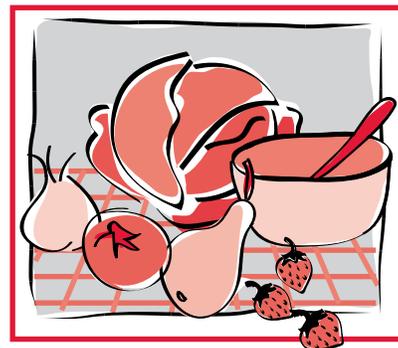


## Dietary Fiber

Fact Sheet No. 9.333

Food and Nutrition Series|Health



by J. Clifford, K. Niebaum, L. Bellows (3/15)

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 in the intestinal tract. Part of it, however, may be broken down 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.

#### Soluble Fiber

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. Soluble fibers have been shown to decrease cholesterol and lower blood glucose. Beans, oat bran, fruit and vegetables contain water-soluble fiber.

#### Insoluble Fiber

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.

Listed below in Table 1 are dietary sources of soluble and insoluble fiber:

**Table 1: Sources of dietary fiber.**

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

### Benefits of Fiber

#### Digestion

Insoluble fiber binds water as it passes through the digestive tract, 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.

#### Cholesterol

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 acids some of which are excreted daily. The 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. Pectin is found in some fruits such as apples, pears, and citrus fruits.

#### Cancer

### 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.

© Colorado State University Extension. 12/98. Revised 7/15  
extension.colostate.edu



\*July, 2015, reviewed and revised by Colorado State University Jessica Clifford, Research Associate and Extension Specialist and K. Maloney, graduate student in the Dept of Food Science Human Nutrition. Original publication by Kate Tophman, CSU food science and human nutrition graduate student. 12/2010

**Table 2: Dietary fiber content of foods**

	Serving size	Fiber(grams)
<b>Breads, cereals, grains</b>		
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	1/2 cup	1.75
Rice, white, cooked	1/2 cup	0.3
<b>Fruit (fresh unless otherwise noted)</b>		
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	1/4 cup	1.4
Strawberries	1 cup	3.3
<b>Vegetables</b>		
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
Potato, baked, fresh	1/2 potato	2.3
Sweet potato, cooked without skin	1/2 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

High-fiber diets may also reduce the risk of developing some types of cancer, 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. While many studies have shown an association between increased fiber intake and reduced prevalence of colon cancer, the mechanisms of how fiber consumption may reduce cancer risk are still unknown.

**Weight loss**

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 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.

**Diabetes and Obesity**

Additionally, recent research suggests that a high-fiber diet rich in whole grains is associated with a reduced risk for developing type 2 diabetes and obesity. Greater consumption of fiber found in whole grains, compared to refined grains, has been shown to modestly reduce glycemic index and improve insulin sensitivity, resulting in an decreased risk for developing type 2 diabetes and obesity. To increase your fiber intake, it is recommended by the 2010 Dietary Guidelines for Americans to make at least half of grains consumed whole grains for optimal health.

**Sources of Fiber**

**Foods**

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, can destroy the water-holding qualities of fiber. For this reason, dried fruit may have less fiber than raw fruit.

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 2 lists the dietary fiber content of some common foods.

**Functional Fiber**

Functional fiber is a newer term that includes foods that consist of isolated, nondigestible carbohydrates that have beneficial physiological effects in humans. Cellulose, chitin, beta glucans, gums, inulin, oligofructose, fructooligosaccharides, 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, as it is being added into many food products. While 10 grams per day of chicory inulin has been shown to be well-tolerated in healthy adults, higher intakes have been associated with gas and bloating. Therefore, it is recommended to consume functional fiber in moderation as a part of a balanced diet.

**How Much Fiber?**

The average American consumes 14 grams of dietary fiber a day, which is considerably less than the recommended level. The 2010 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 2010 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 3). Previously, no national standardized recommendation existed. The new DRIs represent desirable intake levels established using the most recent scientific evidence available.

