

Food and Nutrition Communication

October 2006



The Whole Grain — greater than the sum of its parts

“Diets rich in Whole Grain foods and other plant foods that are low in total fat, saturated fat and cholesterol may reduce the risks of heart diseases and certain cancers” (US Food and Drugs Association Statement)

“Consuming at least three servings of Whole Grains per day can reduce the risk of Diabetes and Coronary Heart Disease and may help with weight maintenance” (2005 U.S. Dietary Guidelines Advisory Committee Report, Aug. 2004)

There is compelling evidence that whole grains benefit health and reduce the risk of chronic disease. It has been clear for some time that the regular consumption of whole grains reduces the risk of coronary heart disease and cancer, but there is now growing evidence that whole grains can also reduce the risk of having a stroke or developing diabetes. Other studies are now pointing to the usefulness of whole grains to avoid weight gain and to slow the ageing process. There are many good reasons to add whole grain cereals to our diet. In this edition, we look a little closer at these.



Nestlé, CPW
and now Uncle Toby



In view of the excellent opportunities for developing nutrition, health and wellness with breakfast cereals, Nestlé S.A. and General Mills Inc. set up a 50/50 joint venture, Cereal Partners Worldwide (CPW), with a head office in Malley, Switzerland. Using General Mills knowledge of cereals and Nestlé sales and distribution strengths, the aim of this joint venture was to develop a worldwide market (excluding USA and Canada) for Nestlé branded cereal products. CPW is reviewing and improving its breakfast cereals, which will all now be made with whole grains. The recent acquisition of Uncle Toby in Australia has considerably strengthened our worldwide breakfast cereal production capacity. Other Nestlé food categories including the Lean Cuisine range and certain Buitoni pasta products also use whole grains.

Whole Grains

A whole grain is basically a seed waiting to germinate into a plant. The Nestlé definition of 'Whole Grains' is that they, or foods made from them, contain all the essential parts and naturally occurring nutrients of the entire grain seed. If the grain has been processed (e.g. cracked, crushed, rolled, extruded, and/or cooked), the food product should deliver, as near as is technically possible, the same balance of nutrients that are found in the original grain seed.

The grain is made up of three layers:

- The outer bran layer contains concentrated amounts of fibre, B vitamins (thiamin, niacin, riboflavin, pyroxidine and pantothenic acid), complex carbohydrates and phytonutrients.
- The middle endosperm layer accounts for 80% of the whole grain and contains carbohydrates, protein and small amounts of B vitamins.
- The inner germ layer contains a rich supply of nutrients including minerals, B group vitamins, vitamin E and phytonutrients.

Structure of whole grain

1 Bran "Outer shell" protects seed

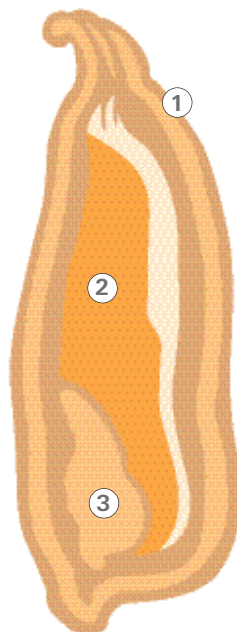
- Fibre
- B Vitamins
- Trace Minerals

2 Endosperm Provides energy

- Carbohydrate
- Protein
- Some B Vitamins

3 Germ Nourishment for the seed

- B Vitamins
- Vitamin E
- Trace Minerals
- Phytochemicals



Milling and nutrient conservation

During traditional white-flour milling, the bran and germ layers of whole wheat grains are removed in order to stabilise the raw material and in so doing to increase its keeping quality. The flour produced has a texture, flavour and appearance that is very acceptable and which has many applications in food preparation. Unfortunately, the type of milling used for refined or white flour leads to the loss of certain nutrients, such as vitamins, minerals and fibre. In response to this problem, flour manufacturers often add back vitamins to the finished product, but not all the valuable nutrients can be added back.

