

REPORT

Anti-Cancer Foods and Supplements



Cancer is, perhaps, one of our greatest fears. Compounding our concern about contracting the disease is the fear of treatment. Few medical treatments inflict so much toxicity, mutilation and pain on the human body. Once a diagnosis is made, a person's life will never be the same.

Even when treatment is successful, a person can be disfigured from the effects, and parts of their body destroyed. The chance of a recurrence is ever present and years after successful treatment, cancer can come back even more virulent than before. Even after enduring conventional therapy, a large number of cancer patients still succumb from cancer cells that escaped the initial treatment.

A cancer diagnosis humbles a person of any means. Hospital gowns don't look any better on rich people than they do on poor, and chemotherapy feels the same. The degree of inconvenience, disruption and destruction of not only the ill person's life, but of those around them, should give any person pause to consider what they can do to avoid it.

The National Cancer Institute (NCI) issued an unprecedented number of press releases in the year 2002 stating that diet has a major impact on cancer. Deleting things from one's diet, as well as adding to it makes all the difference. What follows is some of the

research behind the NCI's announcements—research that is convincing mainstream scientists to take another look at the anti-cancer benefits of compounds that occur naturally.

What you choose to eat largely determines whether or not you will get cancer. In his book *Eat to Beat Cancer*, J. Robert Hatherill points out that Japanese smoke like crazy (more than Americans), yet have the world's lowest rate of lung cancer. They also have the greatest life expectancy on earth. Clearly, they're doing something right. While there are many factors that affect longevity, the one that researchers are currently focusing on is diet. We know that diet plays a big role in cancer. It has been estimated that bad diet is responsible for 60% of all cancers. A good diet can prevent 20% to 50% of all cancers, according to most estimates.

What is a "good diet?" Research shows that it's a diet high in plant-based foods (fruits, vegetables, grains, legumes). A "bad diet" is one that's mostly animal-based foods (meat, dairy products) and synthetic food (prepackaged "convenience" food). Plants contain vitamins, minerals and phytochemicals that block, stop and suppress cancer. Animal-based food contains the highest concentration of cancer-causing chemicals that humans are exposed to, along with saturated fat and lots of calories. "Convenience food" is more product than food—full of calories, mostly devoid of nutrition. It's also contaminated with many chemicals that make it look good on the shelf.

Research into diet and cancer is getting so advanced that scientists are beginning to link what a person eats with the type of cancer they get. Other researchers are going the other way: pinpointing specific things in the diet that prevent cancer from occurring. For example, researchers at the University of Utah investigated the connection between carotenoids and colon cancer. They found that lutein, but not other carotenoids, is associated with lower risk. Similarly, researchers in the Netherlands found that folate, vitamin C and beta-cryptoxanthin (but not lutein and other carotenoids) are protective against lung cancer. The information from these kinds of studies is stacking up.

Phytochemicals (naturally occurring in plants) are the main defense against all types of cancer. As an example of how powerful they can be, it was recently estimated that prostate cancer in Greece could be reduced by two-fifths by merely increasing the consumption of two things: tomatoes and olive oil. (Dairy products should be simultaneously decreased, according to the report.) Another group reports that over 51% of ovarian cancers could be avoided if women would eat more green vegetables. This is an amazing figure. It underscores the tremendous impact diet can have on cancer.

Phytochemicals have different actions and different ways of protecting against cancer. Most are antioxidant, in other words, they

scavenge damaging free radicals. This action also protects DNA. Others protect methylation which is critical for the activation of cancer-suppressing genes. Still others enhance immunity or impede the growth of abnormal cells.

Antioxidants and cancer

Human bodies are constantly exposed to chemicals, radiation and other phenomena that generate free radicals. Free radicals rip through cell membranes and slam into DNA, damaging it. Cancer cells are essentially normal cells that contain damaged DNA. Antioxidants stop free radicals and reduce DNA damage. This is why they are a major defense against cancer.



