

FIBRE-pedia:

A comprehensive look at fibre



Fibre intakes of Canadians fall dramatically short of the dietary recommendations, with average intakes of children and adults alike at only about half of recommended levels.¹ This finding is particularly troublesome because scientific evidence has shown a link between eating a high fibre diet and a spectrum of health benefits – including digestive health, maintaining a healthy body weight, reducing the risk of heart disease, managing diabetes and helping to reduce the risk of some types of cancer.²

FIBRE-pedia: A comprehensive look at fibre is a convenient resource that:

- Explains what fibre is and why it is important.
- Details current fibre recommendations and Canadians' dietary shortfall.
- Summarizes new research showing that fibre accounts for many of the health benefits that have been attributed to whole grain.
- Clarifies how to find foods that provide fibre.
- Provides ideas on how to add fibre to the diet.

Eating a healthy diet rich in fibre helps to:

- Keep the digestive system working effectively and regularly by increasing bulk and decreasing the amount of time food spends in the digestive tract (called transit time), making it easier for waste matter to be eliminated.
- Battle the bulge. Fibre helps to keep you feeling fuller for longer, thus helping to manage body weight.
- Support heart health by helping to lower cholesterol levels so that arteries are less likely to clog.
- Reduce swings in blood sugar levels by slowing the release of sugars into the blood stream.
- Lower the risk of cancer in the lower digestive tract by boosting friendly bacteria and decreasing transit time.
- Keep you feeling great. Research has shown that boosting fibre intake improves mood and feelings of well-being.

¹ Health Canada, Canadian Community Health Survey Cycle 2.2, Nutrition. (2004). Nutrient Intakes from Food. Provincial, Regional and National Summary Data Tables: Volume 1.

² International Food Information Council. (2008). Fiber Fact Sheet. See www.ific.org.



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Fibre Basics

History of Fibre

For centuries, people have understood the health benefits of a high fibre diet. Here is a brief historical review of what many argue is the original “super nutrient.”

- Hippocrates (4th century B.C.), considered by many as the father of medicine, first championed the health benefits of wheat with the bran to help keep the large intestine healthy.
- In the 1830s, Rev. Sylvester Graham, a Presbyterian minister and advocate of dietary reform, believed bran was a cure-all for the bad eating habits of his fellow countrymen and created Graham flour, which is still used today.
- In 1870, the introduction of new mills meant that fine white flour became affordable for all, resulting in a dramatic fall in fibre consumption.
- In 1915, W.K. Kellogg, the founder of Kellogg’s cereals, invented bran flakes, the world’s first high fibre breakfast cereal. *All-Bran** cereal followed in 1916.
- In the 1970s, renowned physician Denis Burkitt launched his “Bran Hypothesis.” He studied people in rural Africa and discovered that, thanks to their high fibre diets, people had fewer hernias, hemorrhoids, diverticulitis and other diseases of the bowel, as well as lower rates of diabetes and heart disease.

Research continues to show the benefits of fibre. Many recent studies are summarized in this report.

What is Fibre?

Fibre is a non-digestible component of plant foods (grains, fruit, vegetables and legumes). Non-digestible means that the enzymes in the upper digestive system do not break down the fibre and so it travels down through the whole digestive tract, including the colon. The fact that fibre is not digested by the body is part of the reason it is beneficial to good health.¹

Fibre is made up of three main parts:

1. **Polysaccharides** represent the largest group of fibre components and they are found in the bran from grains, pectins from fruit and vegetables, beta-glucans from oats, barley and rye, as well as plant gums such as gum Arabic and guar gum.
2. **Lignin** is the tough, fibrous part of plant cell walls and is the second largest component of fibre. Lignins are found in the stalks and skins of plants.
3. **Resistant starches and non-digestible oligosaccharides** are part of fibre because they resist digestion in the upper digestive tract. These compounds are found in legumes, some fruits and vegetables and seeds and grains; they are also sometimes added to foods as isolated ingredients. In Canada, these ingredients are not always classified as fibre.

¹ International Food Information Council (2008) Fiber Fact Sheet. See www.ific.org.

Traditionally, fibre has been grouped into two categories — soluble and insoluble — depending on how well it dissolves in water, which is a property that contributes to some of the effects of fibre in the body. Both types function very differently in the body, and both are important as part of a healthy diet.

Soluble fibre is soluble in water, meaning it can blend with water to form a gel. Soluble fibre helps with satiety (feeling fuller longer). Some soluble fibres can also lower blood levels of low-density lipoprotein (LDL) cholesterol (also known as the “bad cholesterol”) and help to maintain steady blood glucose levels (by evening out the rise in blood glucose that occurs after eating). Some examples of foods that contain soluble fibre are psyllium seed husks, oat bran, barley, apples and pears.

Insoluble fibre is not soluble or does not dissolve in water. Acting like a sponge, this type of fibre swells in size, absorbing up to 15 times its own weight in water. In this way, insoluble fibre provides bulk, which can help with satiety (feeling fuller longer). Insoluble fibre also speeds up the movement of food through the digestive system, helping to promote regularity or laxation. Some examples of foods that contain insoluble fibre include wheat bran and bran cereals, corn bran, some whole wheat foods, vegetables and fruit.

A greater understanding of the role of fibre on health has brought innovations in the development of fibre-enhanced foods and ingredients. Traditionally, corn, wheat and oat ingredients have been used to supply fibre in other foods. Today, fibre components (such as pectins, gums and psyllium) are being extracted from fruits, vegetables, legumes and seeds to be added to other foods. These extracted or isolated fibre ingredients are sometimes referred to as novel or functional fibres – the latter because they do indeed function as fibre.² In Canada, many of these ingredients are considered novel fibres and must undergo approval so that they can be used as fibre in foods.

“Dietary fibre, a non-digested carbohydrate, is an essential nutrient with numerous health benefits. Irrespective of type or source, it is a nutrient the body needs daily. Studies have shown that consuming products with added fibre can help promote good digestive health.”

– Dennis T. Gordon, PhD
Professor Emeritus, North Dakota State University

Are All Fibres Created Equal?

No, but they are all beneficial to the body in their own way. While all fibres have one thing in common – they are not digested – different fibres have different effects in the body depending on their structural make-up and other properties. For example, water soluble fibres generally lower blood cholesterol levels; insoluble fibres help to promote regularity or laxation; and still other fibres may help with satiety (to feel fuller longer). There are also components (such as oligosaccharides) that feed and stimulate the growth of beneficial bacteria in the digestive tract, which is a “prebiotic” effect, and so these components are called prebiotic fibres.

² Institute of Medicine. (2005). Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids (macronutrients). National Academies Press.

How Much Fibre Do We Need?

