What's New and Beneficial About Spinach

Bright, vibrant-looking spinach leaves are not only more appealing to the eye but more nourishing as well. Recent research has shown that spinach leaves that look fully alive and vital have greater concentrations of vitamin C than spinach leaves that are pale in color. The study authors suggest that the greater supply of vitamin C helps protect all of the oxygen-sensitive phytonutrients in the spinach leaves and makes them looking vibrant and alive.
Many people are concerned about the nutrient content of delicate vegetables (like baby spinach) when those vegetables are placed in clear plastic containers in grocery store display cases and continuously exposed to artificial lighting. One recent food study has shown that you don't need to worry about the overall status of antioxidants in baby spinach that has been stored and displayed in this way. In this scientific study, the overall nutrient richness of the baby spinach when exposed to constant light was actually higher than the overall nutrient richness of baby spinach leaves kept in total darkness. The period of time in the study was 9 days, and the spinach was kept at 39°F/4°C (a temperature on the lower end of the scale for most home refrigerators). These findings are good news for anyone purchasing baby spinach in "ready-to-eat" containers.

One new category of health-supportive nutrients found in spinach is called "glycoglycerolipids." Glycoglycerolipids are the main fat-related molecules in the membranes of light-sensitive organs in most plants. They're indispensable for the process of photosynthesis carried out by plants. However, recent lab research in laboratory animals has shown that glycoglycerolipids from spinach can help protect the lining of the digestive tract from damage — especially damage related to unwanted inflammation. You can expect to see more studies about this exciting new category of molecules in spinach and its potential health benefits.

In a recent study on the relationship between risk of prostate cancer and vegetable intake — including the vegetables spinach, broccoli, cauliflower, cabbage, Brussels sprouts, mustard greens, turnip greens, collards, and kale — only spinach showed evidence of significant protection against the occurrence of aggressive prostate cancer. ("Aggressive prostate cancer" was defined as stage III or IV prostate cancer with a Gleason score of at least 7. Gleason scores are based on lab studies of prostate tissue and common tumor-related patterns.) The study authors did not speculate about specific substances in spinach that may have been involved in decreased prostate cancer risk. However, we know that certain unique anti-cancer carotenoids—called epoxyxanthophylls — are plentiful in spinach, even though they may not be as effectively absorbed as other carotenoids like beta-carotene and lutein. You can count on seeing future research on neoxanthin and violaxanthin — two anti-cancer epoxyxanthophylls that are found in plentiful amounts in the leaves of spinach.
WHFoods Recommendations

Among the World's Healthiest vegetables, spinach comes out at the top of our ranking list for nutrient richness. Rich in vitamins and minerals, it is also concentrated in health-promoting phytonutrients such as carotenoids (beta-carotene, lutein, and zeaxanthin) and flavonoids to provide you with powerful antioxidant protection. Enjoy baby spinach in your favorite salads or make a salad made exclusively of baby spinach. Spinach is one of only three vegetables that we recommend boiling to help reduce its concentration of oxalic acid. We recommend boiling for just 1 minute to minimize loss of nutrients and flavor. For more on the Healthiest Way of Cooking Spinach, see the How to Enjoy section below.

Foods belonging to the chenopod family—including beets, chard, spinach and quinoa—continue to show an increasing number of health benefits not readily available from other food families. The red and yellow betalain pigments found in this food family, their unique epoxyxanthophyll carotenoids, and the special connection between their overall phytonutrients and our nervous system health (including our specialized nervous system organs like the eye) point to the chenopod family of foods as unique in their health value. While we have yet to see large-scale human studies that point to a recommended minimum intake level for foods from this botanical family, we have seen data on chenopod phytonutrients, and based on this data, we recommend that you include foods from the chenopod family in your diet 1-2 times per week. In the case of a leafy food like spinach, we recommend a serving size of at least 1/2 cup, and even more beneficial, at least one full cup.

Health Benefits

We all know that Popeye made himself super strong by eating spinach, but you may be surprised to learn that he may also have been helping to protect himself against inflammatory problems, oxidative stress-related problems, cardiovascular problems, bone problems, and cancers at the same time.