All antioxidants are not all the same. Some are better at stopping certain kinds of free radicals than others. For example, I3C (indole-3-carbinol) and a supplement known as "chlorophyllin" (a semi-synthetic version of chlorophyll) have excellent effects against free radicals generated by chemicals called heterocyclic amines. Heterocyclic amines are created when food, especially meat, is cooked over high heat. Studies show that I3C and chlorophyllin can stop this type of free radical up to 100%.

They can also protect against the highly-carcinogenic mycotoxin known as "aflatoxin." Aflatoxin is produced by a fungus that infects grains, notably corn. In studies on rodents, both I3C and chlorophyllin inhibit liver cancer caused by this toxin. A study from a region of China where the incidence of liver cancer is very high shows that 100 mg of chlorophyllin three times a day reduces DNA damage caused by aflatoxin by 55%. The researchers predict that taking this supplement will push back the onset of this type of cancer from 20 years to 40.

I3C and chlorophyllin work in another related way. They keep the liver from metabolizing carcinogens, including heterocyclic amines. It is the body's own metabolism of the chemicals in its effort to detoxify them that makes them carcinogenic. I3C apparently works through one type of enzyme, while chlorophyllin works through another. A combination of the two may eliminate more radicals than either alone.

Some antioxidants are better at preventing certain types of cancer than others. Vitamin C, for example, can inhibit skin cancer by 25% to 50% when applied directly to the skin. It does not have the same effect against breast or prostate cancer. But lycopene, a flavonoid from tomatoes, has antioxidant activity against prostate cancer. Beta-carotene, a carotenoid, appears to protect against breast cancer, but not against lung cancer. Having this type of information about specific antioxidants can help a person choose one that may target a certain type of cancer, or target a specific type of carcinogen. For those without risk for any particular type of cancer or exposure to any specific chemical, it would be prudent to take a variety of antioxidants in order to block as many types of free radicals as possible.

Carotenoids and cancer

Studies show that people who eat a lot of red, orange, green and yellow vegetables have a significantly decreased risk of various cancers. The protective effect is due to carotenoids. Most people are familiar with the carotenoid beta-carotene, found in carrots. There are, however, hundreds of other carotenoids-some not even discovered yet. There is lutein in spinach, zeaxanthin in corn and lycopene in tomatoes. One of the purposes of carotenoids is to act as sunscreen for the plants they occur in. It's not surprising then, that carotenoids provide antioxidant protection, especially against free radicals generated by radiation.

Lycopene is the most abundant carotenoid in humans. The prostate gland alone contains 14 to 18 different metabolites of lycopene in people who eat tomatoes or other vegetables that contain it. Studies show that men who get the most lycopene in their diet have the lowest risk of prostate cancer. The two largest studies involve 14,000 Seventh-Day Adventists (lacto-ovo vegetarians) and 47,894 American physicians. In the physician study, men with the highest level of lycopene in their blood had a 20% reduction in risk. In the Adventist study, eating tomatoes more than five times a week reduced risk of prostate cancer by 40%. Lycopene is good at protecting lymphocytes from DNA damage. In an Italian study, 7 mg/day of lycopene reduced DNA damage 50% in the first week.

Carotenoids work synergistically. Taking several together is better than taking one alone. In the now infamous study where smokers took beta-carotene supplements and nothing else, risk of lung cancer actually rose. But a 30% reduction was found in a study of 100,000 people who ate a variety of carotenoids on a consistent basis rather than just one. A 60% reduction was found in the same study for non-smokers. It appears that alpha-carotene, not beta-carotene, is the best carotenoid against lung cancer.

Folic acid and cancer

This vitamin has been involved in so many important cancer studies that it stands in a class of its own. Folic acid (the vitamin version of folate) is a B vitamin typically found in certain green vegetables and legumes. Meat contains very little of it. A serving of steak, for example, contains 3% of the RDA, while a serving of broccoli contains 50%.

