

## Dietary Fiber

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Can high-fiber diets really do all they claim to do? Studies have looked at the relationship between high-fiber diets and many diseases, including colon cancer, coronary heart disease and diabetes. Proven benefits of a high-fiber diet include prevention and treatment of constipation, hemorrhoids and diverticulosis. In addition, certain types of fiber help decrease blood cholesterol levels.

### What Is Dietary Fiber?

Dietary fiber comes from the portion of plants that is not digested by enzymes in the intestinal tract. Part of it, however, may be metabolized by bacteria in the lower gut.

Different types of plants vary in their amount and kind of fiber. Fiber includes pectin, gum, mucilage, cellulose, hemicellulose and lignin. Pectin and gum are water-soluble fibers found inside plant cells. They slow the passage of food through the intestines but do nothing to increase fecal bulk. Insoluble fibers also decrease cholesterol and can help lower blood glucose. Beans, oat bran, fruit and vegetables contain water soluble fiber.

In contrast, fibers in cell walls are water insoluble. These include cellulose, hemicellulose and lignin. Such fibers increase fecal bulk and speed up the passage of food through the digestive tract. Wheat bran and whole grains contain the highest amounts of insoluble fiber, but vegetables and beans also are good sources.

Sometimes there is confusion as to the difference between crude fiber and dietary fiber. Both are determined by a laboratory analysis, but crude fiber is only one-seventh to one-half of total dietary fiber.

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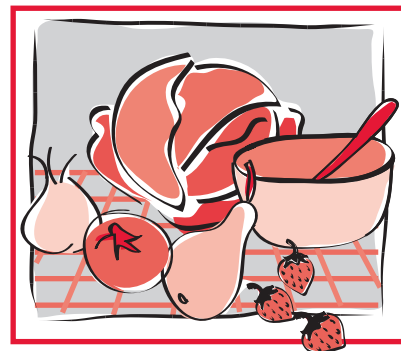
### Benefits of Fiber

Insoluble fiber binds water as it passes through the digestive track, making stools softer and bulkier. Therefore, fiber, especially that found in whole grain products, is helpful in the treatment and prevention of constipation, hemorrhoids and diverticulosis. Diverticula are pouches of the intestinal wall that can become inflamed and painful. This inflammatory condition is called diverticulosis. In the past, a low-fiber diet was prescribed for this condition. It is now known that a high-fiber diet gives better results at preventing inflammation once the inflammation has subsided.

Low blood cholesterol levels (below 200 mg/dl.) have been associated with a reduced risk of coronary heart disease. The body uses cholesterol in the production of bile consumption of water-soluble fiber binds to bile acids, suggesting that a high-fiber diet may result in an increased excretion of cholesterol. Some types of fiber, however, appear to have a greater effect than others. The fiber found in rolled oats is more effective in lowering blood cholesterol levels than the fiber found in wheat. Pectin has a similar effect in lowering the amount of cholesterol in the blood.

Other claims for fiber are less well founded. Dietary fiber may help reduce the risk of some cancers, especially colon cancer. This idea is based on information that insoluble fiber increases the rate at which wastes are removed from the body. This means the body may have less exposure to toxic substances produced during digestion. However, more recent studies have not confirmed the protective effects of fiber in developing colon cancer.

High-fiber diets may be useful for people who wish to lose weight. Fiber itself has no calories, yet provides a "full" feeling because of its water-absorbing ability. For example, an apple that contains fiber is more filling than a half cup of apple juice that contains about the same calories but no fiber. Foods high in



### Quick Facts

- Fiber may be beneficial in treating or preventing constipation, hemorrhoids and diverticulosis.
- Water-soluble fiber helps decrease blood cholesterol levels.
- Foods containing dietary fiber include fruits, vegetables, nuts and grains.
- Include a variety of high-fiber foods in the diet.

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Table 1. Sources of dietary fiber.

Soluble Fiber	Insoluble Fiber
beans	wheat bran
oat bran	whole grains
fruits	vegetables
vegetables	beans

Table 2. Dietary Reference Intakes (DRI) for Fiber.

