

Promising research results suggest a link between apples and weight loss, brain health (including Alzheimer's disease), certain forms of cancer, lung and heart health and stroke. Apples are an excellent source of dietary fiber. In addition, apples are also a healthy source of antioxidants, which have been linked to disease prevention. Recent research links apple nutrients to an impressive range of health benefits:

Weight Loss **Boost weight loss:** Researchers from the State University of Rio de Janeiro studying the impact of fruit intake on weight loss found that overweight women who ate the equivalent of three apples or pears a day lost more weight on a low-calorie diet than women who didn't add fruit to their diet. (*Nutrition*, 2003, 19: 253-256)

Furthermore, researchers at Harvard University found a higher intake of foods rich in flavonols, flavan-3-ols, anthocyanins and flavonoids, all of which are found in apples, was associated with less weight gain among adults aged 27-65 and may contribute to the prevention of obesity and its potential consequences. (*BMJ* 2016; 352: i17)

Granny Smith lead weight loss: Scientists at Washington State University have concluded that nondigestible compounds in apples – specifically, Granny Smith apples – may help prevent disorders associated with obesity. The tart green Granny Smith apples benefit the growth of friendly bacteria in the colon due to their high content of non-digestible compounds, including dietary fiber and polyphenols, and low content of available carbohydrates. The study showed that Granny Smith apples surpassed all other common varieties in the amount of nondigestible compounds they contain. (*Food Chemistry*, Oct. 2014)

Brain Health **Age-related memory loss and Alzheimer's disease:** A growing body of evidence from the University of Massachusetts-Lowell suggests that eating apples and drinking apple juice can be beneficial when it comes to improving brain health and diminishing symptoms of Alzheimer's disease. In conjunction with a balanced diet, apple and apple juice consumption may protect against oxidative brain damage that can lead to memory loss. The brain health benefits were found when animals consumed the equivalent of 2-3 cups of apple juice or 2-4 whole apples per day. A clinical trial showed that drinking apple juice significantly improved mood and behavior among a group of patients diagnosed with moderate-to-severe Alzheimer's disease.

(*Am J Alzheimer's Dis Other Demen*, 2010, 25: 367-371, *AgroFOOD Industry High-Tech*, 2009, 20; 6: 32-34, *Journal of Alzheimer's Disease*, 2009, 16:1; *Journal of Alzheimer's Disease*, 2005, 8: 283-287; *Journal on Nutrition Health and Aging*, 2004, 8: 92-97)*

Brain health and neurodegenerative diseases: Researchers from Cornell University found in their *in vitro* study that apple nutrients protected brain neurons against oxidative damage. Such damage can contribute to neurodegenerative diseases such as Alzheimer's and Parkinson's. The study highlighted a particular apple flavonoid, quercetin, as a principle compound responsible for the protective effect. (*Journal of Food Science*, 2004, 69: S357-S360)*

Cancer **Breast cancer:** A series of studies at Cornell University have evaluated the direct effects of apples on breast cancer prevention in animals. The more apples consumed, the greater the reduction in incidence or number of tumors among test animals. The apple consumption tested was equivalent to one to six apples a day for 24 weeks. (*Journal of Agric. Food Chem.*, 2009, 53: 2341-2343)*

Pancreatic cancer: Quercetin, a flavonoid found naturally in apples, has been identified as one of the most beneficial flavonols in preventing and reducing the risk of pancreatic cancer. Although the overall

risk was reduced among the study participants, smokers who consumed foods rich in flavonols had a significantly greater risk reduction. (*American Journal of Epidemiology*, 2007, 8: 924-931)

Colon and liver cancer: A research team at Cornell University identified a group of phytochemicals that are more abundant in the peel and appear to kill or inhibit the growth of at least three different types of human cancer cells: colon, breast and liver. (*Journal of Agricultural and Food Chemistry*, 2007, 55(11):4366 – 4370)

Prostate cancer: Researchers at Mayo Clinic report that quercetin, a plant-based nutrient found most abundantly in apples, may provide a new method for preventing or treating prostate cancer. They found that quercetin inhibited or prevented the growth of human prostate cancer cells by blocking activity of androgen hormones, in an *in vitro* study. Previous studies had linked androgens to prostate cancer's growth and development. (*Carcinogenesis*, 2001, 22: 409-414)

Bowel cancer: Eating just one apple a day could slash the risk of colorectal cancer by more than one third. Researchers in Poland surveyed 592 people with colorectal cancer and 700 cancer-free individuals about their diet and lifestyle. Cancer-free individuals tended to eat more apples than those with cancer and the more apples per day that an individual ate the less likely they were to develop colorectal cancer. They also found that the anti-cancer effect was seen even when an individual had a low total consumption of fruits and vegetables but consumed at least an apple a day. The observed protective effect may result from apples rich content of flavonoid and other polyphenols, which can inhibit cancer onset and cell proliferation. In addition, apples are a good source of fiber and a high-fiber diet is known as a risk reducer for colorectal cancer. (*European Journal of Cancer Prevention*, 2010, 19(1):42-47)

Metabolic Syndrome

Apple product consumers are likely to have lower blood pressure and trimmer waistlines, resulting in a reduced risk of metabolic syndrome, a cluster of health issues related to diabetes and heart disease. (*Experimental Biology 2008 Poster* (unpublished))*

Antioxidants

The United States Department of Agriculture (USDA) categorized three specific varieties of apples among the top 20 antioxidant sources. While the study highlighted three apple varieties in particular, all apples contain beneficial levels of antioxidants and have other healthful nutrition properties. Two thirds of an apple's antioxidants are found in its peel. (*USDA Agricultural Research Service*, 2007)