Although fiber is important, it is just one part of a balanced diet, and like all foods, should be consumed in moderation. 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.

**Tips for increasing fiber**

For many people, meeting the DRI for fiber may require changes in their eating habits. Consider the following tips when increasing fiber in your diet:

- Aim for at least 3 servings of whole grains a day, such as oatmeal for breakfast, whole wheat bread at lunch, and brown rice with dinner.
- Try adding more legumes to your diet. Add black beans to a burrito or chick peas to a salad.
- Increase your daily fruit and vegetable intake. Aim for 5 servings total per day. Choose whole fruits more often than dried fruit or fruit juices. Cut up veggies for an easy snack throughout the day. Make gradual increases. If you are not used to eating high fiber foods regularly, changes should be made gradually to avoid problems with gas and diarrhea. 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.
- Anyone with a chronic disease should consult a physician before greatly altering a diet.

**Food Labeling of Fiber**

**Nutrition Facts Label**

Nutrients required on the Nutrition Facts Label reflect current public health recommendations. The Nutrition Facts Label 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 3g 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.

**Health Claims**

Specific health claims can be made for food products that meet specific requirements. For example: "Diets low in saturated fat and cholesterol and rich

**Table 3: Dietary Reference Intakes (DRI) for Fiber.**

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

**Figure 1: Nutrition Facts Label Showing Fiber Listed in Grams**

<b>Nutrition Facts</b>			
Serving Size 1/2 cup (114g)			
Servings Per Container 4			
Amount Per Serving			
<b>Calories 90</b>		Calories from Fat 30	
% Daily Value*			
<b>Total Fat</b> 3g			5%
Saturated Fat 0g			0%
<b>Cholesterol</b> 0mg			0%
<b>Sodium</b> 300mg			13%
<b>Total Carbohydrate</b> 13g			4%
<b>Dietary Fiber</b> 3g			12%
Sugars 3g			
<b>Protein</b> 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			

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

**Supplements**

Fiber supplements are sold in a variety of forms from bran tablets to purified cellulose to powdered psyllium. Many laxatives sold as stool softeners are actually 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. If you are taking prescription medications, check with your doctor before taking a fiber supplement.

**Summary**

It is recommended to meet dietary fiber recommendations by eating 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.

## References

- Aune, D., Chan, D., Lau, R., Vieira, R., Greenwood, D., Kampman, E., & Norat, T. (2011). Dietary Fibre, Whole Grains, And Risk Of Colorectal Cancer: Systematic Review And Dose-response Meta-analysis Of Prospective Studies. *BMJ*, 343, D6617-D6617.
- Bonnema, A., Kolberg, L., Thomas, W., & Slavin, J. (2010). Gastrointestinal Tolerance of Chicory Inulin Products. *Journal of the American Dietetic Association*, 110(6), 865-868.
- Cho, S., Qi L., Fahey, G., & Klurfeld, D. (2013). Consumption of cereal fiber, mixtures of whole grains and bran, and whole grains and risk reduction type 2 diabetes, obesity, and cardiovascular disease. *The American Journal of Clinical Nutrition*, 594-619.
- Food Labeling Guide. (2013). Washington, DC: U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition.
- Institute of Medicine. (2005). *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (Macronutrients)*. National Academy Press p. 265-334.
- Kaczmarczyk, M., Miller, M., & Freund, G. (2012). The health benefits of dietary fiber: Beyond the usual suspects of type 2 diabetes mellitus, cardiovascular disease and colon cancer. *Metabolism*, 61(8), 1058-1066.
- Lattimer, J., & Haub, M. (2010). Effects of Dietary Fiber and Its Components on Metabolic Health. *Nutrients*, 2(12), 1266-1289.
- Tucker, L., & Thomas, K. (2009). Increasing Total Fiber Intake Reduces Risk of Weight and Fat Gains in Women. *Journal of Nutrition*, 576-581