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Fruits & Vegetables

"Eat your fruits and vegetables" is one of the tried and true recommendations for a healthy diet. And for good reason. Eating plenty of fruits and vegetables can help you ward off heart disease and stroke, control blood pressure and cholesterol, prevent some types of cancer, avoid a painful intestinal ailment called diverticulitis, and guard against cataract and macular degeneration, two common causes of vision loss.



What does "plenty" mean? More than most Americans consume. If you don't count potatoes - which should be considered a starch rather than a vegetable - the average American gets a total of just three servings of fruits and vegetables a day. The latest dietary guidelines call for five to thirteen servings of fruits and vegetables a day, depending on one's caloric intake.⁽¹⁾ For a person who needs 2,000 calories a day to maintain weight and health, this translates into nine servings, or 4½ cups per day.

Over the past 30 years or so, researchers have developed a solid base of science to back up what generations of mothers preached (but didn't always practice themselves). Early on, fruits and vegetables were acclaimed as cancer-fighting foods. In fact, the ubiquitous 5-A-Day message (now quietly changing to Eat 5 to 9 A Day) seen in produce aisles, magazine ads, and schools is supported in part by the National Cancer Institute. The latest research, though, suggests that the biggest payoff from eating fruits and vegetables is for the heart.

Fruits, Vegetables, and Cardiovascular Disease

There is compelling evidence that a diet rich in fruits and vegetables can lower the risk of heart disease and stroke.

The largest and longest study to date, done as part of the Harvard-based Nurses' Health Study and Health Professionals Follow-up Study, included almost 110,000 men and women whose health and dietary habits were followed for 14 years. The higher the average daily intake of fruits and vegetables, the lower the chances of developing cardiovascular disease. Compared with those in the lowest category of fruit and vegetable intake (less than 1.5 servings a day), those who averaged 8 or more servings a day were 30% less likely to have had a heart attack or stroke.⁽²⁾

Although all fruits and vegetables likely contribute to this benefit, green leafy vegetables such as lettuce, spinach, Swiss chard, and mustard greens; cruciferous vegetables such as broccoli, cauliflower, cabbage, Brussels sprouts, bok choy, and kale; and citrus fruits such as



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oranges, lemons, limes, and grapefruit (and their juices) make important contributions.

Increasing fruit and vegetable intake by as little as one serving per day can have a real impact on heart disease risk. In the two Harvard studies, for every extra serving of fruits and vegetables that participants added to their diets, their risk of heart disease dropped by 4 percent.

Fruits and Vegetables, Blood Pressure, and Cholesterol

High blood pressure is a primary risk factor for heart disease and stroke. As such, it's a condition that is very important to control. Diet can be a very effective tool for lowering blood pressure. One of the most convincing associations between diet and blood pressure was found in the Dietary Approaches to Stop Hypertension (DASH) study. (3) This trial examined the effect on blood pressure of a diet that was rich in fruits, vegetables, and low-fat dairy products and that restricted the amount of saturated and total fat. The researchers found that people with high blood pressure who followed this diet reduced their systolic blood pressure (the upper number of a blood pressure reading) by about 11 mm Hg and their diastolic blood pressure (the lower number) by almost 6 mm Hg - as much as medications can achieve.

Eating more fruits and vegetables can also help lower cholesterol. In the National Heart, Lung, and Blood Institute's Family Heart Study, the 4466 subjects consumed on average a shade over 3 servings of fruits and vegetables a day. Men and women with the highest daily consumption (more than 4 servings a day) had significantly lower levels of LDL (bad) cholesterol than those with lower consumption. (4) How fruits and vegetables lower cholesterol is still something of a mystery. It is possible that eating more fruits and vegetables means eating less meat and dairy products, and thus less cholesterol-boosting saturated fat. Soluble fiber in fruits and vegetables may also block the absorption of cholesterol from food.