Folate has powerful cancer preventive effects through its role in maintaining methylation. Methylation has two powerful roles in preventing cancer. First, it is crucial for the repair of mutations. Second it is crucial for the activation and deactivation of genes involved in cancer. Folate is one of the required factors for methylation. Without it, methylation will fail, and cancer will result. Abnormal methylation is present in all cancers, no matter the type. The critical importance of folate, then, becomes apparent.

Lung and colon cancer are the first cancers to be linked to folate deficiency. Breast, prostate and pancreatic cancer involve the deficiency as well. Alcoholism, folate deficiency and breast cancer go together. The same is true for colon cancer-alcoholism exacerbates folate deficiency.

Research into the folate-cancer connection is just beginning. More information about folate's cancer preventive effects will undoubtedly emerge in the next few years.

Flavonoids and cancer

Quercetin, ellagic acid, apigenin and luteolin are powerful anti-carcinogens from plants. These exotic-sounding phytochemicals counteract cancer at its earliest stages. Apigenin, for example, interferes with the way estrogen is metabolized. When apigenin is present, estrogen stays in its weak form, unable to accelerate cancer growth. Luteolin prevents cancer-promoting estrogen from getting into cells. Several of the flavonoids suppress COX-2 (cyclooxygenase), an enzyme that enables cancer to grow and spread. COX-2 has been in the news because it's the enzyme targeted by certain antiinflammatories that inhibit cancer and other degenerative diseases as well.

In addition to these cancer-blocking actions, flavonoids possess powerful antioxidant activity that protects DNA from damage better than vitamin C.

Some flavonoids come from the family of aromatic herbs and shrubs known as labiatae. The labiatae include many of the herbs traditionally regarded as medicinal such as rosemary, mint, lavender and thyme. Labiatae plants provide a concentrated source of flavonoids with anti-cancer properties. Scientific studies are beginning to prove that flavonoids from these plants have very diverse and powerful effects against cancer. For example, in a study on melanoma in mice, apigenin and quercetin were equivalent to tamoxifen in inhibiting metastases. In studies on human leukemia, luteolin and other flavonoids stopped the growth of these cells in culture. Flavonoids can also inhibit enzymes which enable cancer to invade surrounding tissue and spread to other parts of the body.

Cancer-fighting flavonoids are also found in citrus fruit, tea and other plant-based foods. Certain flavonoids in citrus fruit known as polymethoxylated flavonoids work at the molecular level to counteract cancer. Tangeretin, for example, restores cell communication so that cancer can be brought under the body's control. Nobiletin, a similar flavonoid, causes human leukemia cells to differentiate into normal cells. Dozens of studies have been done showing that these flavonoids have powerful and diverse effects against cancer cells. The net effect is to wipe out cancer cells as soon as they appear.



Continued on Page 2 of 2

[Back to the Magazine Forum](#)

REPORT

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Soy



Soybeans contain several types of cancer-fighting phytochemicals. Soy isoflavones are non-steroidal plant compounds that block hormone-related cancers. These so-called "phytoestrogens" actually block estrogen from getting into cells, and prevent hormone-related cancers including prostate and breast cancer. In addition to their hormone-blocking effects, they also have powerful antioxidant activity.

In a large study, men who drank soy milk more than once a day had a 70% reduced rate of prostate cancer. A similar study on women shows that a soy-based diet, including 36 oz. of soymilk a day (113 to 207 mg/day of total isoflavones) reduced levels of 17-estradiol (strong estrogen) by 25%.

Soy isoflavones may protect against bladder cancer. In a recent study, genistein inhibited the growth of eight different types of human bladder cancer cells. Daidzein and other isoflavones caused the cells to self-destruct.