Whole grains still contain their natural content of fats and oils, which accounts for the fact that they are often more expensive than the refined flours derived from them. This, however, means a risk of the product going rancid, thus complicating processing, storage and transport. But whole grains are nutritionally superior; they are richer in dietary fibre, antioxidants, protein (in particular the amino acid lysine), dietary minerals (including magnesium, manganese, phosphorus and selenium) and vitamins (including niacin, vitamin B6 and vitamin E). The large amount of dietary fibre is arguably the most important factor accounting for the beneficial health effects associated with whole grain, because it helps to slow down the digestion and absorption of carbohydrates, fats and proteins into the bloodstream.

Nutritional Comparison of 100grams of whole-grain wheat flour and enriched, white all-purpose flour

	Whole-grain wheat flour	White flour
Energy	339 kcal	364 kcal
Dietary Fibre	12.2 g*	*2.7 g
Calcium	34 mg*	15 mg
Magnesium	138 mg*	22 mg
Potassium	405 mg*	107 mg
Folate	44 µg	291 µg
Thiamin	0.5 mg	0.8 mg
Riboflavin	0.2 mg	0.5 mg
Niacin	6.4 mg	5.9 mg
Iron	3.9 mg	4.6 mg

**Nutrients whose content in whole-grain wheat flour is more than 100% greater than that in refined white flour.
Source: 2005 Dietary guidelines for Americans*

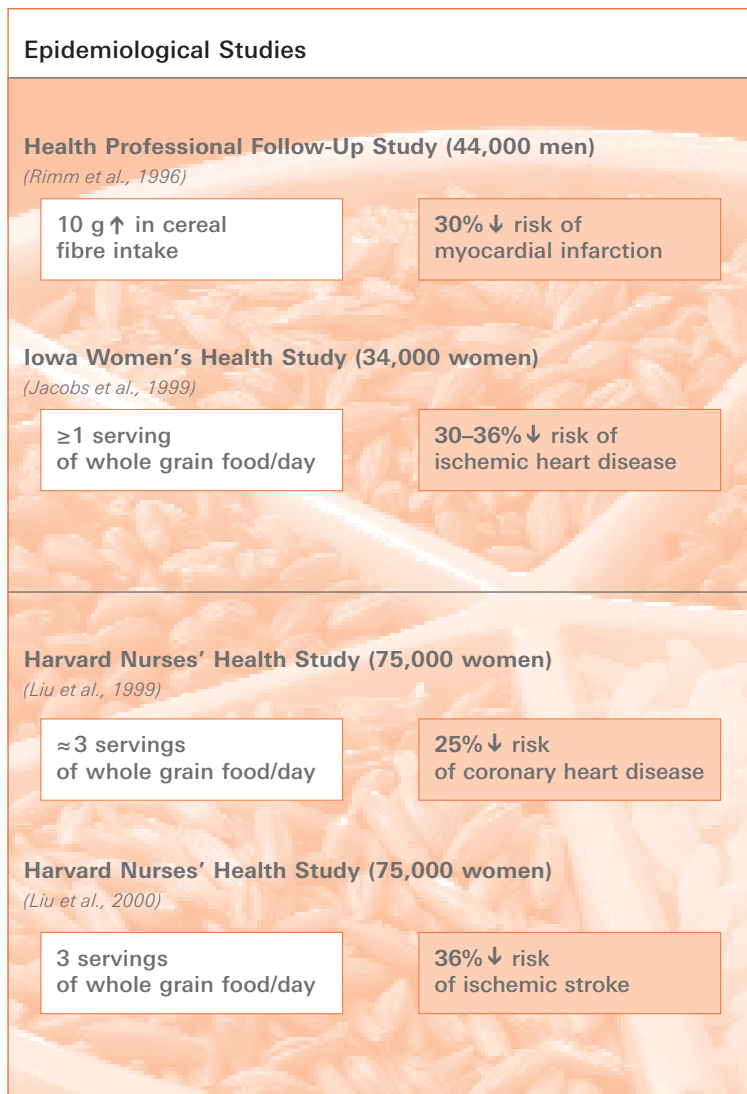




Epidemiology – How we know that whole grains are good for health

Epidemiological studies on four major health areas – cardiovascular conditions, diabetes, cancer and obesity – show the following evidence:

Cardiovascular Conditions



The reasons given for this improvement in cardiovascular health is (a) that whole grains are thought to lower cholesterol levels because of their high level of soluble fibre, and (b) the high level of antioxidants in whole grains. This risk reduction is estimated to be between 27 and 37%. This is a larger reduction in cholesterol level than is obtained by just avoiding foods that contain high levels of cholesterol.