The Institute of Medicine (IOM) has established an Adequate Intake level for fibre as part of the Dietary Reference Intakes (DRIs) for macronutrients.³ It is based on the amount of fibre observed to protect against heart disease in adults and set at 14 grams of fibre for each 1,000 calories daily for people of all ages. Since different age and gender groups eat a different amount of calories, the Adequate Intake for fibre is also provided by age and gender as summarized below.

IOM Fibre Recommendations ³ by Age and Gender	
Population	Adequate Intake Level (grams per day)
Children aged 1-3	19 grams
Children aged 4-8	25 grams
Boys aged 9-13	31 grams
Girls aged 9-13	26 grams
Boys aged 14-18	38 grams
Girls aged 14-18	26 grams
Men aged 19-50	38 grams
Women aged 19-50	25 grams
Men aged 50 years and older	30 grams
Women aged 50 years and older	21 grams

A simple way to help children take small steps towards meeting their recommended fibre intake is to set achievable goals, such as the “age-plus-five” approach outlined in the Children and Fibre section.

³Institute of Medicine. (2005). Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids (macronutrients). National Academies Press.





The Canadian Fibre Deficit

Canadians' fibre intake falls dramatically short of the recommendations for good health, with average intakes of both children and adults at about half of the Adequate Intake levels.⁴ The following chart compares average daily consumption of fibre to the Adequate Intake for selected age and gender groups.

Population	Average Fibre Intake (grams per day)	Adequate Intake Level (grams per day)
Children aged 1-3	10.2 grams	19 grams
Children aged 4-8	13.5 grams	25 grams
Boys aged 9-13	16.5 grams	31 grams
Girls aged 9-13	14.4 grams	26 grams
Men aged 19-50	19.1 grams	38 grams
Women aged 19-50	15.7 grams	25 grams

“As a medical researcher working closely with patients to modify their diets, I see first-hand that adults and children alike aren’t getting the recommended intakes of fibre.”

– David Jenkins, PhD
Professor, Faculty of Medicine, University of Toronto

⁴Health Canada, Canadian Community Health Survey Cycle 2.2, Nutrition. (2004). Nutrient Intakes from Food. Provincial, Regional and National Summary Data Tables: Volume 1.



Fibre – The Powerhouse Nutrient

Despite increased attention to whole grains and the proliferation of whole grain products, Canadian children and adults have average intakes of dietary fibre that are only about half of recommended levels.¹ This fibre gap may be due – in part – to consumer confusion about dietary fibre sources.

An independent review by the Life Sciences Research Office (LSRO)² evaluated the effect of applying the U.S. Food and Drug Administration’s definition of whole grain to the strength of scientific evidence supporting whole grain health claims for reduction in risks of cardiovascular disease (CVD) and diabetes. This review concluded that the presence of fibre is consistently linked to the benefits of whole grain, yet many foods that promote whole grain ingredients do not provide much fibre.³

Key Results of the LSRO review are:

- The health benefits attributed to whole grain are confounded by the presence of bran or dietary fibre.
- The CVD benefits of whole grain are supported only where whole grain foods contain fibre or bran.
- The diabetes health benefits of whole grain are inconclusive, whether or not fibre is considered.
- The health benefits from the consumption of a certain type of whole grain do not necessarily apply to other whole grains because of the nutrient diversity in the various grains.
- A consistent definition of whole grain has not been applied in the existing research.

Key Message from the LSRO Review

Fibre should be a consistent factor when assessing the benefits of whole grain, since there is significant and consistent nutrition research on the various health benefits of fibre as a nutrient. A definition of whole grain needs to include measuring fibre.

Do not mistake “whole grain” for a high source of fibre, or you may be missing out on the benefits of fibre. Not all foods made with whole grain ingredients are significant sources of fibre. So while you are trying to eat more fibre by reaching for foods claiming “whole grain” on the front of the package, you might not be getting as much fibre as you think you are.

¹ Health Canada. Canadian Community Health Survey Cycle 2.2, Nutrition. (2004). Nutrient Intakes from Food. Provincial, Regional and National Summary Data Tables: Volume 1.

² LSRO is an independent organization that provides scientific assessments of topics in biomedical sciences. Reports published by LSRO are based on comprehensive literature reviews and the scientific opinions of knowledgeable investigators in the relevant areas. Expert Panels are appointed by LSRO.

³ De Maura, Fabiana, F. PhD. (November 2008). Life Sciences Research Office (LSRO), Whole Grain Intake, Cardiovascular Disease and Diabetes: A Review, <http://www.lsro.org/articles/wholeGrainIntake.html>

It is important to check the Nutrition Facts table on food packages for the grams of fibre per serving when choosing products made with whole grains to ensure you are also getting the fibre you're looking for. A "source of fibre" provides at least 2 grams per serving, a "high source of fibre" provides at least 4 grams per serving and a "very high source of fibre" provides at least 6 grams per serving. Kellogg provides more ready-to-eat cereals that are at least a source of fibre than any other food company.⁴

It is equally important to recognize that some fibre-rich foods do not contain whole grain ingredients at all, but they do provide the many health benefits of fibre. For example, fruits, vegetables and legumes are natural sources of dietary fibre. Similarly, cereals enriched with bran or other fibres could provide fibre without necessarily containing whole grains. Both whole grains and fibre are important components of a healthy diet and dietary guidance includes increasing the consumption of both.



Whole Grain and Fibre – Understanding the Truth

Myth: Whole grain foods always provide a significant amount of dietary fibre.

Truth: Not all whole grain foods contain significant amounts of fibre. The easiest way to confirm that a food provides the benefits of whole grains AND fibre is to check the ingredient list and Nutrition Facts table. Whole grain foods should list whole grain as the first ingredient; those that are a "high source of fibre" will list at least 4 grams fibre on the Nutrition Facts table, and a "very high source of fibre" would list at least 6 grams of fibre.

Myth: All dietary fibre should come from whole grain sources.

Truth: Some fibre-rich foods do not contain whole grain ingredients, but they do provide many health benefits from their fibre content. For example, fruit, vegetables, legumes, nuts and seeds are all natural sources of dietary fibre. Also, cereals that are enriched with bran can provide fibre and may not contain any whole grain ingredients.

⁴Nielsen GB+MM+DRU, latest 52 weeks ending March 12, 2009. Based on 42% share of RTEC cereals that qualify as a source, high source and/or very high source of fibre.