New research shows that phytoestrogens, including soy phytoestrogens, shut down the activation of the estrogen receptor. This receptor is provoked into sending "grow" signals when it encounters chemical estrogens or estradiol (strong estrogen). In other words, people with hormone-related cancers have too many estrogen "doorways" on their cells. This results in a flood of strong estrogen into the cell. This type of estrogen activates proliferation of the cell. Normal cells have far fewer estrogen receptors. Normal cells also have an equal number of a related receptor that phytoestrogens fit into and activate. Cancer cells are missing this phytoestrogen receptor. The phytoestrogen receptor acts as a counterbalance on the estrogen receptor, preventing it from causing growth.

Tea

During the colonial era, most of North America was owned by a monopoly called the East India Company. When the British government, acting on behalf of the monopoly, granted it the exclusive right to sell tea in America, forcing all other merchants out of business, the colonists rebelled. The Boston Tea Party was the opening act of the American Revolution. It's a testament to the power of tea that it was instrumental in creating America. Tea has been used as medicine since at least the Shang dynasty (1766-1122 B.C.).

Modern research confirms that tea has health benefits, notably anti-cancer properties. Most of this research has been done with green tea (which is minimally oxidized), rather than other teas such as black tea. Tea contains several different phytochemicals, including epigallocatechin-3-gallate (EGCG), a polyphenol with proven biochemical actions against cancer. Tea also contains vitamins A, C and E, a unique amino acid known as theanine, carotene, zinc and many other cancer fighting substances.

One of the most striking studies on green tea was done by a group of Japanese researchers on women who had been treated for breast cancer. Analysis six years later of women with stage I or II breast cancer showed that those who drank five or more cups of green tea a day slashed their risk of recurrence almost in half. This is equivalent to approximately 200 to 400 mg of EGCG. Furthermore, the researchers found that the more green tea a woman drank before she got cancer, the fewer metastases to lymph nodes she would have (if she was premenopausal). Women who engage in the Japanese tea ceremony are half as likely to die not only from breast cancer but from any cause, according to researchers who followed them for eight years.

Two new studies show that green tea or EGCG inhibits certain types of leukemia. When cells from adults with T-cell leukemia are treated with green tea polyphenols or EGCG, the cancer stops multiplying. Similarly, when various types of leukemia cells are treated with EGCG, they self-destruct. According to the study's authors, "Besides anticarcinogenic activity, EGCG is expected to have a new function for leukemia therapy without side effects" (referring to EGCG's ability to make existing cancer cells stop growing).

I3C

Indole-3-carbinol stands alone as the most well-studied natural estrogen modulator. Found in cruciferous vegetables such as

cabbage, cauliflower and broccoli, I3C has proven effects against hormone-related cancers.

I3C may be an important tool against environmentally-caused cancer because it can block dioxin from entering cells. Dioxin is a chlorine chemical, known as the most toxic chemical ever created-so toxic it is measured in parts per trillion. The main source of it for most people is meat and dairy products. Popular fast foods such as McDonald's Big Macs® have been found to contain metabolites of dioxin. Dioxin is suspected as a cause (or contributing cause) of breast, prostate, lymphoma and lung cancers.

I3C comes to the rescue by its ability to compete with dioxin for entry into cells. The same receptors, or doorways, that allow estrogen and dioxin into cells, allow I3C as well. When I3C and dioxin are put together with cells, I3C keeps some of the dioxin out by physically blocking the harmful chlorine chemical. This same mechanism also protects cells from strong estrogen that can promote cancer growth.

A recent study shows that treatment with I3C can reverse precancerous conditions of the cervix in humans. I3C may also protect smokers. When I3C was given to rats forced to ingest smoke, DNA damage was reduced over 50% in lungs and trachea, and 65% in the bladder. It also inhibits heterocyclic amines, dangerous carcinogens that form when meat is cooked. One study showed that I3C was up to 95% effective in inhibiting carcinogens. (Note: the recommended dose for I3C is 400 mg for most women and 600 mg for most men, depending on weight).