Diabetes

Improvements in insulin sensitivity observed in patients on high whole grain diets may be responsible for the reduction in insulin levels, and the reduced risk of developing Type 2 diabetes. Data from the Iowa Women's Health study show a 21% risk reduction for diabetes. Data from another large study, the Nurses' Health Study, indicates a 27% reduction with three daily servings of whole grains [1], [2].

In a study of overweight hyper-insulinemic adult patients with Type 2 diabetes who were given a whole grain diet for six weeks, fasting insulin levels dropped 10%, indicating a tendency for improved insulin sensitivity through this regime [3].

Since 2002, the American Diabetes Association has officially recommended whole grains for the control of diabetes.

For more on Type 1 and Type 2 diabetes, you may like to see Food and Nutrition Communication N°2 – The Metabolic Syndrome, April 2006

Cancer

A meta analysis of 40 studies [4] showed a 2–43% lower risk for gastro-intestinal cancers. Regarding hormone dependent cancers one meta-analysis showed a 10–40% risk reduction with the highest intake of whole grain foods [5].

Recent research has suggested that naturally occurring chemicals in plants have anti-cancer properties. Whole grains contain a number of phytonutrients such as phyto-oestrogens, phytic acid, phenolic compounds and enzyme inhibitors. Whole grains are also rich in antioxidants, such

Risk reduction estimates adapted from CPW's Fact sheet on Diabetes and Whole Grain

Whole grains are known to lower both blood sugar (glucose) and circulating insulin levels. So replacing refined grains with whole grains may offer a simple and important way to maintain healthy blood glucose and insulin levels. Numerous scientific studies indicate a similar trend. In a nutshell:

- Dietary fibre and whole grains are protective against developing Type 2 diabetes.
- Women consuming large amounts of refined grains had nearly 60% higher risk of Type 2 diabetes than those consuming large amounts of whole grains.
- In a group of nearly 43 thousand men, around 40% lower risk of Type 2 diabetes was observed with about three servings of whole-grains per day.
- Of 90,000 women and of 45,000 men in separate long terms studies, those with higher intakes of cereal fibre had about a 30% lower risk of developing Type 2 diabetes.
- In a 10 year follow-up of a Finnish study, there was a 35% reduced risk of diabetes amongst those consuming the highest amounts of whole grain.

as Vitamine E, and nutrients beneficial to antioxidant systems, such as selenium.

People who consume whole grains are, from a statistical point of view to be among those less likely to develop intestinal cancers. However, once cells have become pre-cancerous or cancerous, eating whole grains is going to have little or no effect on the further development of gastrointestinal tumours. The effect of whole grains, therefore, is prophylactic rather than therapeutic.

Obesity

The Harvard Nurses Health Study (75,000 women over 12 years of age) showed that women who consumed appreciable amounts of whole grains consistently weighed less than those who did





not. Refined flour, (white flour) was thus linked to increased weight gain. Women who were careful to include plenty of high fibre foods and whole grains in their daily diets had a very significant (49%) lower risk of major weight gain [6].

In another study 27,082 men aged between 40–75 years, over an 8-year period, showed an association between increased whole grains intake and weight reduction. For every 40g increment of whole grain consumed, weight gain was reduced by 0.49 kg and for every 20g increment of bran, added or obtained from whole grains, weight gain was reduced by 0.36 kg [7].

