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# 11 Cancer Fighting Foods

Say the word “cancer” and a myriad of fears, anxieties, and foreboding arises. And yet, according to the American Cancer Society as many as one-third of all cancer deaths in the United States could be prevented if citizens ate a healthy, balanced diet that emphasized plant foods, and maintained a healthy weight.<sup>1</sup> In the next two issues of this newsletter, we will explore and share clinical information on prostate and breast cancers. So we begin with a list of potentially cancer-fighting foods compiled by the Stanford Health Improvement Program and the YMCA.<sup>2</sup> –SKK

**1. Beans:** Beans contain a number of phytochemicals, which have been shown to prevent or slow genetic damage to cells. While this makes beans beneficial for helping to reduce your risk of many types of cancer, specific research has suggested they are especially potent in preventing prostate cancer. As an added bonus, the high fiber content of beans has been connected with a lower risk of digestive cancers.

**2. Berries:** The two most widely studied cancer-fighting compounds in berries are ellagic acid (richest in strawberries and raspberries) and anthocyanosides (richest in blueberries). Ellagic acid is believed to help prevent skin, bladder, lung, and breast cancers, both by acting as an antioxidant and by slowing the reproduction of cancer cells. The anthocyanosides in blueberries are currently the most powerful antioxidants known to scientists and are beneficial in the prevention of all types of cancer.

## Prostate Cancer in the United States, 2006 Estimates<sup>3</sup>

New cases: 234,460

Deaths per year: 27,350

Five-year relative survival rate for localized stage: 100%

Five-year relative survival rate for all stages combined: 99%

Ten-year relative survival rate for all stages combined: 93%

**3. Cruciferous Vegetables (broccoli, cauliflower, cabbage, kale):** Cruciferous vegetables—like broccoli, cauliflower, cabbage, and kale—are rich in a variety of compounds that have been shown to slow cancer growth and development in a number of laboratory studies. Other larger human studies have shown that cruciferous vegetables can help to reduce the risk of lung, stomach, colorectal, prostate, and bladder cancers.

**4. Dark Green Leafy Vegetables:** Leafy-green vegetables—like romaine lettuce, mustard greens, chicory, and Swiss chard—are rich sources of antioxidants called carotenoids. These compounds scavenge dangerous free radicals from the body before they can promote cancer growth. The vegetables are also rich in folate, a vitamin shown to reduce the risk of lung and breast cancer.

**5. Flaxseed:** Flaxseed in the form of oil and meal contains phytoestrogens believed to reduce the risk of breast, skin, and lung cancer. Research on the potency of flaxseed as an anti-cancer food is still underway.

**6. Garlic (including onions, scallions, leeks, and chives):** Garlic contains a number of compounds believed to slow or stop the growth of tumors. One such compound, diallyl disulfide, appears to be especially potent in protecting against skin, colon, and lung cancer, though it is not known exactly how it functions.

**7. Grapes:** Grapes and wine contain a chemical called resveratrol, which has been shown to be a potent antioxidant and anti-inflammatory agent. Resveratrol is thought to work by preventing cell damage before it begins. Red and purple grapes are the richest sources of resveratrol.

**8. Green Tea (decaf):** Green tea is a rich source of a class of flavonoids known as catechins. Laboratory studies have shown that the catechins present in green tea are able to slow or prevent the development of cancer in colon, liver, breast, and prostate cells.

**9. Soy:** Soy is rich in isoflavones, compounds that have been shown to protect against cancer of the bladder, cervix, lung, and stomach. Soy also contains components that resemble some of the body's natural hormones. These components may be beneficial in preventing breast and prostate cancers.

**10. Tomatoes:** The anti-cancer compound in tomatoes, lycopene, has been shown to be especially potent in combating prostate cancer.

This compound appears to be more easily absorbed if the tomatoes are eaten in processed form—either as tomato sauce, paste, or juice.

In addition to preventing prostate cancer, lycopene may also protect against breast, lung, stomach, and pancreatic cancer.

