

THE MAGIC IN THE GREEN TEA LEAVES

By Tom Monte

Imagine a drink that you could consume everyday that would reduce inflammation throughout your body, kill cancer cells, slow the aging process, cause wounds to heal faster, boost your immune system, and help protect you from an array of devastating diseases. Sound like a fantasy? In fact, that drink already exists and people have been consuming it for thousands of years. The magical elixir that's causing scientists to marvel is green tea.

"Green tea is one of the most powerful food sources for chemoprevention, healing, and antioxidants," said Stephen Hsu, Ph.D., a cell biologist at the Medical College of Georgia. Scientists have known for decades that those who drink green tea regularly have much lower rates of cancer, heart disease, osteoporosis, arthritis, and many other serious illnesses. "Now we are starting to understand what green tea is doing to create better health," said Dr. Hsu (pronounced "Shu").

Perhaps the most fundamental way green tea fights disease is by preventing and reducing inflammation now recognized as the underlying cause of the most degenerative diseases.

"The current theory is that low grade, sub-acute inflammation -- that is to say, inflammation that does not cause overt symptoms -- can lead to an increased risk of heart disease, cancer, diabetes, obesity and other illnesses," said Michael Wargovich, Ph.D., one of the nation's top cancer researchers, formerly of M.D. Anderson Cancer Center and now at the South Carolina Cancer Center in Columbia, S.C. "Among the causes of inflammation is our culture's diet, which contains many pro-inflammatory foods."

Dr. Wargovich, an expert on green tea, says that by reducing inflammation, green tea appears to counteract many of the

inflammatory effects of the standard American diet. Among the ways it does it is by blocking a series of enzymes known as the COX-2 pathway (the cyclooxygenase enzymes) that cause inflammation in cells. "It acts like a natural Celebrex or Vioxx," said Dr. Wargovich, referring to two popular and powerful anti-inflammatory drugs used to treat arthritis, pain, and menstrual disorders. Indeed, numerous studies, including one published in the August 2002 issue of *Arthritis and Rheumatology*, have reported that EGCG blocks the inflammatory process that leads to arthritis.

People who regularly drink green tea have a much lower risk of all the cardiovascular diseases, including high blood pressure and heart attack. One study, published in the January 2004 issue of the *Journal of Agriculture and Food Chemistry*, showed that green tea lowered LDL cholesterol (the type that causes heart disease), reduced fibrinogen levels (fibrinogen causes clots to form in the blood and increases the risk of heart attack and stroke), and inhibited the development of atherosclerosis (or formation of cholesterol plaques that cause heart attack and stroke).

The most active therapeutic agent in green tea appears to be a substance called epigallocatechin-3-gallate, or EGCG, which is a catechin, or a subgroup of chemicals found in tea that are part of the larger family of polyphenols. EGCG is now being studied as perhaps the most powerful health-promoting catechin in the food supply.

In study of green tea's effects on inflammation, the April 15, 2003 *Journal of Immunology*, concluded, "EGCG is a potent anti-inflammatory compound with therapeutic potential."

KILLING CANCER CELLS AND TUMORS

Among the most remarkable benefits of green tea is its tendency to trigger the destruction of cancer cells and tumors, a process known

as apoptosis, or programmed cell death. As you know, cancer cells are virtually immortal. For decades, scientists have been searching for ways to selectively target and kill cancer cells.

Laboratory experiments done on animals and human cell cultures have shown EGCG forces cancer cells to perform normal functions. When they cannot carry out those functions, the cells self-destruct.

Healthy cells mature and become part of a specific organ or system, a process known as differentiation. Some become skin cells, others form parts of the eye, or liver, or heart, for example. "The problem with cancer cells is that they have lost the ability to differentiate," said Dr. Hsu. EGCG stimulates cells to differentiate -- that is, to mature and become a healthy part of one or another organ or system. Once exposed to EGCG, cancer cells are, in effect, ordered to differentiate. But unable to perform that task, genes within cancer cells trigger their own self-destruct sequence, thus bringing about apoptosis.

This is not the only way green tea appears to kill cancer, however. "In tumors, certain signal pathways become corrupted and stop functioning so that the cells keep growing," said Dr. Wargovich. "It's like having the light switch taped in the 'on' position. When that happens in cells, certain functions become degraded and, in time, deplete the machinery and can cause some cells to become cancerous. Green tea reregulates the cell, it reboots the system so to speak, to accept the command to stop growing."