Fibre: Soluble and Insoluble

Fibre is a part of food that is not digested by the body. It passes through the intestinal tract without being broken down, cleansing the intestine, and adding very few, if any, calories to the diet. High fibre intake helps to reduce the risk of irritable bowel syndrome, diverticulosis and colon cancer. Other benefits are the satiating effect and the control of blood sugar levels.

Soluble fibre in contact with liquid becomes a sticky substance, a gel, which binds with cholesterol and bile acids in the intestine and eliminates them from the body. Soluble fibres are also fermented in the large intestine by the bacterial flora, which generates short-chain fatty acids (SCFAs). SCFAs are absorbed by the body and are an important metabolite for intestinal cells. Because of this generation of SCFA, and because they are not fully digested and absorbed, soluble fibres provide about 2 kcal/g: This is less than other carbohydrates (4 kcal/g).

Insoluble fibre does not dissolve in water. It swells and absorbs water and speeds up transit time, together with mucous released from the epithelial cells of the intestinal walls. This effectively moves potentially toxic substances more rapidly out of the system. Insoluble fibres are not digested and, therefore, are regarded as “calorie free”. Most plant foods contain both types of fibre.



Whole Grains and Coeliac Disease

People with Coeliac Disease are intolerant to gluten, but they need not be deprived of the benefits of whole grains because many are gluten-free. These include Amaranth, Buckwheat, Corn, Millet, Montina, Quinoa, Rice, Sorghum, Teff and Wild Rice. Oats are also in fact gluten-free, but they often grow alongside other cereals that are not, and the other grains can be inadvertently mixed in during harvesting. Specially grown, or processed oats are available for gluten intolerant people.

Whole Grains are Prebiotic

The University of Reading (UK) carried out research on our whole grain cereals to investigate whether the whole grains would act as a prebiotic, increasing the number of beneficial bacteria. The researchers set up a laboratory model of the human digestive system to do this, and fed it with quantities of cereals normally consumed by people. The results showed a clear prebiotic effect of whole grains, increasing the number of lactobacilli and bifidobacteria, and a corresponding decrease in the number of potentially harmful bacteria. The laboratory test was followed up with human trials comparing groups consuming our whole grain cereals with other ordinary cereals with bran. The whole grain group, (eating Shredded Wheat) maintained their positive prebiotic benefit, while a second group transferred to ordinary bran cereals gradually lost the beneficial effect.

What is important about this research is (a) that it is the first time a whole food has been shown to be a prebiotic, and (b) that fibre alone did not show this effect. So it is not necessary to add anything to these wholesome cereals to obtain the prebiotic benefit.

Action of Roughage in the Intestine – how fibre fights constipation

The passage of fibrous material causes damage to the epithelial cells lining the intestinal walls. In reaction to this localised trauma, the damaged

surface cells immediately release a protective coating of mucous, which, as well as protecting the cells themselves, also helps to lubricate the intestine and by so doing move the fibre on down the digestive tract. The cells have a short life - less than one week - and are quickly replaced. It is their mucous-producing capacity that protects both themselves, and also the deeper layers of cells, thus ensuring the protective barrier between the inside of the body and the contents of the intestine [8].

Gum Disease Risk Reduced with Whole Grains

The risk of periodontitis, a serious inflammation of the gums that is the major cause of tooth loss in adults, may be reduced by eating more whole grains. Anwar Merchant and colleagues at McMaster University in Ontario, Canada, who studied more than 34,000 men over a 14-year period, conclude that three to four servings of whole grains daily “may be optimal to reduce periodontitis risk” [9].

Fibre: How much do we need? How much do we get?

Stone Age Man used to consume about 50-100 grams per day.

The US National Cancer Institute recommends between 25 and 35 grams, and the US Institute of Medicine proposes a minimum of 38g per day.

In the US, the amount people habitually consume is between 8 to 11 grams per day.

Consumers are not yet actively looking for whole grain cereals, and not many are aware of the benefits.



Confusion arises among consumers over marketing terms such as “100% wheat”, “stone milled”, “organic”, “with bran”, etc., which do not necessarily mean the product is made with whole grains.

Nestlé/CPW use this green banner and symbol on the front of all Nestlé/CPW to whole grain cereal packages.