Fruits, Vegetables, and Cancer

Numerous early studies revealed what appeared to be a strong link between eating fruits and vegetables and protection against cancer. But because many of these were case-control studies, it is possible that the results may have been skewed by problems inherent in these types of studies, such as recall bias and selection bias. Data from cohort studies that follow large groups of initially healthy individuals for years have not consistently shown that a diet rich in fruits and vegetables prevents cancer in general. Data from the Nurses' Health Study and Health Professionals Follow-up Study support this finding. Over a 14-year period, men and women with the highest intake of fruits and vegetables (8+ servings a day) were just as likely to have developed cancer as those who ate the fewest daily servings (under 1.5). (2)



A more likely possibility is that fruits and vegetables may protect against certain cancers. The International Agency for Research on Cancer, which is part of the World Health Organization, recently completed a monumental review of the best research on fruits, vegetables, and cancer. Here's what this 387-page tome concludes about studies in humans: "There is limited evidence for a cancer-preventive effect of consumption of fruit and of vegetables for cancers of the mouth and pharynx, esophagus, stomach, colon-rectum, larynx, lung, ovary (vegetables only), bladder (fruit only), and kidney. There is inadequate evidence for a cancer-preventive effect of consumption of fruit and of vegetables for all other sites." (5) However, considering all evidence from human epidemiological, animal, and other

types of studies, it appears that eating more fruit "probably lowers the risk of cancers of the esophagus, stomach and lung" and "possibly reduces the risk of cancers of the mouth, pharynx, colon-rectum, larynx, kidney, and urinary bladder." Eating more vegetables "probably lowers the risk of cancers of the esophagus and colon-rectum" and "possibly reduces the risk of cancers of the mouth, pharynx, stomach, larynx, lung, ovary and kidney."

Keep in mind that this is for total fruit and total vegetable consumption and that, as pointed out by the International Agency for Research on Cancer, specific fruits and vegetables may protect against specific types of cancer. For example, a line of research stemming from a finding from the Health Professionals Follow-up Study suggest that tomatoes may help protect men against prostate cancer, especially aggressive forms of it. (6-8) One of the pigments that give tomatoes their red hue - lycopene - could be involved in this protective effect. Although several studies other than the Health Professionals' study have also demonstrated a link between tomatoes or lycopene and prostate cancer, others have not or have found only a weak connection. Taken as a whole, however, these studies suggest that increased consumption of tomato-based products (especially cooked tomato products) and other lycopene-containing foods may reduce the occurrence or progression of prostate cancer. But more research is needed before we know the exact relationship between fruits and vegetables, carotenoids, and prostate cancer.(9)

Fruits, Vegetables, and Gastrointestinal Health

One of the wonderful components of fruits and vegetables is their indigestible fiber. As fiber passes through the digestive system, it sops up water like a sponge and expands. This can calm the irritable bowel and, by triggering regular bowel movements, can relieve or prevent constipation.(10) The bulking and softening action of insoluble fiber also decrease pressure inside the intestinal tract and so may help prevent diverticulosis (the development of tiny, easily irritated pouches inside the colon) and diverticulitis (the often painful inflammation of these pouches).(11)

Fruits, Vegetables, and Vision

Eating plenty of fruits and vegetables also keeps your eyes in good shape. You may have learned that the vitamin A in carrots aids night vision. Other fruits and vegetables help prevent two common aging-related eye diseases - cataract and macular degeneration - which afflict millions of Americans over age sixty-five. Cataract is the gradual clouding of the eye's lens, a disk of protein that focuses light on the light-sensitive retina. Macular degeneration is caused by cumulative damage to the macula, the center of the retina. It starts as a blurred spot in the center of what you see. As the degeneration spreads, vision shrinks.

Free radicals generated by sunlight, cigarette smoke, air pollution, infection, and metabolism cause much of this damage. Dark green leafy vegetables contain two pigments, lutein and zeaxanthin, that accumulate in the eye. These two appear to be able to snuff out free radicals before they can harm the eye's sensitive tissues.(12)

In general, a diet rich in fruits, vegetables, and whole grains appears to reduce the chances of developing cataract or macular degeneration. (13-15)

The Bottom Line: Recommendations for Fruit and Vegetable Intake

Fruits and vegetables are clearly an important part of a good diet. Almost everyone can

benefit from eating more of them, but variety is as important as quantity. No single fruit or vegetable provides all of the nutrients you need to be healthy. The key lies in the variety of different fruits and vegetables that you eat.