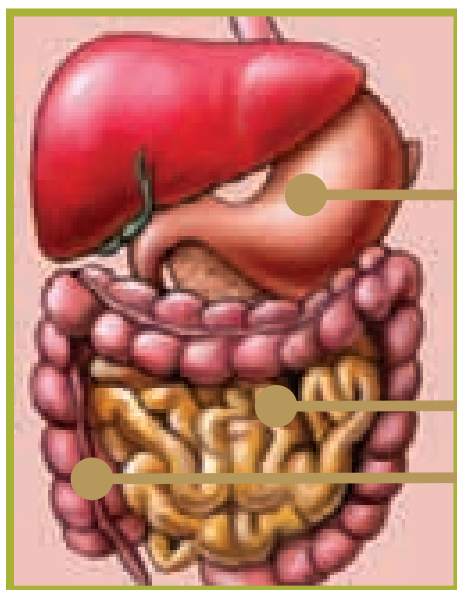
Fibre and Digestive Health

Fast Facts

- The digestive tract is an amazing 28 feet (8.5 metres) long.¹
- Food takes between 1.5 to 3 days to travel the entire length of the digestive tract.¹
- Fibre helps keep food moving through the digestive system and plays a bulking role so that undigested food can be more easily eliminated.¹
- Fibre plays a vital role in helping keep the walls of the digestive tract healthy.¹
- A high fibre diet can help to reduce a bloated feeling.¹

When it comes to overall wellness, maintaining good digestive health is just as important as maintaining a healthy heart or strong bones. Good digestive health not only helps to avoid the discomfort of occasional constipation and promotes regularity, but it also supports overall well-being and the immune system function in the digestive tract.

Increasing fibre intake (particularly insoluble fibre such as wheat bran) prevents food from lingering in the digestive system longer than it needs to. Fibre helps to absorb water and create bulk, which speeds up the passage of food through the digestive system and helps to promote regularity and prevent constipation.



Stomach - Once chewed and swallowed, food enters the stomach, where the big pieces are broken down into much smaller pieces, so the body can pull nutrients out of the food. Typically, food stays in the stomach for one to three hours.

Small Intestine - This is the powerhouse of digestion, where food components are broken down into individual nutrients, and these nutrients are then absorbed into the body. Fibre is not absorbed in the small intestine. Instead, it travels down to the large intestine and gets excreted from the body.

Colon or Large Intestine - This last part of the digestive system contains friendly bacteria, which feed on undigested fibre in a process called fermentation. Through this process, the bacteria provide other important components that support health.

“Wheat bran is a key insoluble dietary fibre and a well-known contributor to regularity, with the added advantage of reducing the energy density of the food.”

– David Jenkins, PhD
Professor, Faculty of Medicine, University of Toronto

¹Jefferson A (2005). Diet and digestive health. Primary Healthcare 15:27-31.

Did you know...

Wheat bran is one of the most studied fibres. In scientific studies on regularity, wheat bran is generally seen as the “gold standard” meaning it is used as the control treatment against which other fibres are measured or compared with to see if they have any regularity effects.

Fibre and Friendly Bacteria – Supporting Good Digestive Health

Few people think about what’s inside their digestive tract, and if they did, most would squirm at the thought of it being full of bacteria. When we are in utero, our intestines are sterile and contain no bacteria. As we are born, we obtain bacteria from our mothers and these bacteria rapidly build up over the first few weeks of life. The human digestive tract contains 300 to 500 different species of bacteria.²

Popular belief is that all bacteria are detrimental, but the truth is many bacteria in the lower digestive tract play important roles in helping to maintain health.

Friendly digestive tract bacteria:²

- Keep detrimental or “bad” bacteria out of the digestive tract.
- Manufacture vitamins from the undigested fibre that make it through to the colon that are then absorbed and used by the body.
- Provide fuel to cells in the colon, which is thought to help reduce the risk of colon cancer.
- Help to support immune function in the digestive tract and throughout the body.

Certain fibre ingredients, such as pectins, inulin and fructo-oligosaccharides, are called prebiotic fibres.³ Prebiotic fibres selectively feed and stimulate the growth of friendly bacteria in the digestive tract. Many fibre-rich foods naturally contain prebiotic fibres, while functional prebiotic fibres can be added to other foods to give specific digestive health benefits as well.⁴

² Guarner, F. et al. (2003). Gut flora in health and disease. *Lancet* 361:512-519.

³ Gibson, G.R. et al. (1995). Dietary modulation of the human colonic microbiota: Introducing the concept of prebiotics. *J Nutr* 125:1401-1412.

⁴ International Food Information Council. (2008). Fiber Fact Sheet. See www.ific.org.



Fibre and a Healthy Weight

Fast Facts

- The latest figures show that 36.1 per cent (8.6 million) of Canadian adults over the age of 18 are overweight and 23.1 per cent (5.5 million) are obese.¹
- Research indicates fibre can play a key role in weight management.²
- Results from two major U.S. studies of the health of men and women over many years suggest that people who eat high fibre diets tend to be slimmer than those who do not.^{3,4}
- A review of studies on the effects of energy density on weight loss found that people eating diets low in fat and high in fibre lose weight three times faster than people eating low fat, lower fibre diets.⁵
- A review of the effects of fibre on energy intake and body weight found that eating an additional 14 grams fibre each day resulted in a 10 per cent reduction in energy intake and weight loss of about four pounds within three months, with the effects greater in the most overweight people.⁶
- A recent analysis of U.S. diet survey data showed that consumption of fibre is associated with lower body weight measures in adults.⁷

Overweight and obesity are described globally as one of the most pressing public health enemies of the 21st century. Numerous studies have investigated the role of fibre in weight management and conclude that eating foods containing fibre can help to avoid weight gain and promote weight loss by:⁸

- Taking longer to chew, slowing down the rate at which we eat and thus giving our bodies a chance to signal satiety or let us know when we are full.
- Absorbing fluid (as much as 15 times its own weight) to swell up in the stomach and upper intestines, helping us to feel full.
- Containing fewer calories on a weight for weight basis (which is known as lower energy density); higher fibre foods tend to have fewer calories than the same weight of lower fibre foods.

¹ Statistics Canada. Nutrition: Findings from the Canadian Community Health Survey, Issue no. 1., Measured Obesity, Adult obesity in Canada: Measured by height and weight (Statistics Canada Catalogue no. 82-620-MWE2005001).

² International Food Information Council. (2008). Fiber Fact Sheet. See www.ific.org

³ Liu, S. et al. (2003). Relation between changes in intakes of dietary fiber and grain products and changes in weight and development of obesity among middle-aged women. *Am J Clin Nutr* 78:920-927.