Anti-Inflammatory and Anti-Cancer Benefits from Spinach Phytonutrients
Even though virtually all vegetables contain a wide variety of phytonutrients—including flavonoids and carotenoids—spinach can claim a special place among vegetables in terms of its phytonutrient content. Researchers have identified more than a dozen different flavonoid compounds in spinach that function as anti-inflammatory and anti-cancer agents. (Some of these substances fall into a technical category of flavonoids known as methylenedioxyflavonol glucuronides.) The anticancer properties of these spinach flavonoids have been sufficiently impressive to prompt researchers to create specialized spinach extracts that could be used in controlled laboratory studies. These spinach extracts have been shown to slow down cell division in human stomach cancer cells (gastric adenocarcinomas), and in studies on laboratory animals, to reduce skin cancers (skin papillomas). A study on adult women living in New England in the late 1980s also showed intake of spinach to be inversely related to incidence of breast cancer.

Excessive inflammation, of course, typically emerges as a risk factor for increased cancer risk. (That's why many anti-inflammatory nutrients can also be shown to have anti-cancer properties.) But even when unrelated to cancer, excessive inflammation has been shown to be less likely following consumption of spinach. Particularly in the digestive tract, reduced inflammation has been associated not only with the flavonoids found in spinach, but also with its carotenoids. Neoxanthin and violaxanthin are two anti-inflammatory epoxyxanthophylls that are found in plentiful amounts in the leaves of spinach. While these unique carotenoids may not be as readily absorbed as carotenoids like beta-carotene or lutein, they still play an important role in regulation of inflammation and are present in unusual amounts in spinach.

Decreased risk of aggressive prostate cancer is one health benefit of spinach consumption that should not be overlooked when talking about the anti-cancer properties of spinach. "Aggressive prostate cancer" is defined as stage III or IV prostate cancer which carries with it a Gleason score of at least 7. (Gleason scores are prostate cancer rating measurements that require lab studies of prostate tissue and evaluation of common tumor-related patterns.) Interestingly, in a recent study that evaluated possible prostate cancer-prevention benefits from a variety of vegetables including spinach, broccoli, cauliflower, cabbage, Brussels sprouts, mustard and turnip greens, collards, and kale — only spinach showed evidence of significant protection against the occurrence of aggressive prostate cancer.

**Antioxidant Benefits of Spinach**
Most of the flavonoid and carotenoid nutrients found in spinach that provide anti-inflammatory benefits provide antioxidant benefits as well. Given the fact that spinach is an excellent source of other antioxidant nutrients — including vitamin C, vitamin E, beta-carotene, and manganese — as well as a very good source of the antioxidant zinc and a good source of the antioxidant selenium — it's no wonder that spinach helps lower risk of numerous health problems related to oxidative stress. Our blood vessels, for example, are especially susceptible to damage from oxidative stress, and intake of spinach has been associated with decreased risk of several blood vessel-related problems, including atherosclerosis and high blood pressure. (Interestingly, the blood pressure benefits of spinach may be related not only to its antioxidants, but also to some of its special peptides. Peptides are small pieces of protein, and researchers have discovered several peptides in spinach that can help lower blood pressure by inhibiting an enzyme called angiotensin I-converting enzyme.)

Two of the carotenoids that are especially plentiful in spinach — lutein and zeaxanthin — are primary antioxidants in several regions of the eye, including the retina and the macula. Although we haven't seen specific studies on spinach intake and prevention of eye-related problems like macular degeneration, we have seen studies showing that human blood levels of lutein can be increased by consumption of spinach in everyday amounts. We've also seen at least one group of researchers suggesting that spinach has a likely role to play in prevention of eye problems, including age-related macular degeneration.

Helping You Bone Up

The vitamin K provided by spinach — almost 200% of the Daily Value in one cup of fresh spinach leaves and over 1000% of the Daily Value in one cup of boiled spinach (which contains about 6 times as much spinach)—is important for maintaining bone health. Vitamin K1 helps prevent excessive activation of osteoclasts, the cells that break down bone. Additionally, friendly bacteria in our intestines convert vitamin K1 into vitamin K2, which activates osteocalcin, the major non-collagen protein in bone. Osteocalcin anchors calcium molecules inside of the bone. All of these vitamin K-related mechanisms point to the importance of vitamin K-rich foods for bone health, and it is difficult to find vegetables that are richer in vitamin K than spinach. (On our World’s Healthiest Foods list, only kale provides more micrograms of vitamin K per cup.) Spinach is also an excellent source of other bone-supportive nutrients including calcium and magnesium.
So while spinach probably won't make you super strong the minute you eat it, as it did for Popeye, it will promote your health and vitality in many other ways. It seems like Popeye was pretty smart after all.