Zinc

Zinc is crucial for immunity. Thirty days of suboptimal zinc intake causes a 30% to 80% loss of immune defense. Studies show that zinc is important for natural killer (NK) cells to multiply and function. NK cells are the body's first-line defense against certain types of cancer. Supplemental zinc has been shown to increase antibody response and T-cell counts. Zinc deficiency causes the thymus to atrophy: supplements can reverse this.

Zinc status is very much related to infection and disease. People with lymphoma have decreased levels of zinc and increased levels of copper. This trend reverses during remission. Zinc deficiency is prevalent in alcoholism, gastrointestinal disorders and renal disease. Infections appear to reduce zinc levels. And reduced zinc levels appear to increase the chances of getting an infection.

It's impossible to make a blanket recommendation about how much zinc a person should take. Too much zinc is as bad as too little. Too much zinc depresses immunity as surely as too little. Very little research has been done on zinc, and unfortunately, "There is no universally accepted single measure suitable to accurately assess the zinc status of an individual."* Currently, 30 to 50 mg of elemental zinc per day is the recommended amount. However, this is very arbitrary inasmuch as an individual might need different amounts of zinc at different times, depending on their health, age, diet and other factors that affect zinc utilization, absorption and acquisition. As an example of how difficult pinpointing zinc supplementation can be, a study on healthy men showed that 300 mg/day of elemental zinc suppressed immunity. Yet, a study in people over age 70 found that 440 mg of zinc a day significantly increased immunity. One approach is to look at copper levels instead. If copper levels are elevated, or the copper-to-zinc ratio is high, zinc should be taken until the balance normalizes, regardless of whether lab results fall within the "normal" range.

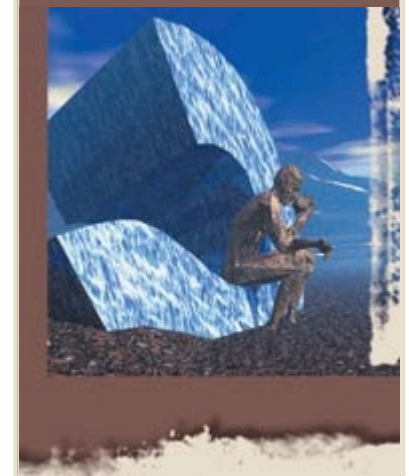
Anti-inflammatories

Non-steroidal anti-inflammatory drugs (NSAIDs) exploded on the scene in 2000 as possible cancer preventive agents. The latest research indicates that NSAIDs, including aspirin, have multiple and diverse actions against the growth and metastasis of cancer cells. Colon cancer has received the most attention. Risk can be slashed 50% by the long-term use of NSAIDs such as ibuprofen. Esophageal, stomach, rectal and bladder cancer risk are also significantly reduced. For breast cancer, 2 to 10 years of NSAIDs reduces overall risk, and reduces the risk of metastases everywhere except nearby lymph nodes.

Aspirin may also reduce risk, but apparently in a different way, and not as strongly. When researchers at the University of Leeds tested aspirin on colon cancer cell lines, it stopped the cells from growing but did not induce apoptosis (cell death). The same cells treated with the NSAID drug indomethacin were growth-arrested and destroyed by apoptosis. Different NSAIDs work differently against cancer cells, and it may turn out that some work better for some types of cancers than others. Combining aspirin with an NSAID may enhance the effectiveness.

Think Prevention

Cancer is the second leading cause of death in America. The time to think about prevention is now. Eliminating chemical exposure (yard sprays, household cleaners, paint, plastic, etc.) as much as possible reduces risk. Changing from a meat-based diet to plant-based food can slash risk by as much as 50%. Certain types of supplements can further reduce risk by terminating cancer before it has a chance to grow and spread.