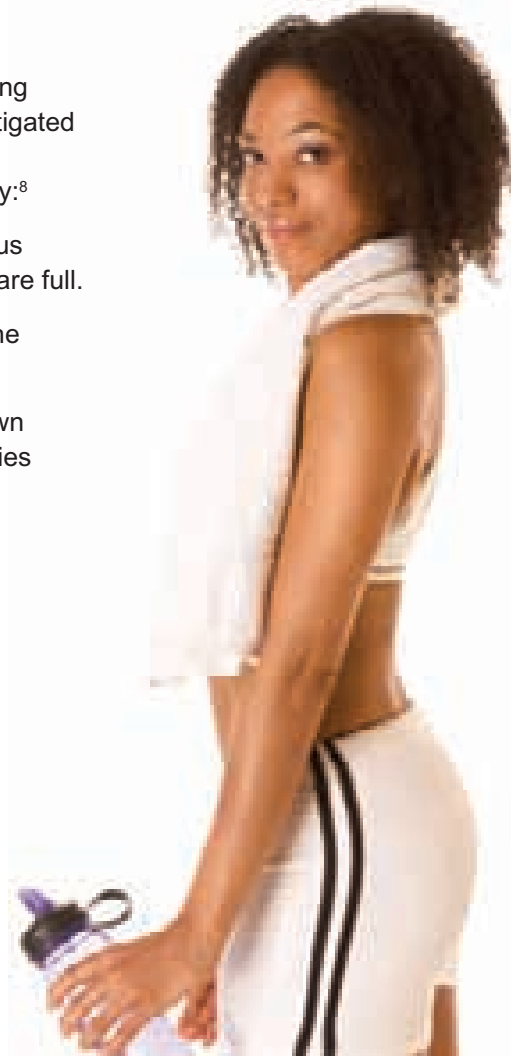
⁴ Koh-Banerjee, P. et al. (2004). Changes in whole-grain, bran and cereal fiber consumption in relation to 8-y weight gain among men. *Am J Clin Nutr* 80:1237-1245.

⁵ Yao, M. et al. (2001). Dietary energy density and weight regulation. *Nutr Rev* 59: 247-258.

⁶ Howarth, N.C. et al. (2001). Dietary fiber and weight regulation. *Nutr Rev* 59:129-139.

⁷ The affect of whole-grain consumption on diet quality and nutrient intake in adults: The National Health and Nutrition Examination Survey (NHANES) 1999-2004.

⁸ Slavin, J. et al. (2007). Dietary fiber and satiety. *Nutrition Bulletin* 32:S32-S42.





Two major studies have shown a protective effect of fibre against unwanted weight gain:

- The Prospective Nurses Health Study tracked 74,000 female nurses in the United States.⁹ Women who ate more fibre weighed less than women with lower fibre intakes. Women with the highest intakes of fibre were half as likely to experience major weight gain over a 12-year period compared with women with the lowest intakes; an increase in fibre of 12 grams per day was associated with an eight pound lower weight gain over 12 years.
- In another study in young adults,¹⁰ dietary fibre consumption predicted weight gain and other cardiovascular risk factors more strongly than total and saturated fat intake. Specifically, results from this multi-centre cohort study demonstrated a strong inverse association with body weight and fibre intake. This translated into an 8 pound reduction in body weight when considering the highest vs. lowest fibre consumption levels over 10 years. Similarly, greater fibre consumption was associated with a reduced waist-to-hip ratio. These findings suggest that fibre intake may help to protect against overweight and obesity.

Most recently, an analysis of U.S. diet survey data evaluated the effects of consumption of fibre and whole grain on body weight in adults.¹¹ A nationally representative sample of adults was analyzed for body mass index (BMI) and waist circumference based on dietary fibre and whole grain intake. This analysis showed that an increased consumption of dietary fibre was associated with lower BMI in women and lower waist circumference in both women and men. Increased intake of whole grains was also associated with lower BMI and waist circumference in women; this association disappeared after adjusting for cereal fibre however, which suggests that dietary fibre is an active contributor to the effects observed for whole grains.

⁹ Liu, S. et al. (2003). Relation between changes in intakes of dietary fiber and grain products and changes in weight and development of obesity among middle-aged women. *Am J Clin Nutr* 78(5):920-927.

¹⁰ Ludwig, D.S. et al. (1999). Dietary fiber, weight gain, and cardiovascular disease risk factors in young adults. *JAMA* 282(16): 1539:1546.

¹¹ Consumption of Fiber is Associated with Lower Body Weight Measures in U.S. Adults: The National Health and Nutrition Examination Survey (NHANES) 1999-2004, S.S. Cho, T.A. Nicklas, C.E. O'Neil.

Fibre and Heart Health

Fast Facts

- Cardiovascular disease (heart disease, diseases of the blood vessels and stroke) is the leading cause of death in Canada.¹
- There are an estimated 70,000 heart attacks each year in Canada and they account for approximately 19,000 deaths annually.¹
- About 40 per cent of Canadians have high blood cholesterol.¹
- Eating a diet rich in fibre may help to reduce the risk of heart disease.²

Fibre and Heart Disease Risk

A meta-analysis compared intakes of total dietary fibre with risk of coronary heart disease (CHD).² This pooled analysis of 10 large prospective studies reported that each 10 gram per day increment in dietary fibre intake (equivalent to one bowl of high fibre cereal, one large banana and one serving of carrots) was associated with a 14 per cent decrease in risk of CHD. Fibre from cereals and fruits had a strong inverse association with CHD risk (10 per cent and 16 per cent reduction in risk, respectively). In terms of coronary deaths, the association was even stronger, with 27 per cent reduction in deaths associated with total fibre, 25 per cent reduction with cereal fibre and 30 per cent reduction with fruit fibre.

In addition to association with heart disease risk, fibre also supports heart health by its effects on risk factors of heart disease. For example, fibre has been shown to:

- Lower blood levels of low-density lipoprotein (LDL) cholesterol.
- Lower blood pressure.
- Help manage body weight.
- Help control blood sugar levels (see Fibre and Diabetes section).

¹ Heart and Stroke Foundation. www.heartandstroke.ca. (accessed May 3, 2009)

² Pereira, M.A. et al. (2004). Dietary fiber and risk of coronary heart disease. *Arch Intern Med* 164:370-376.





Fibre and Blood Cholesterol Levels

High blood cholesterol (mainly LDL-cholesterol) is a major risk factor in the development of heart disease. When cholesterol levels are too high, arteries are more likely to become clogged with fatty cholesterol deposits (a bit like lime scale building up inside a pipe) which can reduce the amount of blood flow. Reduced blood flow to the heart causes angina (chest pain) and, if blood flow stops, a heart attack occurs.

Soluble fibres (such as fibre from legumes, psyllium, and the beta glucans from oats) are effective in lowering LDL-cholesterol levels. Once in the body, these soluble fibres act like a sponge, soaking up the cholesterol and helping to remove it from the body.