**11. Whole Grains:** Whole grains contain a variety of anti-cancer compounds, including fiber, antioxidants, and phytoestrogens. When eaten as part of a balanced diet, whole grains can help decrease the risk of developing most types of cancer.

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# Green Tea and Prostate Cancer

The potential effects of green tea consumption, in particular, on prostate cancer are presented. Green tea is rich in polyphenols including the category of flavanols called catechins that are made up of four types:

- Epigallocatechin gallate (EGCG)
- Epigallocatechin (EGC)
- Epicatechin gallate (ECG)
- Epicatechin (EC)

The most studied catechin in regards to prostate cancer is EGCG. There are 129mg/L of EGCG in green tea compared to 16 mg/L in black tea. Green tea also contains more caffeine than dark tea (233mg/L vs. 177mg/L, respectively).<sup>1</sup>

There are a number of proposed mechanisms that inhibit prostate cancer cell growth, none of which are known to be the principal influence. Green tea catechins have been found to do the following:

- Stimulate cell apoptosis (programmed cell death) by inhibiting fatty acid synthase (FAS) an enzyme that is over-expressed in a variety of human malignancies<sup>2</sup>
- Inhibit angiogenesis<sup>3</sup>
- Anti-inflammatory properties that inhibit COX 1, 2, IL-1,6, leukotrienes and nitric oxide synthetase<sup>4</sup>
- Lower cholesterol, a building block of androgens, due to its rich content of beta-sitosterol<sup>5</sup>
- Reduce oxidative DNA damage, lipid peroxidation, and free radical generation<sup>6</sup>

- Prevent P53 gene expression (associated with more aggressive prostate cancer (PC))<sup>7</sup>

Green tea catechins are one of the few nutrients to inhibit tumorigenesis once the tumor has been initiated. They also destroy cultured prostate cancer cells while not harming normal prostate cell growth *in vitro*.<sup>8</sup>

In mice given a prostate cancer cell line that closely resembles human disease, the equivalent of 6 glasses of green tea daily was found to almost completely inhibit metastasis of tumor to distant organ sites while inhibiting prostate cancer cell growth and new cancer development.<sup>9</sup>

This is great if you are a rat, unfortunately limited human studies have been done. Epidemiological studies have been mixed and have evaluated populations who consumed mainly black tea, which contains fewer catechins. It is not known if there is an advantage to taking green tea leaf in supplement form compared to drinking the tea.

A recent trial of 60 volunteers with high-grade intraepithelial neoplasia, however, ingested green tea capsules 200 mg three times daily. These capsules contained whole plant and thus included all of the catechins, not just EGCG. After one year only 3% of the treated group developed PC compared to 30% in the placebo group. The treatment group also had an improved quality of life and longer latency to tumor detection.<sup>10</sup> Most of the side effects noted in this study came from the caffeine content and included fatigue and GI distress. (See Box: Decaffeination and Polyphenol Content). Human trials have not

been conducted with decaffeinated forms or with isolated catechins such as EGCG.

Until these human trials are completed, it is recommended that the patient use *Camellia sinensis* in tea form or consume the whole tea leaf as a supplement with all the catechins included. Just as we learned about the potential harms of prescribing one isolated component of vitamin E (alpha tocopherol) in high doses,<sup>11</sup> there could also be a similar concern with using one catechin such as EGCG in high amounts. As with most plant products, it is beneficial to incorporate the whole plant/food to allow for potential synergy of all of its components.

– DR

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## Origins of Tea

Legends abound about how tea originated. One of the earlier tales recounts a mythical emperor (5,000 years ago), Shen Nung, who drank boiling water into which a wild tea leaf had fallen and consequently, was the first to taste the beverage.

