to taste on top and eat while hot.

Green Tea Semolina and Yogurt Cake

Ingredients:

½ c blanched, toasted almonds
2/3 c plain yogurt
1 stick melted butter
1 ¼ c semolina flour
1 tsp baking powder
1 tsp vanilla
5 tsp matcha tea powder

Syrup:

1 c plus 2 tbsp sugar
2/3 c water
3 tbsp lemon juice

Preheat oven to 400F. Grease and flour a round baking pan, about 8 inches in diameter.

Prepare the syrup by placing all the ingredients in a small pan and bringing slowly to a boil. Lower the heat and simmer for about 10 minutes or until the syrup forms a sticky film on the back of a spoon. Set aside to cool.

Chop the almonds finely. Pour the yogurt into a bowl, add half the melted low-fat butter, 4 tsp matcha powder, sugar, semolina, baking powder, vanilla and almonds. Mix thoroughly until well blended. Pour the batter into the cake pan and smooth over the surface with the back of a spoon.

Bake for about 30 minutes, or until the surface of the cake is golden. Remove from the oven and sprinkle 1 tsp matcha powder over it. Cut into lozenge shapes (diamond shape) and return to the oven for 3-4 more minutes.

Warm the remaining butter. Remove the basbousa (semolina cake) from the oven and pour the butter evenly over the surface. Leave to cool.

Green Tea Muffins

Ingredients:

2 c flour
1 c sugar
½ tsp baking soda
2 tsp powdered Japanese green tea (matcha)
½ c milk
1 stick butter, softened
2 eggs

Heat oven to 350 degrees. Sift together the flour, baking soda, and green tea powder and set aside.

In a large bowl, beat the butter until light. Add the sugar and beat some more until light and fluffy. Add the dry mixture and the milk.

Stir with a spatula or wooden spoon until the dry ingredients are just incorporated (don't over mix). The batter will be somewhat lumpy.

Divide the batter among the muffin tins (I used those foil liners. If you don't have any liners, grease the tins), about 2/3 full. Bake for 25-30 minutes. Allow to cool on a wire rack.

Spinach Green Tea Phyllo Pizza

Ingredients:

Kosher salt and ground black pepper to taste
1 tsp Italian parsley, minced
1 ½ lbs spinach (about 2 bunches)
5 tbsp melted butter kept warm
7 sheets phyllo dough
6 tbsp freshly grated Parmesan
1 tsp dried rosemary
1 tsp dried green tea loose leaves, crushed
2/3 c finely crumbled Feta cheese
1 ½ tbsp olive oil

In a kettle cook the spinach in the water clinging to the leaves, covered, over moderate heat for 3 to 4 minutes, or until it is just wilted, refresh it under cold water, and let it drain well in a colander while making the phyllo crust.

Preheat the oven to 400 degrees. Brush a baking sheet lightly with

some of the margarine, put 1 sheet of the phyllo on the margarine, the brush it lightly with some of the remaining margarine.

Sprinkle the phyllo with 1 tablespoon of the Parmesan and Italian parsley, put another sheet of the phyllo on top, and press it firmly so that it adheres to the bottom layer.

Margarine, sprinkle, and layer the remaining phyllo in the same manner, ending with a sheet of phyllo. Brush the top sheet lightly with the remaining margarine and bake the crust in the middle of the oven for 5 minutes.

Arrange the spinach evenly on the crust, leaving a 1-inch border all around, crumble the mint, green tea leaves, over it, and season the spinach with Kosher salt and black pepper.

Scatter the red onion over the spinach, sprinkle the pizza with the Feta cheese, and drizzle it with the olive oil. Bake the pizza in the middle of the oven for 15 minutes, or until the cheese is melted, and with a pizza wheel or sharp knife cut it into squares. Serves 8.