Including three servings of the types of foods listed below in the diet every day will boost Canadians' intake of soluble fibre and may help combat high cholesterol levels:

- 1 serving of cereal with psyllium soluble fibre.
- 2 to 3 tablespoons of beans, chick peas or lentils.
- 2 to 3 tablespoons of peas.
- 1 medium apple or pear or 6 dried plums.
- 1 citrus fruit, such as a grapefruit or orange or 2 clementines.
- 1 serving of carrots or sweet potatoes (for even more fibre, leave the skin on the sweet potato).

In the United States, the Food and Drug Administration has approved two health claims on the relationship between fibre and heart disease for use in food labelling and advertising:

- “Diets low in saturated fat and cholesterol and rich in fruits, vegetables and grain products that contain some types of dietary fiber, particularly soluble fiber, may reduce the risk of heart disease, a disease associated with many factors.”
- “Diets low in saturated fat and cholesterol that include 7 grams of soluble fiber from psyllium husk may reduce the risk of heart disease.”

These claims cannot currently be made in Canada; however, Health Canada is in the process of reviewing information to determine if similar claims may be allowed in the future.





Fibre and Diabetes

Fast Facts

- Over two million people in Canada have diabetes and this number is expected to reach three million by 2010.¹
- Ninety per cent of Canadians with diabetes have type 2 diabetes (the type where insulin is not yet needed), for which the risk is increased by being overweight.¹
- Increased intake of fibre-rich foods has been associated with reduced risk of diabetes in a number of epidemiological studies. A 2008 Cochrane Review estimated that eating a fibre-rich diet could help to reduce the risk by about one-third.²
- The Canadian Diabetes Association recommends people with diabetes increase dietary fibre to 25 to 50 grams per day from a variety of sources, including soluble and cereal fibres.³

¹ Canadian Diabetes Association. The prevalence and costs of diabetes. www.diabetes.ca. (accessed May 3, 2009)

² Cochrane Database of Systematic Reviews 2008 Issue 2. Priebe MG, van Binsbergen JJ, de Vos R, Vonk RJ Whole grain foods for the prevention of type 2 diabetes mellitus – see <http://www.cochrane.org/reviews/en/ab006061.html>.

³ Canadian Diabetes Association Clinical Practice Guidelines Expert Committee, Canadian Diabetes Association 2008 clinical practice guidelines for the prevention and management of diabetes in Canada. (2008). Can J Diabetes 32 (suppl 1): S1-S201.

Fibre May Help to Reduce Risk of Type 2 Diabetes

According to a number of studies, consumption of foods rich in fibre has been associated with a reduced risk of type 2 diabetes.

A comprehensive review of the health effects of fibre has found that nine out of 11 prospective studies concluded that increasing cereal fibre intakes significantly reduces the risk of developing type 2 diabetes.⁴ Fibre was also found to decrease the risk of pre-diabetes.

The mechanisms of how fibre may prevent diabetes are unclear. The action is likely to be a combination of the effects of fibre, including helping the body to manage blood sugar levels, insulin and a healthy body weight. The impact of other fibre-related dietary components such as magnesium, folate, vitamin B₆ and vitamin E may also play a role.

The recommendation from the Canadian Diabetes Association is to increase fibre intake to 25 to 50 grams per day.³ While every food in a diabetics' or diabetes-based meal plan does not have to be high in fibre, it is important to strive to meet the recommended intake through a combination of foods throughout the day. Increased activity levels are also recommended for diabetes management.



⁴ Scientific Advisory Committee on Nutrition. (2008). Statement on Dietary Fiber. See http://www.sacn.gov.uk/pdfs/final_sacn_position_statement_for_website_dietary_fibre.pdf.

Fighting Cancer with Fibre

Fast Facts

- In 2009, it is estimated that 22,000 people will be diagnosed with colorectal cancer and 9,100 will die from the disease, making it one of the most common types of cancer in Canada.¹
- Fibre helps the lining of the colon stay healthy and reduces the time toxic substances stay in contact with the colon, which may help protect against colon cancers.
- Foods rich in fibre tend to also be rich in antioxidants and vitamins and minerals, which have been linked to cancer prevention.
- A 10-country European study involving more than 500,000 people suggests that doubling fibre intake could reduce the risk of bowel cancer by 40 per cent.²

In the 1970s, renowned physician Denis Burkitt observed that people who ate diets full of fibre-rich foods tended to have much lower rates of colon cancer than people who ate low fibre diets. Over the years, this observation has been supported by some of the world's leading experts, who suggest that eating a diet rich in fibre could substantially reduce the risk of developing not only cancer of the colon but other cancers too.

The World Cancer Research Fund report on Food, Nutrition, Physical Activity and the Prevention of Cancer: A Global Perspective (2007) recommends an intake of at least 25 grams of fibre per day to reduce the risk of cancer.³ The expert panel for this report judged the level of evidence and determined that foods high in fibre probably protect against colorectal cancer, while there is more limited evidence to suggest high fibre helps to protect against cancer of the esophagus.

Newer research suggests that by changing to a diet rich in high fibre foods, women could be protected from developing breast cancer.^{4,5} This research is early and the number of studies looking at fibre and breast cancer is small; however, these initial results provide one more reason to increase dietary fibre levels.

¹ Canadian Cancer Society, Statistics Canada, Provincial/Territorial Cancer Registries and Public Health Agency of Canada. Canadian Cancer Statistics. (2009). See www.cancer.ca.

² Bingham, S.A. et al. (2003). Dietary fiber in food and protection against colorectal cancer in the European Prospective Investigation into Cancer and Nutrition (EPIC): An observational study. *Lancet* 361:1496-1501.

³ World Cancer Research Fund. (2007). Food, Nutrition, Physical Activity and the Prevention of Cancer: A Global Perspective.

⁴ Cade, J.E. et al. (2007). Dietary fiber and risk of breast cancer in the UK Women's Cohort Study. *Int J Epidemiol* 36:231-238.

⁵ Mattisson, I. et al. (2004). Intakes of plant foods, fiber and fat and risk of breast cancer – a prospective study in the Malmo Diet and Cancer Cohort. *Br J Cancer* 90:122-127.





How Fibre May Help Protect Against Cancer

The research suggests that there are several ways that fibre may help to reduce the risk of cancer. It is likely that these mechanisms act in combination to provide protective effects:

- Fibre is fermented in the bowel by friendly bacteria to produce substances called short-chain fatty acids, which provide energy for the cells lining the walls of the bowel, helping the cells to renew and repair.
- Fibre speeds up the passage of waste material through the colon, reducing the amount of time any toxic substances stay in the digestive tract.
- The cancer-protective effects have been linked to the role of antioxidants and vitamins and minerals in some fibre-rich foods is thought to alter some hormone levels in the body, particularly lowering estrogens, which have been linked to breast cancer risk.