Some basic fruit and vegetable tips:

- **Try to eat more fruits and vegetables. If you need 2,000 calories a day to maintain your weight and health, aim for at least nine servings (4½ cups) a day.**
- **Choose a variety of different fruits and vegetables. It's easy to get into a rut when it comes to the food you eat. Break out and try a wider variety - include dark-green, leafy vegetables; yellow, orange, and red fruits and vegetables; cooked tomatoes; and citrus fruits.**

References

1. [Dietary Guidelines for Americans 2005](#). Center for Nutrition Policy and Promotion, U.S. Department of Agriculture.
2. Hung HC, Joshipura KJ, Jiang R, et al. Fruit and vegetable intake and risk of major chronic disease. [J Natl Cancer Inst](#) 2004; 96:1577-84.
3. Appel LJ, Moore TJ, Obarzanek E, et al. A clinical trial of the effects of dietary patterns on blood pressure. DASH Collaborative Research Group. [N Engl J Med](#) 1997; 336:1117-24.
4. Djousse L, Arnett DK, Coon H, Province MA, Moore LL, Ellison RC. Fruit and vegetable consumption and LDL cholesterol: the National Heart, Lung, and Blood Institute Family Heart Study. [Am J Clin Nutr](#) 2004; 79:213-7.
5. Vainio H, Bianchini F. IARC Handbooks of Cancer Prevention: Fruit and Vegetables. Vol. 8. Lyon, France, 2003.
6. Giovannucci E, Ascherio A, Rimm EB, Stampfer MJ, Colditz GA, Willett WC. Intake of carotenoids and retinol in relation to risk of prostate cancer. [J Natl Cancer Inst](#) 1995; 87:1767-76.
7. Gann PH, Ma J, Giovannucci E, et al. Lower prostate cancer risk in men with elevated plasma lycopene levels: results of a prospective analysis. [Cancer Res](#) 1999; 59:1225-30.
8. Giovannucci E, Rimm EB, Liu Y, Stampfer MJ, Willett WC. A prospective study of tomato products, lycopene, and prostate cancer risk. [J Natl Cancer Inst](#) 2002; 94:391-8.
9. Etminan M, Takkouche B, Caamano-Isorna F. The role of tomato products and lycopene in the prevention of prostate cancer: a meta-analysis of observational studies. [Cancer Epidemiol Biomarkers Prev](#) 2004; 13:340-5.
10. Lembo A, Camilleri M. Chronic constipation. [N Engl J Med](#) 2003; 349:1360-8.
11. Aldoori WH, Giovannucci EL, Rockett HR, Sampson L, Rimm EB, Willett WC. A prospective study of dietary fiber types and symptomatic diverticular disease in men. [J Nutr](#) 1998; 128:714-9.

12. Brown L, Rimm EB, Seddon JM, et al. A prospective study of carotenoid intake and risk of cataract extraction in US men. [Am J Clin Nutr](#) 1999; 70:517-24.
13. Moeller SM, Taylor A, Tucker KL, et al. Overall adherence to the dietary guidelines for americans is associated with reduced prevalence of early age-related nuclear lens opacities in women. [J Nutr](#) 2004; 134:1812-9.
14. Cho E, Seddon JM, Rosner B, Willett WC, Hankinson SE. Prospective study of intake of fruits, vegetables, vitamins, and carotenoids and risk of age-related maculopathy. [Archives of Ophthalmology](#) 2004; 122:883-92.
15. Krinsky NI, Landrum JT, Bone RA. Biologic mechanisms of the protective role of lutein and zeaxanthin in the eye. [Annu Rev Nutr](#) 2003; 23:171-201.

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