Age	g/day Fiber
Children	
1-3 years	19
4-8 years	25
Males	
9-13 years	31
14-18 years	38
19-50 years	38
51+ years	30
Females	
9-13 years	26
14-18 years	26
19-50 years	25
51+ years	21
Pregnancy	
≤18 years	28
18+ years	28
Lactation	
≤18 years	29
18+ years	29

fiber often require more chewing, thus it takes more time to eat, so a person is unable to eat a large number of calories in a short amount of time.

Sources of Fiber

Dietary fiber is found only in plant foods: fruits, vegetables, nuts and grains. Meat, milk and eggs do not contain fiber. The form of food may or may not affect its fiber content. Canned and frozen fruits and vegetables contain just as much fiber as raw ones. Other types of processing, though, may reduce fiber content. Drying and crushing, for example, destroy the water-holding qualities of fiber.

The removal of seeds, peels or hulls also reduces fiber content. Whole tomatoes have more fiber than peeled tomatoes, which have more than tomato juice. Likewise, whole wheat bread contains more fiber than white bread. Table 3 lists the dietary fiber content of some common foods.

Functional fiber is a newer term that includes food that consist of isolated, nondigestible carbohydrates that have beneficial physiological effects in humans. Cellulose, chitin, beta glucans, gums, inulin, oligofructose, fructoligosaccharides, lignin, pectins, psyllium, and resistant starches are forms of functional fiber when added to foods. Inulin or chicory inulin is one functional fiber that is receiving more attention in the news as it is being added into many food products and is known to cause gas.

How Much Fiber?

The average American consumes 14 grams of dietary fiber a day, which is considerably less than the recommended level. The 2005 Dietary Guidelines for Americans recommends 14 grams of fiber per 1000 calories consumed. So, if you consume a 2,500 calorie diet, you should eat approximately 35 grams of fiber per day. Also, fiber intake may vary depending on age and gender.

While the 2005 Dietary Guidelines for Americans serves as a general guide to healthy eating, the Dietary Reference Intakes (DRIs) provide standard recommended amounts for nutrients. In 2002, the Food and Nutrition Board of the National Academy of Sciences Research Council issued DRIs for fiber (see Table 1). Previously, no national standardized recommendation existed. The new DRIs represent desirable intake levels established using the most recent scientific evidence available.

For many people, meeting the DRI for fiber may require changes in their eating habits. Eating several servings of whole grains, fruits, vegetables and dried beans each day is good way to boost fiber intake. Anyone with a chronic disease should consult a physician before greatly altering a diet. If you are not used to eating high fiber foods regularly, these changes should be made gradually to avoid problems with gas and diarrhea. Also, drink plenty of water to minimize intestinal gas. If problems with gas continue to be an issue, gas-reducing over-the-counter and prescription drugs are available.

Food Labeling of Fiber

Nutrients required on food labels reflect current public health concerns and coincide with current public health

Nutrition Facts

Serving Size ½ cup (114g)  
Servings Per Container 4

Amount Per Serving	
Calories 90	Calories from Fat 30
% Daily Value*	
Total Fat 3g	5%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
Sodium 300mg	13%
Total Carbohydrate 13g	4%
Dietary Fiber 3g	12%
Sugars 3g	
Protein 3g	
Vitamin A 80%	Vitamin C 60%
Calcium 4%	Iron 4%

\* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrates			
Dietary Fiber		25g	30g
Calories per gram:			
Fat 9 • Carbohydrate 4 • Protein 4			

Figure 1: A food nutrition label.

recommendations. Nutrition labels now list a Daily Reference Value (DRV) for specific nutrients, including fiber. The DRV for fiber is 25 grams per day based on a 2,000 calorie diet, or 30 grams per day based on a 2,500 calorie diet. The fiber content of a food is listed in grams and as a percentage of the daily value.

Figure 1 shows a food nutrition label. It tells you the product provides 3 g of fiber in a half cup serving. The percent Daily Value for one serving is 12 percent, or 12 percent of DRV of 25 grams based on a 2,000 calorie diet.