Finally, green tea blocks the formation of blood vessels to tumors, a talent known as anti-angiogenesis. Like all other tissues, tumors need blood and oxygen in order to survive. Green tea blocks blood vessels from attaching to tumors, and thus prevents them from getting what they need to live.

In a study published in the September 2003 *Journal of Urology*, researchers at the Medical College of Toledo injected EGCG into the bladders of rats with bladder cancer. Three weeks later, 18 of the 28 animals treated with EGCG were tumor-free. A control group of untreated animals all experienced growth of their tumors.

Many studies have shown that people who drink green tea regularly have far lower rates of breast, prostate, pancreatic, and colon cancer. Two separate studies done at the Mayo Clinic showed that the polyphenols in green tea killed both prostate cancer cells and leukemia cells, while protecting normal cells.

A SUPER ANTIOXIDANT

In addition to inflammation, another primary cause of aging and illness are oxygen free radicals, which are highly reactive oxygen molecules that cause cells, tissues, and organs to break down or decay. Oxidants, as they are called, transform healthy tissue into wrinkles and scars. When that scar tissue forms in the eyes, it clouds the lens and forms the basis for cataracts. When it occurs in the brain, it can lead to Alzheimer's or Parkinson's disease. Oxidants turn the interior of healthy arteries into bulbous masses of atherosclerosis that leads eventually to heart attacks or strokes. Finally, oxidants can deform DNA, the cell's brain center, causing some cells to mutate and become cancerous.

The antidote to oxidants are *antioxidants*, or free radical scavengers, which are molecules that stop the oxidative process. The enormous press attention given to antioxidants, especially to antioxidant vitamins C, E, and beta-carotene, has turned the supplement business into a multi-billion dollar industry.

Now researchers are finding that these vitamins pale in comparison to the powers of EGCG to protect cells and tissues from the

damage caused by oxygen free radicals. Tariq M. Haqqi, M.D., a green tea expert and associate professor of medicine at Case Western Reserve University, reported recently "Many polyphenols in green tea possess much more potent antioxidant activity than well-known antioxidants such as vitamin C and vitamin E." In fact, researchers at Kansas University have found that EGCG is at least 100 times more effective than vitamin C and 25 times better than vitamin E at protecting cells and their DNA from the damage caused by free radicals.

Dr. Wargovich points out that green tea and other plant sources of antioxidants are far richer in immune boosting and antioxidant chemicals than any multivitamin could ever be. "These plant chemicals, of which there are thousands, effect the body in many different and positive ways, some of which we don't understand as yet," said Dr. Wargovich. Indeed, in addition to the catechins and polyphenols, green tea also provides B vitamins, as well as vitamins A, C, E, and beta carotene, all of which have been shown to boost immune response and ward off disease.

HEALING THE SKIN

At the Medical College of George's Department of Oral Biology, Dr. Hsu has found yet another remarkable benefit from green tea: it's ability to promote rapid wound healing. Skin cells, says Dr. Hsu, normally migrate from the lower levels of the skin to the surface, a process that takes about 28 days. By day 20, the cells have finally made it to the surface where they eventually die and form a protective layer known as the stratum corneum. EGCG has the mysterious effect of rejuvenating these dying cells.

"When exposed to EGCG, the old cells found in the upper layers of the epidermis appear to start dividing again," Dr. Hsu said. "They make DNA and produce more energy. They are reactivated."

Under normal circumstances, injuries and open wounds require at least this same 28-day period in order to fully heal. But when exposed to EGCG, that month-long healing process has been shortened to a single day. Dr. Hsu and his colleagues are now helping to formulate wound healing and skin care products that can be used to prevent scarring and treat acne, psoriasis, rosacea, ulcers, infections, and other injuries to tissues. Dr. Hsu points out that EGCG can be particularly important to diabetics, who typically cannot heal wounds and often suffer infections that lead to gangrene and amputations.

EGCG protects cells from toxins of all sorts, Dr. Hsu has learned. It does it by adhering to the cell's receptor sites -- places that act like doorways into the cell -- and thereby prevent toxins from getting inside the cell. "People in China and Japan smoke like crazy," Dr. Hsu said. "Yet, they drink green tea and do not have the cancer rates that we have in the U.S., especially oral cancers. One of the reasons is that the green tea polyphenols attach themselves to the receptor sites of cells and block harmful chemicals from getting into the cells."