**Description**

Calorie for calorie, leafy green vegetables like spinach with its delicate texture and jade green color provide more nutrients than any other food. Although spinach is available throughout the year, its season runs from March through May and from September through October when it is the freshest, has the best flavor, and is most readily available. Spinach belongs to the same family (Amaranthaceae-Chenopodiaceae) as Swiss chard and beets and has the scientific name, Spinacia oleracea. It shares a similar taste profile with these two other vegetables, having the bitterness of beet greens and the slightly salty flavor of Swiss chard.

Popeye popularized spinach, but it's too bad he ate it out of a can. Fresh spinach retains the delicacy of texture and green color that is lost when spinach is processed. Raw spinach has a mild, slightly sweet taste that can be refreshing in salads, while its flavor becomes more acidic and robust when it is cooked.

There are three different types of spinach generally available. Savoy has crisp, creased curly leaves that have a springy texture. Smooth-leaf has flat, unwrinkled, spade-shaped leaves, while semi-savoy is similar in texture to savoy but is not as crinkled in appearance. Baby spinach is great for use in salads owing to its taste and delicate texture.

**History**

Spinach is thought to have originated in ancient Persia (Iran). Spinach made its way to China in the 7th century when the king of Nepal sent it as a gift to this country. Spinach has a much more recent history in Europe than many other vegetables. It was only brought to that continent in the 11th century, when the Moors introduced it into Spain. In fact, for a while, spinach was known as "the Spanish vegetable" in
England.

Spinach was the favorite vegetable of Catherine de Medici, a historical figure in the 16th century. When she left her home of Florence, Italy, to marry the king of France, she brought along her own cooks, who could prepare spinach the ways that she especially liked. Since this time, dishes prepared on a bed of spinach are referred to as "a la Florentine."

Spinach grows well in temperate climates. Today, the United States and the Netherlands are among the largest commercial producers of spinach.

**How to Select and Store**

Choose spinach that has vibrant deep green leaves and stems with no signs of yellowing. The leaves should look fresh and tender, and not be wilted or bruised. Avoid those that have a slimy coating as this is an indication of decay.

Do not wash spinach before storing as the exposure to water encourages spoilage. Place spinach in a plastic storage bag and wrap the bag tightly around the spinach, squeezing out as much of the air as possible. Place in refrigerator where it will keep fresh for up to 5 days.

Avoid storing cooked spinach as it will not keep very well.

**Tips for Preparing and Cooking**

**Tips for Preparing Spinach**
Spinach should be washed very well since the leaves and stems tend to collect sand and soil. Before washing, trim off the roots and separate the leaves. Place the spinach in a large bowl of tepid water and swish the leaves around with your hands as this will allow any dirt to become dislodged. Remove the leaves from the water, empty the bowl, refill with clean water and repeat this process until no dirt remains in the water (usually two to three times will do the trick). Do not leave spinach soaking in the water as water-soluble nutrients will leach into the water.

Spinach sold in bags has been pre-washed and only needs to be rinsed. If you are going to use it in a salad, dry it using a salad spinner or by shaking it in a colander.

The Healthiest Way of Cooking Spinach

Spinach is only one of three vegetables we recommend boiling to free up acids and allow them to leach into the boiling water; this brings out a sweeter taste from the spinach. Discard the boiling water after cooking; do not drink it or use it for stock because of its acid content.

Use a large pot (3 quart) with lots of water and bring to a rapid boil. Add spinach to the boiling water and boil for 1 minute. Begin timing as soon as you place the spinach in the pot if you are using 1 pound or less of spinach. If you are cooking larger quantities of spinach bring the water back to a boil before beginning timing the 1 minute. Do not cover the pot when cooking spinach. Leaving the pot uncovered helps to release more of the acids with the rising steam. Research has shown that the boiling of spinach in large amounts of water helps decrease the oxalic acid content by as much as 50%.

Remove spinach from pot, press out liquid with a fork, place in a bowl, toss with our Mediterranean Dressing, and top with your favorite optional ingredients.

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