Deep Fried Green Tea Camembert

4 oz. Camembert cheese
1 egg
½ c fine Italian bread crumbs
¾ c dry crushed green tea leaves
3 c olive oil

Cut chilled cheese in 6 equal wedges. In a shallow bowl, beat egg. On a sheet of wax paper, mix Italian bread crumbs and crushed dry green tea leaves.

Dip each cheese wedge in egg and turn to coat. Roll cheese in crumb mixture to coat. (If preparing ahead, cover and refrigerate now until ready to cook.)

In a heavy saucepan, heat about 2 inches of olive oil to high (until a 1-inch bread cube turns golden brown on all sides). Fry cheese until golden. Drain on paper towels.

Green Tea Cheddar Swiss Cheese Ball

6 c shredded cheddar cheese
8 c shredded Swiss cheese
1 ½ c crumbled bleu cheese
1 large onion, chopped
½ c green tea powder
4 tsp prepared horseradish
1 tbsp prepared mustard
¼ c chopped salted cashew nuts

In a mixing bowl, blend Cheddar and Swiss cheeses until smooth. Add the Blue cheese, onion, green tea powder, horseradish and mustard except cashew nuts. Mix well and shape into ball.

Garnish by rolling into chopped cashew nuts.

Serve with crackers and cheese knife.

Crispy Green Tea Wonton Chips

Ingredients:

30 wonton wrappers
¼ c green tea powder
Non-stick cooking spray
2 tbsp olive oil
1 clove minced garlic
½ tsp crushed dried basil
¼ c grated Parmesan or Romano cheese

Using a sharp knife, cut the wonton wrappers diagonally in half to form 60 triangles

Spray a baking sheet with nonstick cooking spray.

Arrange one third of the triangles in a single layer on the prepared baking sheet.

In a small bowl stir together the olive oil, tea powder garlic, and basil. Brush the wonton triangles lightly with some of the oil mixture, sprinkle with some of the Parmesan or Romano cheese.

Bake in a 350 F. oven about 8 minutes or until golden brown. Cool completely on a wire rack.

Repeat with the remaining wonton triangles, oil mixture, and Parmesan or Romano cheese.

Makes 60 chips

There are a variety of meals that go very well with tea – especially green tea! Consider adding a few of these to your menus!

Good With Green Tea

Toasted Ravioli

Ingredients:

2 tbsp milk
1 egg
¾ c Italian seasoned bread crumbs
½ tsp sea salt
25 oz. package frozen cheese ravioli, thawed
3 c olive oil
1 jar marinara sauce
1 tbsp grated Parmesan cheese

Combine milk and egg in a small bowl. Place breadcrumbs and if desired, sea salt in a shallow bowl.

Dip ravioli in milk mixture, and coat with breadcrumbs. In a large saucepan, heat marinara sauce over medium heat until bubbling. Reduce the heat to simmer.

In a large heavy pan, pour olive oil to depth of 2 inches. Heat oil over medium heat until a small amount of breading sizzles and turns brown. Fry ravioli, a few at a time, 1 minute on each side or until golden.

Drain on paper towels. Sprinkle with Parmesan cheese and serve immediately with hot marinara sauce.

Shiitake Mushroom and Crab Enchiladas

Ingredients:

1 lb. chopped crab meat
1 ten ounce can red enchilada sauce
1 can cream of mushroom soup
½ lb shiitake mushrooms, sliced
1 eight ounce package shredded Mexican-style cheese blend
8 ten inch flour tortillas

Preheat oven to 375 degrees. Lightly grease a medium baking dish.

In a large bowl, mix the crab meat, red enchilada sauce, cream of mushroom soup, shiitake mushrooms, and 1/2 the cheese.

Roll an equal amount of the mixture in each tortilla.

Arrange the filled tortillas in a prepared baking dish, and cover with the enchilada sauce. Top with the remaining cheese.