Nestlé food business also has logos to indicate whole grains, for example in the Lean Cuisine range.



fasts were missed during the year. In France 33% of children (12–14 years) start the day on an empty stomach – compared to only 7% of 3-6 year olds (INCA Study), 12% of Dutch children from 10–18 also skip breakfast [11]. Even in Great Britain – a country with a long breakfast tradition, 6% of children eat nothing in the morning; among 12–13 year old children breakfast skipping is as high as 20–30%.

This is a pity because breakfast is a very good opportunity to consume whole grains – in breads, porridges, and breakfast cereals. In the Middle East several types of flat bread are made with whole grains, for example the delicious Iranian sangak bread, eaten at breakfast and other meals.

Breakfast – an important meal and an opportunity to eat whole grains

For most people, breakfast is the first meal after a fast of about twelve hours. Energy levels are therefore low at this stage, and a good breakfast is important for both adults and children to cope with the morning’s mental and physical activities. Studies in Europe have shown that a correctly balanced breakfast contributes to maintaining a healthy weight by reducing the desire for fatty food intake later in the day. Essential nutrients missed at breakfast are rarely compensated by other meals of the day, and learning capacity may be impaired by hunger later in the morning. A French study showed that obese and overweight children eat less at breakfast time and more in the evening than their slimmer companions [10].

Modern lifestyle usually means a rush in the morning to get children off to school and adults to work. However there is a wide range of simple-to-prepare products to cater for this situation – breakfast cereals, dairy products, fruit, and bread are just some examples. In spite of this relative ease and speed of preparation, breakfast skipping remains a common practice in Europe. According to market analyst Datamonitor, on average the British skipped 113 breakfasts a year per person, while elsewhere in Europe 71 break-

fast cereals are a “nutrient dense” food, i.e. while supplying only modest amounts of energy (calories) they make a significant contribution to intakes of essential nutrients.

But what about the sugar?

Sugar is added to some cereals by the manufacturer and often to others by the consumer according to taste. Sugar provides pleasant sweetness, and, when consumed in moderation, is not an unhealthy component of the diet. Sugar consumption from breakfast cereal typically accounts for less than 10% of the daily total sugar consumption. In fact when eaten with milk, as is usually the case, even the sweetest cereal provides only 11% sugar in the bowl, which is less than that provided by other breakfast choices such as bread with jam or marmalade, pancakes and syrup, and even orange juice.

Salt is added to cereal to optimise the taste. Excessive salt in the diet can be a cause for concern, so Cereal Partners have been working successfully to reduce salt as much as possible in cereals while maintaining consumer product preference. In the UK, for example, salt has been reduced by nearly 30% since 1998.



Principal Whole Grains – Typical Values for Basic Nutrients *(Values per 100g)*

Grain	Protein	Fat	Carbohydrate	Fibre
Amaranth	14.5	6.5	66.2	15.2
Barley	12.5	2.3	73.4	17.3
Buckwheat	13.2	3.4	71.5	10.0
Farro or Spelt	12.7	0.6	77.4	5.0
Kamut	17.3	2.6	68.2	1.8
Millet	11.0	4.2	72.8	8.5
Oats	16.8	6.9	66.3	10.6
Quinoa	13.1	5.8	68.9	5.9
Rice (white long grain)	7.1	0.6	74.9	6.2
Rice (brown)	7.9	2.9	77.2	3.5
Wild Rice	14.7	1.0	74.9	6.2
Rye	14.7	2.5	69.7	14.6
Teff	11.0	4.2	72.8	8.5
Wheat	10.7	2.0	10.7	12.7
Bulgur wheat	12.3	1.3	75.8	18.3
Couscous (durum)	12.7	0.6	77.4	5.0
Cracked wheat (durum)	13.6	2.5	71.1	5.0

The average energy value of these grains is around kcal 360 per 100g

Values can vary significantly within varieties of a same cereal.

