

## Harvard School of Public Health

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# The Nutrition Source

## *Fiber: Start Roughing It!*

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## Introduction

Fiber is one of those nutrients that many of us know is important but that remains a bit of a mystery. Exactly what is it? What are the best sources of fiber? And what are its health benefits? Here we try to answer these and other questions.

### Related Articles

**[Carbohydrates: Good Carbs Guide the Way:](#)** Why—and how—to pick healthy sources of carbohydrate

**[Health Gains From Whole Grains:](#)** The latest research on whole grains and health

**[Vegetables and Fruits: Get Plenty Every Day:](#)** How these fiber- and vitamin-rich foods can boost your heart health

Basically, the term fiber refers to carbohydrates that cannot be digested. Fiber is present in all plants that are eaten for food, including fruits, vegetables, grains, and legumes. However, not all

fiber is the same, and there are a number of ways to categorize it. One is by its source or origin. For example, fiber from grains is referred to as cereal fiber. Another way of categorizing fiber is by how easily it dissolves in water. Soluble fiber partially dissolves in water. Insoluble fiber does not dissolve in water. These differences are important when it comes to fiber's effect on your risk of developing certain diseases.

Current recommendations suggest that children and adults consume at least 20 grams of dietary fiber per day from food, not supplements. The more calories you eat each day, the more fiber you need; teens and men may require upwards of 30 to 35 grams per day or more. Yet the average American eats only 15 grams of dietary fiber a day. (View a [table](#) of specific fiber recommendations based on age, gender, and estimated calorie needs.)

## Health Effects of Eating Fiber

Long heralded as part of a healthy diet, fiber appears to reduce the risk of developing various conditions, including heart disease, diabetes, diverticular disease, and constipation. Despite what many people may think, however, fiber probably has little, if any effect on colon cancer risk.

### Fiber and Colon Cancer

For years, Americans have been told to consume a high-fiber diet to lower the risk of colon cancer—mainly on the basis of results from relatively small studies. Larger and better-designed studies have largely failed to show a link between fiber and colon cancer. One of these—a Harvard study that followed over 80,000 female nurses for 16 years—found that dietary fiber was not strongly associated with a reduced risk for either colon cancer or polyps (a precursor to colon cancer). (1) More recently, researchers combined the results of the Harvard study with those of several other large studies that followed more than 700,000 men and women, some for up to 20 years. (2) After accounting for differences in participants' red meat and alcohol intake, as well as other factors that could increase colon cancer risk, high intake of fiber was not found to protect against colorectal cancer. (Read more about the scientific research on [fiber and colon cancer](#).)

But just because fiber plays little role in preventing colon cancer doesn't mean you should abandon a high-fiber diet. As explained below, fiber provides many other benefits.

### Fiber and Heart Disease

In the United States, coronary heart disease is a leading cause of death for both men and women. This disease is characterized by a buildup of cholesterol-filled plaque in the coronary arteries—



the arteries that feed the heart. This causes them to become hard and narrow, a process referred to as atherosclerosis. Total blockage of a coronary artery produces a heart attack.

High intake of dietary fiber has been linked to a lower risk of heart disease in a number of large studies that followed people for many years. (3) In a Harvard study of over 40,000 male health professionals, researchers found that a high total dietary fiber intake was linked to a 40 percent lower risk of coronary heart disease, compared to a low fiber intake. (4) Cereal fiber, which is found in grains, seemed particularly beneficial. A related Harvard study of female nurses produced quite similar findings. (5)

Fiber intake has also been linked with the metabolic syndrome, a constellation of factors that increases the chances of developing heart disease and diabetes. These factors include high blood pressure, high insulin levels, excess weight (especially around the abdomen), high levels of triglycerides, the body's main fat-carrying particle, and low levels of HDL (good) cholesterol. Several studies suggest that higher intake of cereal fiber and whole grains may somehow ward off this increasingly common syndrome. (6,7)

## Fiber and Type 2 Diabetes

Type 2 diabetes is the most common form of diabetes. It is characterized by sustained high blood sugar levels. It tends to develop when the body can no longer produce enough of the hormone insulin to lower blood sugar to normal levels or cannot properly use the insulin that it does produce.

### Fiber Sources

#### Soluble Fiber

- Oatmeal, oatbran
- Nuts and seeds
- Legumes
- Beans
- Dried peas
- Lentils
- Apples
- Pears
- Strawberries
- Blueberries

### **Insoluble Fiber**

- Whole wheat bread
- Barley
- Couscous
- Brown rice
- Bulgur
- Whole grain  
breakfast cereals
- Wheat bran
- Seeds
- Carrots
- Cucumbers
- Zucchini
- Celery
- Tomatoes

There are several important factors that may help lower your risk for type 2 diabetes, such as maintaining a healthy weight, being physically active, and not smoking. Researchers are also trying to pinpoint any relevant dietary factors, one of which seems to be a high-fiber diet. The Harvard studies of male health professionals and female nurses both found that a diet high in cereal fiber was linked to a lower risk of type 2 diabetes. Other studies, such as the Black Women's Health Study (8) and the European Prospective Investigation Into Cancer and Nutrition –Potsdam, have found similar results.