Specific health claims can be made for food products that meet specific requirements. For example: “Diets low in saturated fat and cholesterol and rich in fruits, vegetables and grain products that contain fiber, particularly soluble fiber, may reduce the risk of coronary heart disease.” In order to make a health claim about fiber and coronary heart disease, the food must contain at least 0.6 g of soluble fiber per reference amount. The soluble fiber content must be listed and cannot be added or fortified. A product containing a

health claim for fiber and coronary heart disease must also meet the definitions of a low fat, low in saturated fat and low in cholesterol product.

A statement such as “made with oat bran” or “high in oat bran” implies that a product contains a considerable amount of the nutrient. Claims that imply a product contains a particular amount of fiber can be made only if the food actually meets the definition for “high fiber” or “good source of fiber,” whichever is appropriate.

The following terms describe products that can help increase fiber intake:

High fiber	5 g or more per serving
Good source of fiber	2.5 g to 4.9 g per serving
More or added fiber	At least 2.5 g more per serving than the reference food

Although fiber is important, it is just one part of a properly balanced diet. It is possible that too much fiber may reduce the amount of calcium, iron, zinc, copper and magnesium that is absorbed from foods. Deficiencies of these nutrients could result if the amount of fiber in the diet is excessive, especially in young children.

Fiber supplements are sold in a variety of forms from bran tablets to purified cellulose to powdered psyllium. Many laxatives sold as stool softeners actually are fiber supplements. Fiber’s role in the diet is still being investigated. It appears that the various types of fiber have different roles in the body. Furthermore, fiber may interact with prescription medications.

For these reasons, avoid fiber supplements. Instead, eat a variety of fiber-rich foods. This is the best way to receive the maximum benefits from each type of fiber present in foods, and obtain necessary nutrients.

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UC Berkeley Wellness Letter, April 2007.

Table 3. Dietary fiber content of foods.

	Serving size	Fiber (grams)
Breads, cereals, grains		
White bread	1 slice	0.6
Whole grain bread	1 slice	1.7
100% All Bran	1/2 cup	8.8
Corn Flakes	1 cup	0.7
Shredded Wheat	2 biscuits	5.5
Oatmeal, cooked	1 cup	4.0
Rice, brown, cooked	1 cup	3.5
Rice, white, cooked	1/3 cup	0.6
Fruit (fresh unless noted otherwise)		
Apple, with skin	1 large	3.3
Apricots	1	0.7
Banana	1	3.1
Blackberries	1 cup	7.6
Dates	5	3.3
Grapes	10	n/a
Grapefruit, pink and red	1/2	2.0
Grapefruit, white	1/2	1.3
Melon, cantaloupe	1 cup	1.4
Nectarine	1	2.3
Orange	1 small	3.1
Peach	1	1.5
Pear	1 medium	5.1
Pineapple	1 cup	2.2
Plums	1 small	0.9
Prunes, dried	5	3.0
Raisins	1 cup	5.4
Strawberries	1 cup	3.3
Vegetables		
Beans, baked, canned, plain	1 cup	10.4
Beans, green, cooked	1 cup	4.0
Beets, canned	1 cup	2.9
Broccoli, raw	1 cup	2.3
Cabbage, raw	1 cup	1.6
Carrots, raw	1 cup	3.1
Cauliflower, raw	1 cup	2.5
Celery, raw	1 cup	1.9
Corn, yellow, cooked	1 cup	3.9
Lentils, cooked	1 cup	15.6
Lettuce, romaine, raw	1 cup	1.2
Lettuce, iceberg, raw	1 cup	0.7
Peas, boiled	1 cup	4.5
Peas, split	1 cup	16.3

**Table 3, continued**

**Table 3. Dietary fiber content of foods.**

	<b>Serving size</b>	<b>Fiber (grams)</b>
Potato, baked, fresh	1 potato	2.3
Sweet potato, cooked without skin	1 potato	3.9
Tomato, red, ripe	1 tomato	1.5
Winter squash, cooked	1 cup	5.7
Zucchini squash	1/2 cup	n/a
<b>Other foods</b>		
Meat, milk, eggs		0
Almonds (24 nuts)	1 oz.	3.3
Peanuts, dry roasted (approx. 28)	1 oz.	2.3
Walnuts, English (14 halves)	1 oz.	1.9