Another legend tells that a tea bush sprang up when a Buddhist monk cut off his eyelids to keep from falling asleep while meditating—this tale may have been inspired by the Buddhists' heavy use of tea.<sup>1</sup>

*Camellia sinensis* (L.) Kuntze is the plant from which white, green, oolong, and black tea is prepared. The cradle of the tea plant is a region that encompasses eastern and southern China, northern Myanmar, and Assam in northeastern India. Spontaneous (wild) growth of the assamica variant is observed in an area ranging from the Indian state of Assam to the Chinese province Yunnan and the northern part of Myanmar. The variant *sinensis* grows naturally in eastern and southeastern regions of China. In Myanmar, for example, there are tribes who still prepare a beverage and a type of "tea salad" where the leaves are fermented underground for several months



and then mixed with mushrooms, oil, garlic, chili peppers, and other ingredients. Some surmise that the tea plant originated in Myanmar and spread to China by the Han period (206 BC to AD 221).<sup>2,3</sup>

Chinese food culture gave rise to an array of teas from the *Camellia sinensis* plant. The most commonly known are white, green, oolong, and black tea.

–SKK

## Clinical Pearl

### Decaffeinated Tea & Polyphenol Content

The process used in decaffeinating green tea influences how much polyphenols are retained in the product. Look for a product that is decaffeinated using the process called "effervescence" that uses water and carbon dioxide. This retains 90% of the polyphenols compared to the process that utilizes the solvent ethyl acetate for decaffeination, which only retains about 30% polyphenols.

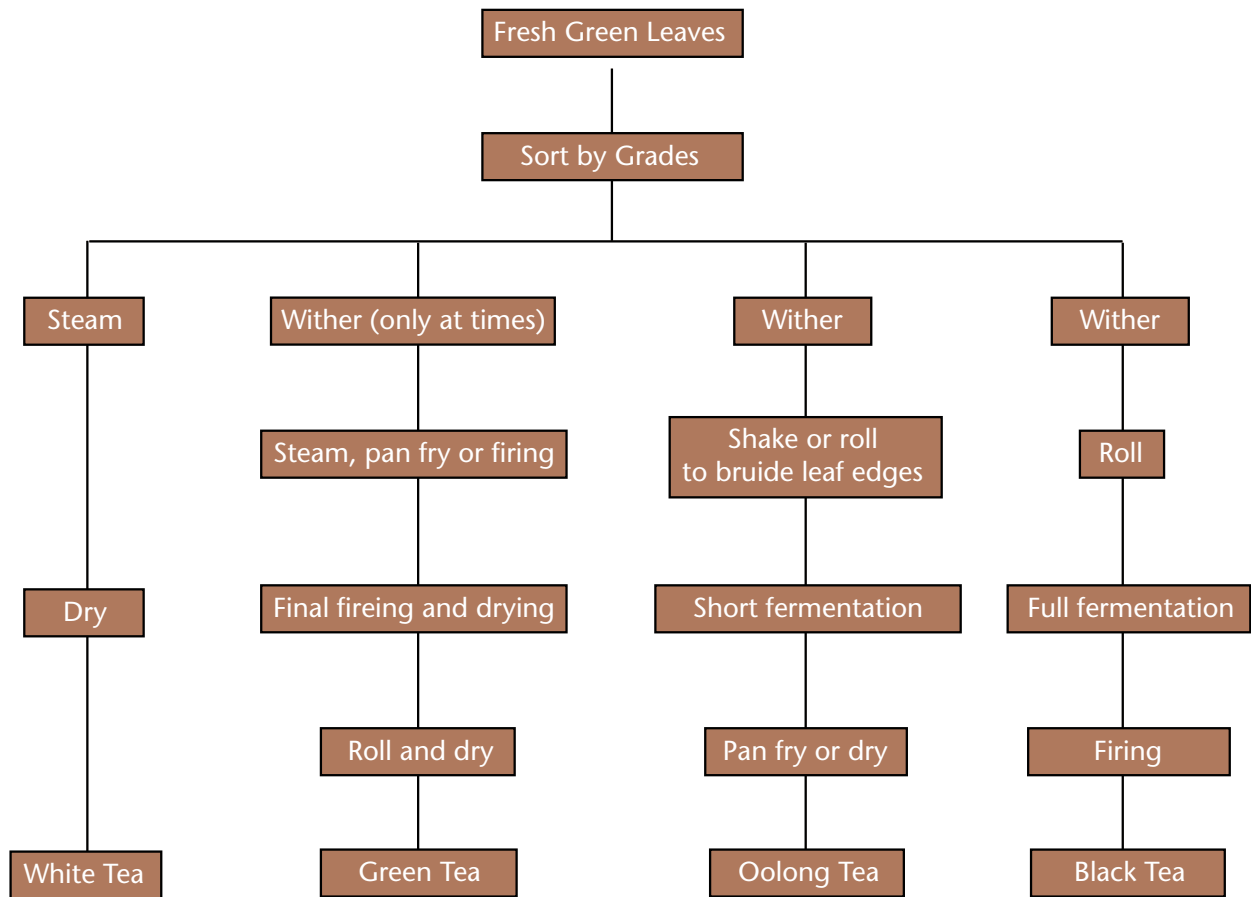
You can decaffeinate your own tea by using your tea bag twice. Most of the caffeine is released in the first cup of tea, with much less in the second. If you pour out the first cup and only drink the second, there will be much less caffeine. Unfortunately, there is also fewer polyphenols in the second cup.<sup>13</sup>