Lung Health

Childhood and adult asthma: Research from the UK reports that children of mothers who eat apples during pregnancy are much less likely to exhibit symptoms of asthma, including wheezing, at age 5. Among a variety of foods consumed and recorded by the pregnant women, apples were the only food found to have a positive association with a reduced risk of asthma. (*Thorax*, 2007, 62:745-746). Researchers from Australia report that study participants who ate apples and pears had the lowest risk of asthma. (*American Journal of Clinical Nutrition*, 2003; 78: 414-21). A study from London's King's College and the University of Southampton reports that people who ate at least two apples per week had a 22-32 percent lower risk of developing asthma than people who ate fewer apples. (*Am. J. Respir. Crit. Care Med*, 2001, 164: 1823-1828)

Chronic cough and lung cancer: A study from the National Institutes of Health (NIH) reports that foods rich in fiber and flavonoids — found abundantly in apples — may reduce chronic productive cough and other respiratory symptoms. Researchers at the University of Hawaii and Finland's National Public Health Institute have also linked flavonoids found in apples with a reduced risk of developing certain cancers, including lung cancer. (*Am. J. Respir. Crit. Care Med*, 2004, 170: 279-287; *Journal of the National Cancer Institute*, 2000, 92: 154-160; *American Journal of Epidemiology*, 1997, 146: 223-230)

Heart Health

When rodents prone to obesity were given a higher fat diet, similar to a typical American's diet, and fed a freeze dried powder made from whole apples, the result was a heart-health benefit that went beyond cholesterol reduction alone. The researchers suspect that it may be the phytochemicals in the whole apple that help reduce oxidative stress in the rodents and contribute to improved measures of blood pressure (and ultimately overall heart health). (*American Dietetic Association 2010 Poster* (unpublished))*

Reduced mortality: A study has identified a possible link between a common component of apples and heart health in postmenopausal women. The study results indicate that increased consumption of apples may contribute to a decrease in mortality from both coronary heart disease and cardiovascular disease. (*American Journal of Clinical Nutrition*, 2007, 85 (3): 895-909)

Fiber and cardiovascular disease: A French study found that diets with the highest total dietary fiber and nonsoluble dietary fiber intakes were associated with a significantly lower risk of several heart disease risk factors, including overweight, elevated waist-to-hip ratio, blood pressure, and cholesterol levels. (*American Journal of Clinical Nutrition*, 2005, 82: 1185-1194). U.S. researchers report that for every 10 grams of fiber consumed per day the risk of developing heart disease may decrease 14 percent, and the risk of dying from heart disease may decrease 27 percent. Fiber from fruits appeared to be slightly more protective than cereal fiber, lowering the risk of coronary disease death by 30 percent. (*Arch Int Med*, 2004, 164: 370-376)

LDL Oxidation: Researchers at the University of California-Davis report that daily consumption of apples and apple juice may help reduce the damage caused by the “bad” type of cholesterol and protect against heart disease, based on the first human study of its kind. (*Journal of Medicinal Food*, 2000, 3: 159-165). An earlier study from UC-Davis Davis reported similar findings *in vitro*. They also confirmed that important phytonutrients from apples are also found in apple juice. (*Life Sciences*, 1999, 64: 1913-1920)*

In addition, in an Ohio State University Study of healthy, middle-aged adults, consumption of one apple a day for four weeks lowered by 40 percent blood levels of oxidized LDL – low-density lipoprotein, the “bad” cholesterol. When LDL cholesterol interacts with free radicals to become oxidized, the cholesterol is more likely to promote inflammation and can cause tissue damage and hardening of the arteries. (*Journal of Functional Foods*, 2013)

Recent studies performed by the Arthritis Foundation, found evidence to support claims that eating apples on a daily basis may lower levels of cholesterol as well as C-reactive protein (CRP), a key marker of inflammation in the blood. In fact, in the study of 160 women ages 45 to 65, participants who ate apples every day for six months saw lower LDL cholesterol levels by 23 percent as well as a 32 percent decrease in CRP. (*Arthritis Foundation*, 2016)

Reducing Vascular Deaths: A 2013 University of Oxford (UK) study found that eating one apple a day may be just as beneficial as daily statin use when it comes to preventing vascular deaths in individuals over 50.

In a recent debate, cardiologists argued that statins do more harm than good, especially for those who do not already have heart disease. Instead, people would benefit from eating an apple a day to prevent heart attacks, strokes and other vascular diseases. (*BMC Medicine*, 2016 14:4)

Immunity

Soluble fiber, like pectin from apples, may reduce the inflammation associated with obesity-related diseases and strengthen the immune system, according to a study from the University of Illinois. Lab animals fed a low-fat diet with either soluble or insoluble fiber showed distinctly different responses when their immune system was challenged, with the soluble-fiber-fed animals displaying the less sickness and a faster recovery rate than the other animals. (*Brain, Behavior, and Immunity*, 2010, in press/available online)

Gut Health

Researchers from the University of Denmark have discovered that apples and apple products could give the health of your intestines as well as your immune system a boost – by increasing the numbers of good gut bacteria. When scientists fed rats a diet of apples in all its forms including juice, applesauce, and the whole fruit, the rats developed larger numbers of good gut bacteria. Researchers believe it is due to the pectin the apple contains. Pectin is a fiber-like substance found in the cell walls of plants, and is often packaged and used as a gelling agent for people who make their own homemade jams and jellies. Apples are a natural source of this fiber-like material. The friendly bacteria in the intestines like to feed on apple pectin which allows them to replicate and thrive while doing their good disease fighting deeds in the intestines. (*BMC Microbiology* 2010, 10:13)

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