

Anthocyanins



More on Anthocyanins

Because of their strong **red to blue coloring**, anthocyanins are the most recognized, visible members of the bioflavonoid phytochemicals. They can be found in large amounts in diets high in berries and grapes. For example, one 100 gram (g) serving of black currant can provide up to 750 mg of anthocyanins.

- **Anthocyanins** are members of the **flavonoid** group of phytochemicals, which is a group predominant in teas, honey, wines, fruits, vegetables, nuts, olive oil, cocoa and cereals.
- The flavonoids are thought to be perhaps the most important single group of phenolics in food.
- The primary players in the **flavonoid** group include:
 - Anthocyanins** (cyaniding, pelargonidin, petunidin)
 - Flavanols** (quercetin, Kaempferol)
 - Flavones** (luteolin, apigenin)
 - Flavanones** (myricetin, naringin, hesperetin, naringenin)
 - Flavan-3-ols** (catechin, epicatechin, gallicocatechin)
 - Isoflavones** (genistein, daidzein)
- Phytochemicals in this group (flavonoids) are frequently referred to as **bioflavonoids** due to their multifaceted roles in human health.

Anthocyanins can be found in **berries** (e.g. black currant, elderberries, blueberries, and strawberries), **their juices**, as well as **red wine**.



Anthocyanin pigments have been used in **folk medicine** throughout the world. For example, bilberry anthocyanins have long been used for the treatment of diarrhea, microbial infections, and vision disorders. While the use of anthocyanins for therapeutic purposes has long been supported by both anecdotal and epidemiological evidence, it is only in recent years that some of the specific, measurable pharmacological properties of isolated anthocyanin pigments have been conclusively verified by rigorously controlled research trials.

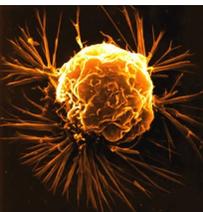




In recent years, studies have begun to investigate the specific properties of isolated anthocyanin pigments. However, many still study the health effects of anthocyanins from fruit extracts where anthocyanins are present in combination with other compounds. In fact, some reports suggest that anthocyanin activity is actually potentiated when delivered in mixtures, as opposed to isolates.

Anthocyanins have been shown to play a beneficial role in:

- Visual acuity
- Cancer
- Heart Disease
- Age-related neurodegenerative disorders



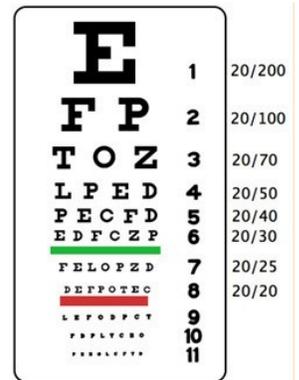
There are still several aspects of anthocyanins' pharmacological roles that have remained elusive to scientists. In most of the interventions of anthocyanins in human health, details on the mechanisms of action for bioactivity, uptake, absorption, bioavailability, whole body distribution and tissue localization are still not fully understood. Here are a few obstacles which stand in the way of better understanding the effects of anthocyanins:

- When speaking in terms of biological activity in the human body, an **anthocyanin pigment is (almost) never acting independently.**
- **Anthocyanins can be** of an evanescent nature, meaning they are **highly susceptible to oxidation and degradation.** Many of the classic phytochemical methods used to extract from plant tissues and fractional components can degrade and/or inactivate anthocyanins, making it difficult to isolate.
- The initial production and accumulation of phytochemicals is triggered by physical or chemical microenvironmental triggers, usually a stress factor. This triggering of productivity can be difficult to accomplish at times.
- **The inability** of the scientist or medicinal practitioner **to track metabolic progress of anthocyanins after ingestion.** This is due to a multitude of metabolic breakdown products rapidly produced in situ.