The natural anti-inflammatory, curcumin, has demonstrated similar and powerful effects against the growth of cancer cells. Some new concerns have been raised about the expensive and highly advertised NSAIDs, Celebrex and Vioxx drugs. According to the drug reference book *Worst Pills, Best Pills*, they may have previously unknown gastrointestinal and cardiovascular side-effects. The manufacturers of both drugs have been warned by the FDA to cease misrepresenting their safety and effectiveness.

One of the interesting properties about anti-inflammatories is that they may conserve the body's antioxidants, particularly the carotenoids. In a study from the UK, 1200 mg/day of ibuprofen helped cancer patients recover their levels of beta-carotene, lutein and lycopene. This phenomenon can be explained by the fact that inflammatory reactions generate free radicals that deplete the body of such plant-derived antioxidants. Anything that suppresses inflammation, be it ibuprofen, fish oil or curcumin, conserves precious antioxidants in the body. Chronic inflammation is related to increased cancer risk, and inflammation enhances the ability of cancer to spread.

Supplements versus food

Food contains all the nutrients the human body needs. And if we eat the right kind of food, we'll get them. The problem is we don't. Some of us, however, are chasing our hot dogs with vitamins in an effort to fortify our diets. That's the approach of the industry that makes food products-they fortify their products with vitamins. It's not the greatest approach, but it's not altogether bad. Vitamins can undo some of our bad habits. They can't replace good diet, but they can have a beneficial effect.



And in fact, sometimes a supplement gets the job done better than a food containing it. The reason is partly due to bioavailability. Bioavailability has to do with the body's ability to utilize a nutrient. The vitamins in food are attached to proteins. They must be separated from those proteins in order to be utilized. Different factors can conspire to impede that process. For example, phytic acid that is found in the hulls of grains like wheat can interfere with the body's absorption of zinc and calcium. Another classic example is the necessity of a stomach chemical known as intrinsic factor for vitamin B12 utilization. And then there's the problem of how various things a person eats interact. A person who dresses their salad with non-fat dressing will not be able to utilize the vitamin K in the leaves of the lettuce: fat must be present for the vitamin to be absorbed. Supplements avoid these problems. Vitamin K supplements, for example, come ready-made with a drop of oil for absorption. The bioavailability problem has been demonstrated in studies showing that if Indonesian women eat a beta-carotene-fortified cracker, more beta-carotene and vitamin A will appear in their blood than if they eat stir-fried vegetables containing beta-carotene.

Folate is another vitamin that seems more bioavailable as a supplement. Research in the UK shows that "intake of folic acid supplements provides a greater elevation in serum folate levels than dietary food intake, suggesting that dietary manipulation is an ineffective strategy (for pregnant women)." This agrees with data from the Nurses' Health Study where folate from food lowered the risk of colon cancer a little, but supplemental folate lowered it significantly.

This highlights one of the other benefits of supplements. They are concentrated and you know how much you're getting (if the supplement is from a reputable company). One of the problems with trying to get enough cancer-fighting nutrients from food is that the sheer amount of vegetables and fruit a person has to consume is daunting if the person wants to get a full spectrum of protection, not just avoid deficiency disease. For example, if a person wanted to cover all the carotenoids every day, they would need to eat green, yellow, orange and red vegetables-all of them. Let's say they also wanted the benefits of I3C (indole-3-carbinol), a phytochemical in cruciferous vegetables, they would have to add cabbage, broccoli, cauliflower or mustard. If they also wanted to cover the citrus flavonoid spectrum, they would also have to eat a wide variety of citrus fruit-and so on. If a person wants to ingest a wide variety of anti-cancer compounds on a daily basis, in a substantial amount, it's more practical to take them in a concentrated form. A person can hold in one hand vitamins found in bushels of vegetables, pounds of soy and mountains of fruit. However, supplements should not replace a good diet. Whole foods contain important and diverse factors that maintain health, and everyone should be eating as much of them as possible. Supplemental vitamins can, however, provide an extra measure of protection. For cancer prevention, this is especially important.

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