- Decaffeinated green tea loses some polyphenols in the processing of the tea and may not be as potent as tea made from non-decaffeinated leaves.
- The polyphenols in green tea can reduce the absorption of iron from food sources. Placing lemon juice in the green tea can help prevent this since it contains citric acid that enhances iron absorption.
- If using green tea extracts, look for ones that are standardized to at least 25% polyphenols and prescribe 600 mg daily in divided doses if using therapeutically.
- There is potential for hepatotoxicity with regular use of high dose green tea extracts.<sup>12</sup> Follow liver function tests if a green tea extract is being used for extended periods of time.
- For prevention, encourage regular consumption of green tea. Three cups a day provides about 240-320 mg of polyphenols and about 90 mg of caffeine (one cup ~ 30 mg of caffeine, one cup coffee ~ 100 mg) Caffeine content in three cups of green tea equals caffeine content in one cup of coffee.

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# Tea Processing Flow Chart



Reproduced from [http://www.planRT-tea.com/what\\_is\\_tea.html#](http://www.planRT-tea.com/what_is_tea.html#)

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## What's so great about broccoli?

"Eat your broccoli!" Most of us didn't, and perhaps don't want to now. But our mothers were very wise! Pratt and Matthews (2006) designated broccoli a super food in their book *Superfoods Health Style*.<sup>1</sup> So what is so great about broccoli?

Broccoli is a highly nutritious plant that belongs to the cruciferous family (also called Brassica). The cruciferous plant family includes broccoli, Brussels sprouts, cabbage, cauliflower, and kale. As the plant grows, a cross is formed by the overlapping leaves of the plant, thus the reason for the name "cruciferous".

Broccoli and crucifers in general, have received a significant amount of press for the prevention and treatment of cancer. In many studies, crucifers decrease risk of cancer by 29-70% (Keck). These vegetables contain glucosinolates which when hydrolyzed in the body, form indoles and isothiocyanates (ITCs), chemicals that occur in many plants, but especially in the cruciferous family. These chemicals prevent cancer cells from growing, and inhibit the proliferation of cancer cells that already exist. They act by increasing cancer-inhibiting enzymes, decreasing cancer activating enzymes, increasing cancer cell death, and decreasing the progression of cancer cell growth.<sup>2,3</sup> Broccoli contains the ITC called sulforaphane, and all crucifers contain the ITC called indole-3-carbinol. Cruciferous vegetables grown in selenium-rich soil have the added benefit of high selenium content. Selenium is a powerful anti-oxidant that prevents oxidative stress, which creates unstable molecules called free radicals that damage cells and can lead to cancer.<sup>2</sup>

Plant-based diets high in fruits and vegetables are now recommended by the National Cancer Institute for the prevention of cancer, and are important during the treatment of cancer. Other key measures in the prevention of cancer are maintaining normal weight, exercising daily, ingesting a diet high in omega-3 fatty acids, and regulating alcohol intake (1 alcoholic drink/day for women, 2 for men). Five to nine daily servings of fruits and vegetables are recommended with one serving of cruciferous vegetables daily.