Bake 20 minutes in the preheated oven, until the cheese is bubbly. Allow to sit about 5 minutes before serving

Granny Apple Oatmeal Bread

Ingredients:

2 tsp white vinegar
1 c milk
2 c flour
1/3 c firmly packed light brown sugar
2 ½ tsp baking powder
¾ tsp baking soda
¼ tsp kosher salt
1 c oatmeal (not instant)
1 c chopped granny apples
½ c chopped walnuts
1 egg
2 tbsp vegetable oil

Preheat oven to 350 degrees. Grease and flour an 8 1/2-by-3 5/8-by-2 5/8-inch loaf pan.

Pour vinegar into 1-cup glass measure. Add non-fat milk to measure 1 cup total. Let stand 10 minutes to sour.

Combine organic flour, brown sugar, baking powder, baking soda and salt. Stir in oats, plums and walnuts.

Beat egg in bowl. Add soured milk and oil. Pour all at once into dry ingredients. Stir just until evenly moistened. Turn into pan.

Bake for 45 minutes or until wooden pick inserted in center comes out clean. Remove bread from pan to wire rack to cool. Store overnight for easier slicing. Makes one loaf.

Turkey and Andouille Burgers with Swiss Cheese

4 sun dried tomatoes
½ c mayo
1 tbsp Dijon mustard
8 oz. andouille sausages cut into 1 inch pieces
2 ½ lb ground turkey
2 large minced shallots
2 tsp kosher salt
2 tsp ground black pepper
1 tsp crushed fennel seeds
6 hamburger buns
6 slices 1/3-inch thick red onion
Olive oil
6 slices Swiss cheese
1 seven ounce jar roasted red peppers drained

Finely chop sun-dried tomatoes in a processor. Blend in mayo and mustard. Transfer to small bowl. (This can be made hours ahead. Cover; refrigerate.)

Finely chop andouille sausages in processor. Transfer to large bowl. Add turkey, shallots, salt, pepper, and crushed fennel seeds. Stir with fork just until blended. Form mixture into six 1-inch-thick patties.

Prepare barbecue (medium-high heat). Grill hamburger buns until golden, about 2 minutes. Transfer to platter. Brush onion slices with oil. Sprinkle with salt and pepper. Grill until golden, about 7 minutes per side. Grill hamburgers to desired doneness, about 5 minutes per side for medium-rare. Put Swiss cheese over top of burgers.

Spread cut sides of hamburger buns with sun-dried-tomato mayonnaise. Top bottom halves of buns with hamburgers, then red peppers. Top with onion slices. Cover with top halves of buns and serve with your favorite chilled tea.

CONCLUSION

The Asian people have known for years that tea and specifically green tea help rejuvenate the body and the mind. Now that this amazing product has begun to grow in popularity in the United States as well as in other parts of the world, we can all share in that same knowledge.

It's always nice to take a hot cup of tea and a good book and relax perhaps on a sun porch, your back deck, or even in bed. When you choose green tea as that beverage, you are doing much more for your body than just relaxing the mind. You are healing parts of your body and doing yourself a huge favor when it comes to your overall health.

While most of the studies done regarding the healing properties of green tea have been done on laboratory animals, more and more studies are coming about on humans and the results are proving to be much the same. Plus, physicians are seeing great improvements in their patient's health problems just by them adding green tea to their diets.

Remember that green tea is an herbal supplement and should be bought from a reputable place so that you are getting exactly what you need and want in this amazing herb.

Today, you can find green tea in all sorts of products: diet aids, nail polish, shampoo, conditioner, vitamin supplements, and so much more. There's a reason for that.

Green tea provides so many health benefits that there's no denying that adding green tea to your diet is a step in the right direction. Once you start drinking green tea or adding it to your recipes, you will begin to notice some great changes.

Asian countries don't have the same health problems that we do. There's a reason for that. They have known about green tea for centuries and now we get to share in that wonderful knowledge.

Explore green tea seriously – for yourself, for your family, and for the world. We're willing to bargain that it'll be the best choice you've ever made!

The following websites were referenced in researching this book:

www.wikipedia.org
www.about.com
www.webmd.com
www.greentealovers.com

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