Proposed Health Effects of Anthocyanins

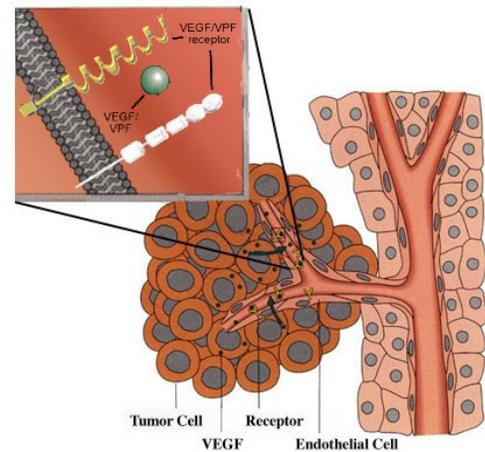
Visual Acuity

Visual acuity can be defined as sharpness of vision and is generally based on the Snellen chart, where normal visual acuity is 20/20. Many studies have shown a relationship between improved visual acuity with anthocyanin consumption. In fact, several studies have strongly suggested that the enhancement of rhodopsin regeneration is at least one of the mechanisms by which anthocyanins enhance visual acuity. Anthocyanins from black currant appear to have the greatest effects.



Cancer

In research trials, anthocyanins have demonstrated the ability to **reduce cancer cell proliferation** (growth/multiplication) and to **inhibit tumor formation**. The capacity of anthocyanin pigments to interfere with the process of carcinogenesis seems to be linked to multiple potential mechanisms of action including the inhibition of cyclooxygenase (COX) enzymes and potent antioxidant potential.



Angiogenesis is a term used to describe formation of new blood vessels. It is particularly unwanted in situations including varicose veins and tumor formation because it is a key event that feeds tumor growth and cancer metastases. Because of this, anti-angiogenic approaches to prevent and treat cancer represent a priority area in investigative tumor biology.

In one study, six anthocyanin-rich berry extracts (wild blueberry, bilberry, cranberry, elderberry, raspberry seeds, and strawberry) were studied for antioxidant efficacy, cytotoxic potential, cellular uptake, and anti-angiogenic properties. From these extracts, various combinations were obtained. A synergistic formula, named Optiberry IH141, was developed and exhibited a high ORAC (oxygen radical absorbing capacity) value, low cytotoxicity, and superior anti-angiogenic properties compared to other combinations tested. Several experiments were run on the Optiberry formulation and researchers found that:

1. **Optiberry exhibited the most potent inhibitory effect on H₂O₂-induced VEGF** (a key regulator of tumor angiogenesis) expression compared to the other berry extracts (in vitro).
2. **Optiberry significantly impaired angiogenesis** in an *in vitro* angiogenesis assay conducted on human dermal microvascular endothelial cells.
3. **Optiberry significantly inhibited basal MCP-1 and NF- κ B transcriptions and markedly diminished *in vivo* angiogenesis.**

Heart Disease

The role of anthocyanins in cardiovascular disease prevention is strongly linked to oxidative stress protection. Since endothelial dysfunction is involved in the initiation and development of vascular disease, one study incorporated four anthocyanins isolated from elderberries into the plasma lemma and cytosol of endothelial cells to directly examine their protective roles. These tests ended up demonstrating that not only could anthocyanins be directly incorporated into endothelial cells, but also that significant oxidative stress protection resulted.

Several studies have linked protection from heart attacks to anthocyanin-rich products. One study showed that after administration of grape juice or wine, significant heart attack protection was achieved. This was believed to be due to the anthocyanin content of these beverages, allowing for reduced inflammation, enhanced capillary strength and permeability, the inhibition of platelet formation, and enhanced nitric oxide release.

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Age-related Neurodegenerative Disease

Anthocyanins have been credited with the capacity to modulate cognitive and motor function, to enhance memory and to have a role in preventing age-related declines in neural function. Investigations have revealed that is likely due to the fact that anthocyanins (in particular, cyaniding-3 sambubioside-5-glucoside and cyaniding-3, 5-diglucoside) are highly bioavailable in endothelial cells (which is likely also the reason that these compounds have shown such favorable effects on atherosclerosis).

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