Can these nutrients be taken in a pill? Yes, but food is best. Food is more available for absorption, and it works synergistically in the body. Other nutrients in vegetables such as antioxidants and fiber are also important for health.

Can cruciferous vegetables taste good? Preparation of any food can make the difference in how good it tastes. I recommend combining a variety of vegetables in soups and salads. Broccoli steamed and added to tomato sauce with mushrooms, garlic, and onions tastes great over whole grain pasta. Cut the broccoli into very small pieces, and the other flavors in the sauce will make the broccoli (or cauliflower) taste delicious. Keep it simple. Frozen or fresh broccoli can be used. One may also lightly steam broccoli or cauliflower for use on salads. Small pieces might be more appealing in a salad or soup filled with all the ingredients you love. Add fruit, nuts, seeds, and healthy low-fat salad dressing to a variety of dark leafy vegetables for a nutrient-packed salad. Add beans to vegetables in soup. Cauliflower is delicious mashed with garlic and high quality extra virgin olive oil. Brussels sprouts are



tasty grilled. Steamed cabbage can hold a combination of grains, other vegetables, and lean meats—a vegetable leaf burrito! You may find that when you get creative with these veggies, that you may actually love them. And don't forget to invite your mom to dinner!

– LM

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## Recipe: No-Fuss Broccoli Soufflé

*This recipe works well with cauliflower, spinach, or Brussels sprouts; simply substitute the same amount of any of these vegetables for broccoli.*

### Ingredients:

20 ounces broccoli spears, frozen, thawed, and drained,  
or 1 large head, broken into florets, blanched until  
tender, and drained

4 egg whites or 4 ounces nonfat pasteurized egg  
product (such as EggBeaters)

1/3 cup grated Parmesan cheese

1/4 teaspoon of Cayenne

1/3 teaspoon salt

Freshly ground pepper

1 teaspoon olive oil or olive oil-based cooking spray

Serves: 4

### Directions:

Puree broccoli in food processor until no large chunks remain. Add remaining ingredients, except olive oil, and puree until very smooth. Rub interior of four 4- to 6-ounce ramekins (small ceramic bowls) with olive oil to evenly coat. Fill with broccoli mixture, then pat down and smooth out surface with rubber spatula so it is flat and firmly packed. Microwave individually for 6 to 8 minutes on high until center is set and firm. Run paring knife around the sides of ramekins to loosen soufflé for easy removal. Carefully invert each mold and serve hot or at room temperature.

For lighter soufflé, whip egg whites separately until soft peaks form. Fold egg whites into seasoned, pureed broccoli mixture and continue as directed.

For creamier soufflé add 1 medium cooked potato to broccoli mixture, and puree until smooth.

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Reproduced from *The Strang Cookbook for Cancer Prevention*, Pensiero, R.D., Oliveria, Sc.D., M.P.H., Osbourne, M.D.Dutton, Published by the Penguin Group, New York, 1998.

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# Foodways Focus: The Brassica/Mustard Family

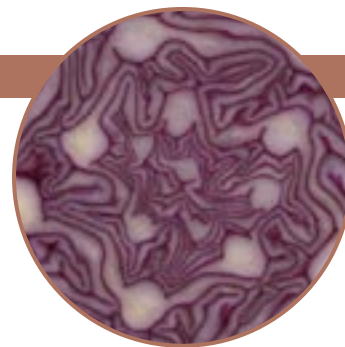
Wild cabbage, native of the Mediterranean, Southwestern Europe, and Southern England, thrived along the ocean. This uncultivated species does not resemble the cabbage we purchase in markets today. Unlike the familiar round head that distinguishes cultivated cabbage, the wild cabbage has stalks with a few leaves and flowers. Botanists estimate that agriculturalists cultivated cabbage from a few hundred to a few thousand years before the Common Era.