In the United States, the Food and Drug Administration has approved a health claim on the relationship between fibre consumption and cancer prevention:

- “Diets low in fat and rich in fibre-containing grain products, fruits and vegetables may reduce the risk of some types of cancer.”

Health Canada has not approved a similar claim.

Angela Epstein, a leading health writer, comments: “It’s terrifying to acknowledge that at least one person close to us will get cancer at some point in their lives. But it’s also heartening to know that it’s possible to reduce significantly our risk of one of the most common forms of the disease – cancer of the bowel – simply by eating more dietary fibre. That’s why I always ensure that a high fibre breakfast cereal and whole grain bread are on my shopping list.”

Feeling Great with Fibre

It is hard to believe that something as simple as eating more fibre can help to provide that “get up and go” feeling.

Researchers at the University of Cardiff in the U.K. found that people who had higher fibre intakes experienced less emotional distress and fatigue and fewer cognitive difficulties than people who had lower fibre intakes. The study was based on a total of 139 volunteers who switched their normal breakfast cereal for *Kellogg's* All-Bran** cereal or bran flakes every day for two weeks and showed that by increasing fibre intake in this way, a 10 per cent increase in perceived energy levels and reduced fatigue could be enjoyed within the two weeks.

The researchers concluded that increasing dietary fibre intake with wheat bran cereals appeared to decrease fatigue. The researchers speculate this effect could be due to improvements in digestion and better removal of waste products from the body or an increase in the numbers of friendly bacteria in the lower digestive tract. The former explanation is based on the observation that the benefits of eating fibre were very rapid (on the first day) and there is no evidence that wheat bran has an effect on the proliferation of digestive bacteria.

Additional research has also shown high fibre breakfasts reduce fatigue and increase satiety (see Children and Fibre section).

Professor Andrew Smith who carried out the research at the University of Cardiff says, “In the modern world, many people find themselves struggling with tiredness and feeling drained. Our research suggests that doing something as simple as eating a bowl of high fibre cereal every day for breakfast can quickly make you feel more energetic and vitalized. This could simply be due to relief of mild, unnoticeable constipation or to faster removal of waste products from the body. Either way, it’s certainly worth giving it a try.”

¹Smith, A, et al. (2001). High fiber cereals reduce fatigue. *Appetite* 37:1-3.

²Smith, A.P. (2005). The concept of wellbeing: relevance to nutritional research. *Br J Nutr* 93(Suppl 1):S1-S5.

³Pasman, W.J. et al. (2003). Effects of two breakfasts, different in carbohydrate composition, on hunger satiety and mood in healthy men. *Int J Obes Relat Metab Disord* 27:663-668.





Feeling Great with Fibre



Children and Fibre – A Special Case

Canada's Food Guide recommends that children two years of age and older adopt a healthy eating pattern similar to adults. Just like adults, children need to eat a variety of foods from each food group, including a variety of fibre-containing foods like grains, fruits, vegetables and legumes.

Every mom knows that family life runs more smoothly when kids are healthy and feel good. Making sure children have enough fibre in their diets can help keep them healthy and also establish healthy eating habits that are more likely to be sustained throughout life.¹

Many parents believe that high fibre foods help prevent constipation in children.² A systematic review of childhood constipation, which considered studies from all over the world, revealed that the prevalence of constipation in children ranged from 0.7 per cent to nearly 30 per cent, implying that this condition is a common problem internationally.³

Also, observational studies have shown that children with higher fibre intakes are less likely to be overweight than those with low fibre intakes.⁴ With increasing rates of overweight and obesity among children and growing evidence that high fibre diets may help prevent excessive weight gain, adoption of a higher fibre diet is timely advice for many Canadian families.

Furthermore, higher fibre diets during childhood have been shown to be inversely related to blood cholesterol levels.⁵ High fibre diets can also help keep kids healthy by developing and maintaining a healthy population of bacteria in their digestive tract.¹

Yet, average fibre intakes of Canadian children are only about half the recommended amount.⁶ A simple way to help children take small steps towards meeting their recommended intake is to set achievable goals. As a general "rule of thumb" start with the age of the child and add five. This number can serve as a good starting point for adding more fibre to children's diets. For example, a five-year-old should strive to get at least 10 grams of fibre per day (five years + five grams = 10 grams per day).

¹ Edwards, C.A, et al. (2003). Dietary fiber in infancy and childhood. *Proc Nutr Soc* 62:17-23.

² Kellogg Canada Fibre Survey. (March 2009).

³ van den Berg, M.M. et al. (2006). Epidemiology of childhood constipation: A systematic review. *Am J Gastroenterol* 101: 2401-2409.

⁴ Pereira, M.A. et al. (2001). Dietary fiber and body weight regulation: Observations and mechanisms. *Pediatr Clin North Am* 48:969-980.

⁵ Williams, C.L. et al. (2008). Childhood diet, overweight and CVD risk facts: the Healthy Start Project. *Prev Cardiol* 11:11-20.

⁶ Health Canada, Canadian Community Health Survey Cycle 2.2, Nutrition. (2004). Nutrient Intakes from Food. Provincial, Regional and National Summary Data Tables: Volume 1.

Dr. Sarah Jarvis, a leading family doctor and editor of *Children's Health For Dummies* says: "A constipated child can suffer considerable discomfort, painful not only for themselves, but also their parents and caregivers. In most of the cases of childhood constipation that I see, a major contributing factor is a low fibre diet. Taking a few simple steps to gradually boost fibre and fluid intake could help to prevent most of the cases of this common, distressing and often unnecessary childhood condition."

Giving Children a Healthy Start to the Day and Getting Fibre at the Same Time!

Research on the impact of nutritional intake on children's physical and academic performance has mainly focused on the influence of the breakfast occasion. A body of evidence has shown that eating breakfast is associated with improved cognitive and academic performance, including improved memory, attention, problem solving and logical reasoning.⁷ Children who do not eat breakfast are likely to feel tired and hungry and find it difficult to concentrate and learn.

Recent evidence is now emerging to show that the foods and nutrients children consume at breakfast can also influence these outcomes. A study of 6 to 11 year-old children who ate either a high fibre, slowly digested breakfast, or a more rapidly digested low fibre meal, performed better on short-term memory and auditory tasks following the high fibre meal.⁸ The authors suggest that this effect may be due to the higher fibre breakfast providing a more sustained energy source and therefore enhancing cognitive performance for a longer period of time.

