

Superfruit! Understanding the Health Benefits of Blueberries

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The term “Superfruit” means different things to different people. In marketing, it is a term often used when advertising a product that has a high level of antioxidant activity relative to the competition’s product. In nutrition research, the term has little meaning. The reason for this is that measuring the antioxidant activity of a food or beverage in a test tube has very little to do with the actual effects that food or beverage may have in your body, or on your health over the long term.

There are several different methods used to measure antioxidant activity, e.g., ORAC, FRAP, DPPH, etc., and each one may give a different value for the same food or beverage. This is what enables advertisers to rank several similar products, like berries, and choose the method that puts their product on top, i.e., the Superfruit! This term should be used with caution as it may send the wrong message to consumers, implying they should eat less of all other fruits. In order to state that one food is more beneficial with regard to our health, we really need to test the effects of regularly consuming that food in human studies. And that is one area in which blueberries stand out.

Blueberries are often ranked high in antioxidant activity, primarily due to their phytochemical content. Phytochemicals are plant compounds that have biological activities in the body that go beyond their ability to act as antioxidants. For example, they can affect how your blood vessels function, how your cells communicate with one another, and whether certain genes are expressed or not. All of these activities affect how the various organs and systems in your body function and, ultimately, play a role in the development of chronic diseases such as heart disease and cancer.

Phytochemicals are the reason why nearly all plants have some antioxidant activity. However, different types of phytochemicals will have somewhat different effects in the body above and beyond their ability to act as antioxidants. There are thousands of different phytochemicals found in nature, and they are often classified according to their chemical structure. The predominant class of phytochemicals is the phenolics. Among all fruits, blueberries are one of the richest sources of phenolic compounds, including flavonoids, phenolic acids, and stilbenes. The flavonoids are the largest class of phenolics and are often referred to as polyphenols. There are several different types of flavonoids, including the anthocyanins found in berries. Anthocyanins are responsible for the dark red, blue and purple pigments found in these and other similarly colored fruits and vegetables.

We know from studies conducted in cell cultures, in animal models, and in humans that anthocyanins have anti-inflammatory and anti-cancer activities, and may play a role in heart disease prevention, weight management, and in controlling diabetes. Since blueberries are a

great source of anthocyanins, we would hope to see similar health effects when we regularly incorporate them into our diet. Given their unique blend of nutrients and phytochemical composition, it is possible that blueberries have additional benefits.

The best way to determine the actual effects of blueberries on human health is to conduct well-designed experiments in human subjects that use the whole food, and not just its isolated components. Previous work conducted by the late USDA/Tufts researcher, Dr. James Joseph, found that blueberries can improve cognition, specifically memory, in aging animals. It is only within the last 5 years that these effects have been studied in human subjects.

In order to inform researchers about the potential health effects of specific foods or nutrients in humans, it is often helpful to begin with an observational study. Observational or epidemiological studies follow the habits of large groups of people over time, and compare these habits with the development of certain chronic diseases. This allows researchers to see if there are any important relationships between the diets of these individuals and specific health outcomes. One such study is the Nurses' Health Study started in 1976 by Harvard researchers and follows the health habits of over 120,000 U.S. nurses. Since that time we have learned many things from this cohort, including the benefits of consuming plant-based foods like berries on a regular basis. In a publication of the data from this study, Devore et al. (2012) observed an important relationship between blueberries and brain function in humans. They found that the nurses who consumed 1 or more servings of blueberries per week scored higher on multiple tests measuring their cognitive function compared with those who consumed less than 1 serving per month.

Other recent human studies have looked at the effects of blueberries on risk factors for heart disease. Both whole blueberries (50 grams or ~ 1/3 cup per day) and freeze-dried blueberry powder (22 gram or the equivalent of 1 cup whole berries per day) have been shown to lower blood pressure after 8 weeks in men and women who are at high risk of developing cardiovascular disease in studies by Basu et al. (2010) and Johnson et al. (2015), respectively. The blueberry powder was also shown to improve arterial stiffness, a measure of damage to the arteries involved in the development of both hypertension and heart disease. Rodriguez-Mateos et al. (2013) reported improved blood vessel function in young healthy men after just a single dose of a blueberry drink made from freeze-dried powder. They were able to demonstrate an even stronger effect with a higher dose of this blueberry drink suggesting an important dose-response effect.

Interestingly, Stull et al. (2015) reported improved blood vessel function but no blood pressure lowering effect in high risk subjects after 6 weeks of drinking two daily smoothies with a total of 45 grams blueberry powder (or ~ 2 cups blueberries) combined with 12 oz of yogurt and skim milk. There is some evidence that combining blueberries with milk reduces their antioxidant activity and the absorption or bioavailability of the phenolic compounds, although there is some controversy about this potential interaction.

Kuntz et al. (2015) found no difference in the absorption of most blueberry anthocyanins among healthy young adults after consuming a serving of an extruded blueberry juice when compared with a smoothie of blueberry puree blended with no milk products, suggesting no interference with the food matrix, i.e., fiber, sugars, etc. In an earlier study, Del Bo' et al. (2012) compared the bioavailability of anthocyanins from two different blueberry purees, one made from raw fresh berries and other from berries that were steam-blached for 3 minutes, and found no difference in the absorption of these phenolics. Both of these studies have implications for food processors as they suggest some preparation methods, like juicing, blending and subjecting to heat for a short period of time, may be as effective as raw berries in the delivery of blueberry phenolics to humans. Given their versatility and demonstrated health benefits, blueberries may truly be a Superfruit!