Wild cabbage is a parent of many cultivated plants from the Brassica or Cruciferous family including broccoli, Brussels sprouts, cabbage, cauliflower, collards, kale, and kohlrabi. The domesticated cabbage (*Brassica oleracea* var. *capitata*) is made up of large leaves that form a compact globular head. There are

three major types of cabbage, for example, smooth layered green, red, and a Savoy cabbage, which has finely crimped leaves that form a looser head than the previous two.<sup>2</sup> In the United States, Wisconsin produces more cabbage than any other state; the crop is mainly used in the production of sauerkraut.<sup>3</sup>

There are also many Asian crucifers that include compact headed Chinese cabbage or *Brassica pe-tsai*, and other forms with loose rosettes such as wong bok and chihli. A popular Asian crucifer known as bok-choi (*Brassica chinensis*) is widely used in Chinese stir fry dishes.<sup>6</sup>

Today, there are a large variety of Brassica species that span the Americas, Europe, the Mediterranean, South Asia, Asia, and Africa. In fact, a creative cook can not only experiment



with these different varieties but can also taste the different culinary traditions that give rise to sauerkraut on your Reuben, wasabi on your sushi, mustard oil used in South Asian pickles, sautéed collard greens in vinegar, fermented Kimchi with your rice, boiled turnips with salt, and baked cauliflower with cheese. So start cooking and enjoy tasting culture!

– SKK

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The Brassica Family <sup>8</sup> Selected Species		
Crop	Scientific Name Genus/Species/Variety	Native Region
<i>Leaves, stems, or roots</i>		
Bok-choi	<i>Brassica chinensis</i>	Asia
Broccoli	<i>Brassica oleracea</i> var. <i>botrytis</i>	Europe
Brussels sprouts	<i>Brassica oleracea</i> var. <i>gemmifera</i>	Europe
Cabbage	<i>Brassica oleracea</i> var. <i>capitata</i>	Mediterranean
Cauliflower	<i>Brassica oleracea</i> var. <i>cauliflora</i>	Europe
Chinese cabbage	<i>Brassica Pe-tsai</i>	Asia
Collard	<i>Brassica oleracea</i> var. <i>acephala</i>	Mediterranean
Kale	<i>Brassica oleracea</i> var. <i>acephala</i>	Mediterranean
Kohlrabi	<i>Brassica oleracea</i> var. <i>gongyloides</i>	Mediterranean
Radish	<i>Raphanus sativus</i>	Western Asia
Rutabaga	<i>Brassica napus</i>	Europe
Turnip	<i>Brassica campetris</i>	Eurasia
<i>Spices and Herbs</i>		
Horseradish	<i>Armoracia rusticana</i>	Eurasia
Mustard	<i>Brassica juncea</i> <sup>9</sup>	Asia
	<i>Brassica nigra</i>	Mediterranean
	<i>Sinapsis alba</i>	Mediterranean
<i>Vegetable Oils</i>		
Canola/Rape	<i>Brassica rapa</i>	Mediterranean



Wild Cabbage<sup>1</sup>



Red Cabbage<sup>4,5</sup>



Brassica Pe-tasi  
(Bok-choi)<sup>7</sup>



# Beyond the Box: Match the Phytochemical with the food

- |                         |                                    |
|-------------------------|------------------------------------|
| <b>1. Berries</b>       | <b>A. glucosinolates</b>           |
| <b>2. Broccoli</b>      | <b>B. allyl sulfur compounds</b>   |
| <b>3. Carrots</b>       | <b>C. quercetin</b>                |
| <b>4. Chili peppers</b> | <b>D. betacarotene</b>             |
| <b>5. Garlic</b>        | <b>E. anthocyanins</b>             |
| <b>6. Green tea</b>     | <b>F. curcumin</b>                 |
| <b>7. Onions</b>        | <b>G. capsaicin</b>                |
| <b>8. Turmeric</b>      | <b>H. epigallocatechin gallate</b> |

1. E. 2. A 3. D 4. G 5. B 6. H 7. C 8. F

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Production of this newsletter is made possible through an unrestricted grant from Standard Process, Inc.

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