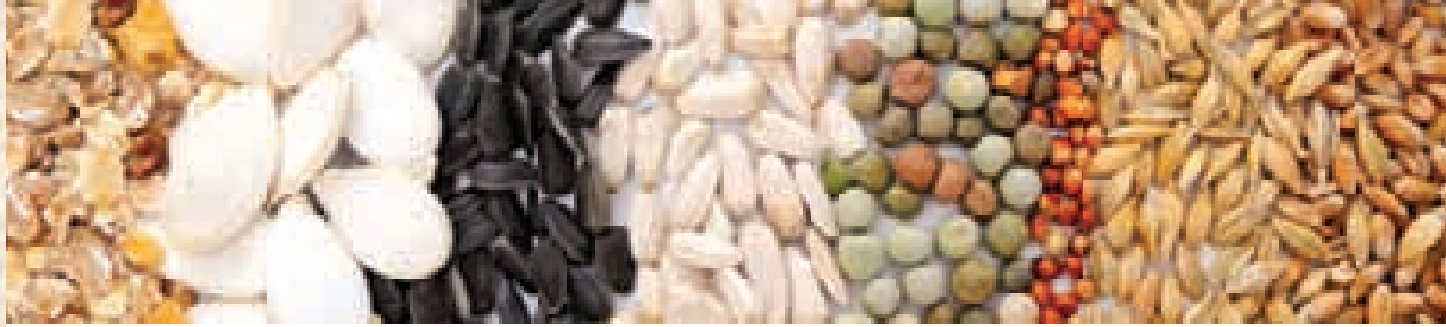
Research in the U.K. has also shown that a child's performance declines throughout the morning, but that the level of decline can be substantially reduced by eating high fibre, ready-to-eat cereal, giving a more sustained release of energy compared to a low fibre cereal that is quickly digested.⁹

⁷Rampersaud, G.C. et al. (2005). Breakfast habits, nutritional status, body weight and academic performance in children and adolescents. *J Am Diet Assoc* 105:743-760.

⁸Mahoney, C.R. et al. (2005.) Effect of breakfast composition on cognitive processes in elementary school children. *Physiol Behav* 85:635-645.

⁹Ingwersen, J. et al. (2007). A low glycaemic index breakfast cereal preferentially prevents children's cognitive performance from declining throughout the morning. *Appetite* 49:240-244.





How to Find High Fibre Foods

The easiest way to learn about the nutrients in foods is to check the Nutrition Facts table on food labels. The Nutrition Facts table provides information on the serving size, calories and per cent Daily Value (DV) of many key nutrients, including fibre.

Nutrient content claims on foods can also provide additional information. Health Canada regulates nutrient content claims so that if a food claims to be a “source of fibre,” a “high source of fibre,” or a “very high source of fibre,” you can be assured that it does contain the levels of fibre for these claims:

- Source of Fibre = at least 2 grams of fibre per serving.
- High Source of Fibre = at least 4 grams of fibre per serving.
- Very High Source of Fibre = at least 6 grams of fibre per serving.

Nutrition Facts

Serving 1 cup (34 g)

Amount per serving	Cereal	With 1/2 Cup 1% Milk
Calories	110	170
% Daily Value		
Fat 0.5 g[†]	1 %	3 %
Saturated 0 g	0 %	4 %
+ Trans 0 g		
Cholesterol 0 mg	0 %	2 %
Sodium 290 mg	12 %	15 %
Potassium 180 mg	5 %	11 %
Carbohydrate 27 g	9 %	11 %
Fibre 5 g	20 %	20 %
Sugars 4 g		
Starch 18 g		
Protein 4 g		
Vitamin A	0 %	8 %
Vitamin C	0 %	0 %
Calcium	2 %	15 %
Iron	30 %	30 %
Vitamin D	0 %	25 %
Thiamin	50 %	60 %
Riboflavin	4 %	15 %
Niacin	15 %	20 %
Vitamin B₆	10 %	15 %
Folate	10 %	10 %
Vitamin B₁₂	0 %	25 %
Pantothenate	8 %	15 %
Phosphorus	15 %	25 %
Magnesium	20 %	30 %
Zinc	15 %	20 %

[†] Amount in cereal.

Whole Grain Tip

Do not assume that all products with whole grain claims provide a significant amount of fibre. They may not. It is important always to check the Nutrition Facts table for the grams of fibre per serving.

Fibre-At-A-Glance

Many foods commonly consumed in the Canadian diet contain little dietary fibre. The following table provides a guide to the typical fibre content of an average serving of a range of different foods.¹

Food Category	< 2g of fibre	Source of Fibre	High Source of Fibre	Very High Source of Fibre
		2.0 to 3.9g Fibre	4.0 to 5.9g Fibre	≥ 6g Fibre
<ul style="list-style-type: none"> Breakfast cereals (per labelled serving unless otherwise indicated) 		<ul style="list-style-type: none"> Oatmeal (3/4 cup) Oat bran (3/4 cup) <i>Just Right</i>* <i>Special K</i>* 5 Grains 	<ul style="list-style-type: none"> <i>All-Bran</i>* Bran Flakes <i>All-Bran</i>* Strawberry Bites <i>Mini-Wheats</i>* (all flavours) MultiGrain <i>Krispies</i>* <i>Müslix</i>* (all flavours) <i>Special K</i>* <i>Satisfaction</i>* 	<ul style="list-style-type: none"> <i>All-Bran Buds</i>* <i>All-Bran Original</i>* <i>All-Bran</i>* Strawberry Medley <i>Guardian</i>* Original <i>Kellogg's Two Scoops Raisin Bran</i>*
<ul style="list-style-type: none"> Bread (1 slice) Crackers Grain-based bars 	<ul style="list-style-type: none"> Graham crackers (3) Saltine crackers (5) White bread 	<ul style="list-style-type: none"> <i>Nutri-Grain</i>* cereal bars (all flavours) <i>Nutri-Grain</i>* <i>Munch'ems</i>* granola snacks Rye bread Whole wheat bread 	<ul style="list-style-type: none"> <i>All-Bran</i>* bars (all flavours) <i>All-Bran</i>* Snack Bites (all flavours) Fibre Plus bars (all flavours) 	
<ul style="list-style-type: none"> Pasta & Rice (1/2 cup unless otherwise specified) 	<ul style="list-style-type: none"> Couscous Brown rice Pasta White rice Wild rice 	<ul style="list-style-type: none"> Barley Bulgur Whole wheat pasta 		
<ul style="list-style-type: none"> Legumes (3/4 cup) 			<ul style="list-style-type: none"> Chickpeas 	<ul style="list-style-type: none"> Black beans Kidney beans Lentils Pinto beans White beans
<ul style="list-style-type: none"> Vegetables (1/2 cup unless otherwise specified) 	<ul style="list-style-type: none"> Asparagus Beans Beets Cabbage Cauliflower Lettuce Tomato (1) Zucchini 	<ul style="list-style-type: none"> Baked potato with skin (1) Broccoli Brussels sprouts Carrots Corn Sweet potato with skin (1) 	<ul style="list-style-type: none"> Green peas 	
<ul style="list-style-type: none"> Fruit (1 medium unless otherwise specified) 	<ul style="list-style-type: none"> Cantaloupe (1/2 cup) Cherries (1/2 cup) Mango (1/2 cup) Peach Prunes (3) Raisins (1/4 cup) Strawberries (1/2 cup) 	<ul style="list-style-type: none"> Apple, with skin Apricots, dried (1/4 cup) Banana Blueberries (1/2 cup) Dates (1/4 cup) Kiwi Nectarine Orange 	<ul style="list-style-type: none"> Blackberries (1/2 cup) Pear, with skin Raspberries (1/2 cup) 	
<ul style="list-style-type: none"> Nuts & Seeds (1/4 cup unless otherwise specified) 	<ul style="list-style-type: none"> Peanut Butter (2 T) 	<ul style="list-style-type: none"> Pecans Peanuts, dry roasted Sunflower seeds, dry roasted Walnuts 	<ul style="list-style-type: none"> Almonds 	