Numerous other benefits are now being revealed by scientific studies, including weight loss -- green tea speeds up fat burning -- lower rates of osteoporosis, fewer dental caries and, thanks to its immune boosting powers, lower incidences of E. coli, Strep, and staph infections.

WHY GREEN TEA IS DIFFERENT FROM BLACK

Regular consumption of both green and black tea is associated with better health and longer life, but researchers are finding that green tea is more effective than black tea at protecting cells against DNA damage and cancer. The reason, says Dr. Hsu, is that black tea is fermented, a process that neutralizes many of the polyphenols in the black tea. "Black tea is placed in large tanks, exposed to high

temperatures, and then fermented," said Dr. "That process turns the tea black and destroys many of the polyphenols. It tastes good, but many of the protective chemicals are lost. Green tea is still green when you drink it. That shows that the polyphenols are still present in the tea."

To illustrate the very different effects of green versus black tea, Dr. Hsu points to the three big tea-drinking populations -- British, Indian, and Asian. "The British and Indian populations drink a lot of black tea, but they have similar cancer rates as we do in the U.S., but Asians drink green tea and they don't have the same cancer rates as we do."

Interestingly, Dr. Hsu points out that boiling water and then pouring over green tea does not cause any losses of the EGCG or other polyphenols. "Green tea can stand temperatures of up to 120 centigrade without losing its protective polyphenols," says Dr. Hsu. "But if you allow it to sit in water for too long, or you leave it out in the air, then the polyphenols are lost." The best thing to do, he advises, is to brew the tea and then drink it.

Both black and green teas contain, on average, about 45 milligrams (mg.) of caffeine, while coffee ranges from 120 to 200 mg., depending on how it is brewed.

QUALITY MATTERS

Dr. Hsu points out that in order to obtain the maximum amount of polyphenols in the tea, you should be sure to get the highest quality available. Conventional agriculture, with its heavy use of pesticides and herbicides, destroy many of the polyphenols in green tea. Moreover, conventional growing also can introduce heavy metals into the tea, says Dr. Hsu, which further corrupts the tea's health effects. In addition, many green teas are exposed to chemical solvents during processing. These solvents are often

laced in the tea when it finally reaches the consumer.

"The best way is to drink tea that has been organically grown -- that way, you don't get the toxins and the tea is the highest quality," says Dr. Hsu. "It's a little more money, but there is no risk of contamination."

Dr. Hsu points to new products that are providing the highest quality green tea in capsules that offer concentrated amounts of green tea polyphenols, especially EGCG. One such product is KINA® Green Tea Complex, perhaps the highest quality green tea product available on the market today.

KINA® green tea is grown on certified organic farms in Nara, Japan. In fact, the lands where the product is grown have been cultivated only with organic practices since the 9th century. Once harvested, the green tea leaves are crushed between rollers and then subjected to high heat for less than one second. The leaves are crushed again and dried, a process that destroys any enzymes that might lead to fermentation. At that point, the leaves are ground into a fine powder and then stored in capsules. No synthetic chemicals, alcohol, or solvents are used at any point in the entire growing, drying, or processing of the plants.

According to independent research done by Japan Food Research Laboratories, these unique processing methods preserve and concentrate the polyphenols and catechins in green tea, providing as much as 10 grams of polyphenols for every 100 grams of tea. Of those 10 grams, the catechins make up 90 percent. EGCG comprises about 40 percent of those catechins. These are the highest, and the purest, concentrations of catechins and polyphenols in any food source of green tea, KINA reports. KINA representatives recommend that you take the capsules as a supplement, or open them, pour the green tea into a cup, add water and drink.

Given the remarkable health benefits of green tea, products such as KINA® Green Tea Complex will become all the more popular, especially as the research on green tea becomes more widely known.

Still, no matter how you get your green tea catechins -- as a supplement or a standard cup of tea -- the important point is to get them. As the scientists reported in the April 2001 issue of the *Annals of the New York Academy of Sciences*, "Green tea has preventive effects on both chronic inflammatory diseases and lifestyle-related diseases (including cardiovascular disease and cancer), resulting in prolongation of life span." So the next time you're enjoying that pleasant little 'cuppa,' as our British friends like to call it, you can toast a friend, or even yourself, with that old and rather tattered cliché, "To your health," and this time know that it's really true.

Tom Monte is an internationally renowned author and lecturer. His latest book, *Unexpected Recoveries*, was published in 2005.

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