When it comes to factors that increase the risk of developing diabetes, a diet low in cereal fiber and rich in high-glycemic-index foods (which cause big spikes in blood sugar) seems particularly bad. Both Harvard studies—of nurses and of male health professionals—found that this sort of diet more than doubled the risk of type 2 diabetes when compared to a diet high in cereal fiber and low in high-glycemic-index foods. (9-11)

One question raised by such studies is whether fiber itself protects against heart disease and diabetes, or whether the disease-fighting benefits accrue from the nutrient-rich whole grain package. A recent meta-analysis of seven major studies showed that cardiovascular disease (heart attack, stroke, or the need for a procedure to bypass or open a clogged artery) was 21 percent less likely in people who ate 2.5 or more servings of whole grain foods a day compared with those who ate less than 2 servings a week. (12) Another meta-analysis of several large studies, including more than 700,000 men and women, found that eating an extra 2 servings of whole grains a day decreased the risk of type 2 diabetes by 21 percent. (13) So to protect against heart

disease and diabetes, perhaps the best advice is to choose whole grain, high-fiber foods at most meals.

## Fiber and Diverticular Disease

Diverticulitis, an inflammation of the intestine, is one of the most common age-related disorders of the colon in Western society. In North America, this painful disease is estimated to occur in one-third of all those over age 45 and in two-thirds of those over age 85. Among male health professionals in a long-term follow-up study, eating dietary fiber, particularly insoluble fiber, was associated with about a 40 percent lower risk of diverticular disease.<sup>(14)</sup>

## Fiber and Constipation

Constipation is the most common gastrointestinal complaint in the United States and is of particular concern to the elderly.

### Your Questions Answered

#### Water

**Q. How much water do I need each day?**

A. Water is an essential nutrient, but the daily amount we need isn't set in stone.

[\(Read more\)](#)

The good news is that the gastrointestinal tract is highly sensitive to dietary fiber, and consumption of fiber seems to relieve and prevent constipation.

The fiber in wheat bran and oat bran seems to be more effective than similar amounts of fiber from fruits and vegetables. Experts recommend increasing fiber intake gradually rather than suddenly. As fiber intake is increased, the intake of beverages should also be increased, since fiber absorbs water.

## The Bottom Line: Recommendations for Fiber

Fiber is an important part of a healthy diet, and you should get a least 20 grams a day, more is better. The best sources are whole grain foods, fresh fruits and vegetables, legumes and nuts.

### Recipes for Health



**Try this delicious fiber-rich recipe for  
Whole Wheat Penne and Pistachio Pesto.**

Some tips for increasing fiber intake:

- Eat whole fruits instead of drinking fruit juices.
- Replace white rice, bread, and pasta with brown rice and whole grain products.
- Choose whole grain cereals for breakfast.
- Snack on raw vegetables instead of chips, crackers, or chocolate bars.
- Substitute legumes for meat two to three times per week in chili and soups.
- Experiment with international dishes (such as Indian or Middle Eastern) that use whole grains and legumes as part of the main meal (as in Indian dahls) or in salads (for example, tabbouleh).

## References

1. Fuchs CS, Giovannucci EL, Colditz GA, et al. Dietary Fiber and the Risk of Colorectal Cancer and Adenoma in Women. *N Engl J Med.* 1999; 340:169–176.
2. Park Y, Hunter DJ, Spiegelman D, et al. Dietary Fiber Intake and Risk of Colorectal Cancer: A Pooled Analysis of Prospective Cohort Studies. *JAMA.* 2005; 294:2849–2857.
3. Pereira MA, O'Reilly E, Augustsson K, et al. Dietary fiber and risk of coronary heart disease: a pooled analysis of cohort studies. *Arch Intern Med.* 2004; 164:370–6.

4. Rimm EB, Ascherio A, Giovannucci E, Spiegelman D, Stampfer MJ, Willett WC. Vegetable, fruit, and cereal fiber intake and risk of coronary heart disease among men. *JAMA*. 1996; 275:447–51.
5. Brown L, Rosner B, Willett WW, Sacks FM. Cholesterol-lowering effects of dietary fiber: a meta-analysis. *Am J Clin Nutr*. 1999; 69:30–42.
6. McKeown NM, Meigs JB, Liu S, Saltzman E, Wilson PW, Jacques PF. Carbohydrate nutrition, insulin resistance, and the prevalence of the metabolic syndrome in the Framingham Offspring Cohort. *Diabetes Care*. 2004; 27:538–46.
7. McKeown NM, Meigs JB, Liu S, Wilson PW, Jacques PF. Whole-grain intake is favorably associated with metabolic risk factors for type 2 diabetes and cardiovascular disease in the Framingham Offspring Study. *Am J Clin Nutr*. 2002; 76:390–8.
8. Krishnan S, Rosenberg L, Singer M, et al. Glycemic index, glycemic load, and cereal fiber intake and risk of type 2 diabetes in US black women. *Arch Intern Med*. 2007; 167:2304–9.
9. Fung TT, Hu FB, Pereira MA, et al. Whole-grain intake and the risk of type 2 diabetes: a prospective study in men. *Am J Clin Nutr*. 2002; 76:535–40.
10. Liu S, Willett WC, Stampfer MJ, et al. A prospective study of dietary glycemic load, carbohydrate intake, and risk of coronary heart disease in US women. *Am J Clin Nutr*. 2000; 71:1455–61.
11. Schulze MB, Liu S, Rimm EB, Manson JE, Willett WC, Hu FB. Glycemic index, glycemic load, and dietary fiber intake and incidence of type 2 diabetes in younger and middle-aged women. *Am J Clin Nutr*. 2004; 80:348–56.
12. Mellen PB, Walsh TF, Herrington DM. Whole grain intake and cardiovascular disease: A meta-analysis. *Nutr Metab Cardiovasc Dis*. 2007.
13. de Munter JS, Hu FB, Spiegelman D, Franz M, van Dam RM. Whole grain, bran, and germ intake and risk of type 2 diabetes: a prospective cohort study and systematic review. *PLoS Med*. 2007; 4:e261.

14. 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.

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