¹ Canadian Nutrient File, version 2007b for standard reference, plus Kellogg Canada Nutrition Facts tables.

Simple Steps to a High Fibre Diet

Increasing fibre intake is relatively easy and there are many great tasting ways to get more fibre in your diet every day.

The following tips provide a few ideas on how to increase daily fibre intake.

Boosting Fibre at Breakfast

“Breakfast is the most important meal of the day” is a great motto to follow. Breakfast provides fuel after the overnight fast to help wake up the body and mind, as well as many other health benefits. For example, children who eat a nutritious breakfast have been shown to have healthier body weights, perform better at school, make healthier food choices throughout the day, have higher intakes of essential vitamins and minerals, and consume more fibre.¹

Breakfast cereals are an easy way to boost fibre at this important first meal of the day. Simply switch to a high fibre or 100 per cent whole grain cereal, or mix a handful of bran cereal with your usual favourite cereal. Add a glass of milk or yogurt and include a recommended serving from the vegetables and fruit food group, and you have a nutritious start to the day.

Some other tips include:

- Add chopped fresh or dried fruit to breakfast cereals or yogurt.
- Mix a high fibre bran cereal with yogurt.
- Try a fruit smoothie made with fresh or frozen fruit instead of a glass of fruit juice.
- Switch to high fibre muffins (such as bran muffins).
- Make sure the bread you eat for toast provides fibre.

Super Snacks

Healthy snacks make an important contribution to daily intakes of vitamins and minerals, and provide a great chance to get more fibre. Think about snacks when shopping to make sure you have lots of tasty, healthy choices. Try to plan ahead and pack a healthy snack option for later in the day when you are away from home.

Great snack choices include:

- Popcorn
- Fruit
- Dried fruit and nut mixes
- High fibre crackers or cereal bars
- Vegetables and hummus dip

And don't forget, a bowl of high fibre cereal also makes a great snack.

¹Rampersaud, G.C. et al. (2005). Breakfast habits, nutritional status, body weight, and academic performance in Children and adolescents. JADA 105: 743-760.



Lunchtime Treats

While rushing your way through each busy day, it can be difficult to come up with easy ways of eating a quick and healthy lunch. Taking time to eat a meal helps you re-energize so you can be ready to face the rest of the day.

Here are some great and convenient suggestions for a fibre-filled lunch:

- Order a bowl of vegetable or bean soup at the cafeteria or restaurant.
- Top yogurt with fruit and a high fibre cereal.
- Try a baked regular or sweet potato. Sweet potatoes especially make a tasty choice – and remember to eat the skin, too, for extra fibre and other nutrients.
- Enjoy a small salad with your sandwich and top it with some bran cereal for an extra crunch.
- Use hummus or black bean dip as a sandwich spread in place of mayonnaise or mustard.

Dinnertime

With today's hectic schedules – between coming home from work or school and rushing off to an evening practice – there is less time available to prepare dinner.

Here are some quick and easy ways to boost fibre at dinnertime:

- Always include vegetables or a mixed greens salad.
- When making soup, add vegetables and beans to the recipe. Make a big batch of soup and freeze for some quick meals later on.
- When a recipe calls for breadcrumbs, use whole grain breadcrumbs with fibre, or mix plain breadcrumbs with crushed bran cereal.
- Substitute part of the flour in recipes with crushed wheat bran cereal.
- Experiment with higher fibre legumes such as refried beans or chickpeas. Canned options are very convenient – just open and rinse.
- Chili isn't the only way to enjoy beans, try adding different beans to casseroles and stews.
- Add extra vegetables to tomato sauce by grating in carrots or other vegetables.
- Brown rice may take a bit longer to cook than white rice, but it has a great nutty taste and can be used in most dishes in place of white rice.

Desserts

Many people enjoy finishing a meal with something sweet. Here are a few simple ways to increase fibre in desserts:

- For homemade baked goods, replace white flour with a 50:50 mix of white and whole wheat flours.
- Sprinkle fruit with toasted oats or a high fibre cereal for extra crunch.
- Try a baked apple that has been stuffed with chopped dates and honey, dried apricots and almonds, or banana and walnuts – and sprinkle some crunchy bran-based cereal on top.

Remember

Foods made with whole grain do not always provide a source of fibre. Look at the Nutrition Facts table to find foods that have at least 2 grams of fibre per serving.



Simple Steps to a High Fibre Diet

About this Report

FIBRE-pedia: A comprehensive look at fibre is intended to be a convenient resource to help spread the word about the importance of dietary fibre and empower people to increase their fibre intakes. The information in **FIBRE-pedia** comes from referenced scientific research.

FIBRE-pedia is brought to you by Kellogg Canada. Kellogg was founded over 100 years ago with a philosophy of encouraging people to improve their health and we continue that commitment today. Kellogg provides more ready-to-eat cereals that are at least a source of fibre than any other food company¹, including *All-Bran**, *Mini-Wheats**, *Kellogg's Two Scoops Raisin Bran** and *MultiGrain Krispies**. Kellogg also provides other high fibre foods such as *All-Bran** bars.

For additional information on the health benefits of fibre, visit *Kellogg's** Nutrition at www.kelloggsnutrition.ca. For more information on our products, visit www.kelloggs.ca.



Acknowledgement

Kellogg Canada wishes to thank Loretta DiFrancesco, PhD, RD, MBA for her review of this report. Dr. DiFrancesco runs a consulting business dedicated to helping clients manage scientific and regulatory affairs in food and nutrition.

¹Nielsen GB+MM+DRU, latest 52 weeks ending March 12, 2009. Based on 42% share of RTEC cereals that qualify as a source, high source and/or very high source of fibre.

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