

Blueberries

"Their role in health"



Overview

- **Blueberries** are the common name for the group of flowering plants in the genus *Vaccinium*, section *Cyanococcus*.
- Other sections in the genus, native to other parts of the world like Europe, include other wild shrubs which produce edible berries, such as **cranberries**, **bilberries**, and **cowberries**. These berries are also known for having important health benefits.
- Blueberries are both cultivated and picked wild. In North America, *V. corymbosum* (aka Northern Highbush Blueberry) is the most common cultivated species.

Usage and Popularity

- Blueberries are used in jellies, jams, and pies. They are baked into muffins and are an ingredient in many other snacks and delicacies.
- A more recent use of blueberries includes blueberry juice which has now entered the market and is considered a whole new category of juice on the beverage aisle.
- Blueberries have increasingly gained attention; USDA reports indicate that between the years of 1994 and 2003, annual U.S. consumption of fresh blueberries rose approximately 1.6 times.
- This gain in attention is likely due to the increased recognition of the potential human health benefits of regular blueberry consumption.



What are Phytochemicals?

Phytochemicals, commonly referred to as phytonutrients, are naturally-occurring non-nutritive (not required in the diet like nutrients) constituents of fruits and vegetables. They are said to be bioactive and are considered to have a beneficial effect on human health.

The health benefits of blueberries are believed to be due to the diverse range of phytochemicals contained within them, giving rise to the following biological properties:

- Antioxidant
- Anticancer
- Anti-neurodegenerative
- Anti-inflammatory

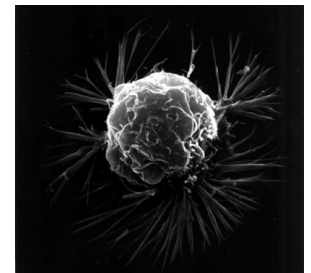
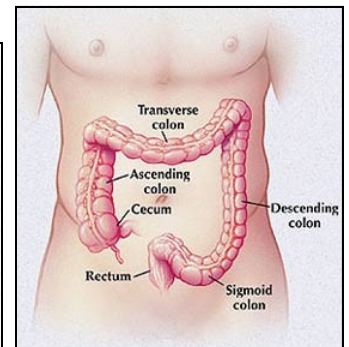
Because of these properties, many studies have been conducted in order to further explore the potential relationship between the components found in blueberries and disease.

Cancer Risk

Overview: Berry fruits, particularly blueberries, have been under recent investigation in regards to their role in cancer prevention. Several different cancers have been investigated, including oral, breast, colon and prostate cancers.

Reporting the Studies

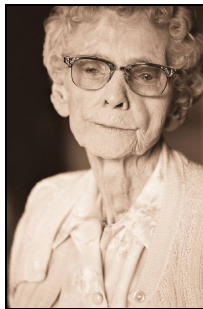
- One study evaluating the ability of 6 different berry extracts (including blueberry extract) to inhibit the growth of human oral, breast, colon and prostate tumor cell lines at differing concentrations (25 to 200 $\mu\text{g}/\text{ml}$) found all extracts to be concentration dependent. The greater the concentration of berry extract, the greater the inhibition of cell proliferation in all cell lines observed, translating to lower risks for cancer.
- Another *in vitro* study looked at the effects of 10 different extracts of fruits and berries on cell proliferation of colon cancer cells HT29 and breast cancer cells MCF-7. This study also found the effects of these extracts to be concentration dependent and noted that of the 10 extracts tested (at the highest concentration used), blueberry extract exhibited the greatest effects on colon cancer cells.
- In order to determine which component of blueberry extract is most responsible for these anticancer properties observed among several *in vitro* studies, one study separated blueberry extract based on phenolic compounds known to be present. This separation resulted in 4 different fractions: the flavanol, tannin, phenolic acid, and Anthocyanin fractions. Although all four fractions did show inhibition of cell proliferation, the Anthocyanin fractions were shown to be the strongest, inhibiting cancer cell proliferation at much lower concentrations than the other fractions.



To clarify, an *in vitro* study is a study that takes place in an artificial environment outside the living organism.

Heart Disease Risk

It is known that regular consumption of fruits and vegetables lowers the risk for developing heart disease. A study examined the effects of **blueberry consumption** in relation to heart disease risk. Participants (chronic cigarette smokers) consumed either 250 grams of blueberries a day for three weeks or one dose of 250 grams of fruit. Several markers of oxidative stress were examined along with a marker of antioxidant potential. A significant decrease in one marker of oxidative stress was found among those who consumed fruit on a daily basis but not in those with one dose. This suggests that in order to obtain the greatest level of benefits comes from regular consumption.



Alzheimer's Risk

The consumption of **blueberries** is also believed to possibly play a role in delaying the development of neurodegenerative diseases, such as Alzheimer's disease. There have been several studies in laboratory animals that show promising results.

One study fed blueberry extracts to laboratory animals for 8 weeks. After the 8-week feeding, the researchers noted a reversal of age-related deficits in both neuronal signaling and behavioral parameters. Although the researchers believed that the improvements seen were due to the polyphenols in the blueberry (BB) extract, it was not evident whether or not these phytonutrients entered the brain.

A further study for 8-10 weeks on spatial learning and memory measures was repeated. Results showed that several anthocyanins were found in the brain and there was a positive relationship between spatial learning/memory and anthocyanin content of the cortex. Researchers concluded that the polyphenols can enter the brain.

GI Health

The consumption of phenolic compounds in berries has also been suggested to play a role in gastrointestinal (GI) health. One study found that these compounds inhibited the growth of several intestinal pathogens, such as *Salmonella* and *Staphylococcus*. Another study examined the effect of six different berries (raspberries, strawberries, cranberries, elderberries, blueberries, and bilberries) on inhibiting the growth of *Helicobacter pylori*. *H. pylori* is a bacterial infection that can become serious if left untreated. It has the potential to progress to gastritis (irritation and inflammation of the lining of the stomach), peptic ulcer disease [PUD] (characterized by sores in the stomach or the duodenum) and possibly even stomach cancer later in life. This particular study was done in order to determine the effects of the berries alone and also in combination with a drug, clarithromycin, which *H. pylori* can become resistant to. The study found that, when compared with the controls, all berries significantly inhibited growth of *H. pylori*, and that the berry extracts also increased the susceptibility of *H. pylori* to clarithromycin.

A blend of the 6 berries, referred to as Optiberry, was also tested in this experiment. It was shown to exhibit the greatest effects on *H. pylori*. Because of these inhibitory effects on several intestinal pathogens, it has been suggested that the antimicrobial properties of berries could be utilized in functional foods.



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