Source: Nutrition Facts and Food Composition Analysis. nutritionanalyser.com

As well as the macronutrients above, whole grains also contain the following phytochemicals:

- Resistant Starch
- Lignin
- Antioxidants
- Inulin and Fructo-oligosaccharides
- Phytate
- Saponins
- Plant Stanols and Sterols (phyto-oestrogens)
- Waxes, cutin and suberin
- Sphingolipids





Different types of whole grains

Amaranth originated in South and Central America. The grains are very small and have a peppery taste. Amaranth has a high protein content and includes adequate amounts of lysine, an amino acid that is not present in sufficient quantities in other grains, especially wheat.

Barley is one of the oldest cultivated cereals. The fibre in barley may lower cholesterol even more effectively than oat fibre.

Buckwheat is not just for pancakes. The Japanese use it for soba noodles. It is a cousin of rhubarb, not really a grain at all, but its nutrients and appearance have led to its adoption into the family of grains. It contains high levels of rutins, antioxidants that improve blood circulation and help to prevent build-up of cholesterol in the blood vessels.

Bulgur is the name given to wheat kernels that have been boiled, then dried and broken into small pieces. A staple of Magrebin and Middle Eastern cooking, bulgur is often made of durum wheat. Among favourite dish made with bulgur are couscous and tabbouleh. It has a high percentage of fibre and short cooking time.

Corn or **Maize** Although considered a simple starch with little nutritional value, corn treated with alkali to liberate the anti-pellagra vitamin Niacin it contains, make it a more nutritious grain. Cooked and eaten with beans, as is traditional in Latin America, the combination takes on an improved protein mix and bioavailability. More recently it was discovered that corn has the highest level of antioxidants of any grain, in fact almost twice the antioxidant action of apples.

Emmer or **Farro** is an ancient type of wheat, grown in Ethiopia. It is used for special pasta dishes and soups, especially in Italy.

Kamut is another ancient variety of wheat, said to originate in Egypt. It has higher levels of protein and vitamin E than common wheat.

Millet is a staple grain in India and is found widely in China, Russia and the Himalayas as well as in South America. The grains are very small. Millet is often toasted before serving to enhance its mild flavour.

Oats are nearly all whole grain. It is extremely rare that oat bran and germ are removed in processing. Most oats are flattened and steamed to cook more quickly. Like barley, oats contain beta glucan fibres especially effective in lowering cholesterol. Recent research reports that oats also have a unique antioxidant, avenanthramide that helps to protect blood vessels. Porridge and muesli are the dishes most commonly associated with oats.

Quinoa from the Andes is a relative of the vegetables Swiss chard and beetroot, rather than a true grain. It is now appearing commercially in cereal flakes. The grain resembles sesame seed. It can also be found in different colours from red to purple or black, and contains the entire range of essential amino acids for human nutrition. Quinoa needs to be well washed to remove its natural defence against insects, a bitter saponin coating.

Rice thrives in warm humid climates all over the world. White rice is the refined grain with the germ and bran removed. Whole grain rice is usually brown, but can also be black, purple, red or golden yellow. Parboiling is a technique which drives some of the B vitamins into the centre of the grain so that they are not lost when the bran is removed. Parboiled rice is therefore healthier than ordinary white rice, but not as rich in nutrients as whole grain brown rice. Rice is a very easily digested cereal.

Rye is often associated with whisky production. However rye, a tall growing, tough type of cereal, is useful for its ability to grow in cold, high altitude or wet climates. Rye bread promotes a rapid and durable feeling of fullness on account of the high level of fibre, making it a good choice for people trying to lose weight.

Spelt is an old variety of wheat known from the 12th Century. German monks used it also to make a liqueur. Spelt is higher in protein than common wheat.

Teff is the principal source of nutrition for over 60% of the Ethiopian population. It is a type of millet used to make the local flat bread. Teff is high in iron and calcium.

Triticale is a hybrid of durum wheat and rye. It grows easily and does not require farm chemical inputs, which make it popular with the organic farming movement. The bioavailability of triticale protein is slightly higher than soyabeans and higher than wheat.

Wheat is the dominant cereal because of its large gluten content. Gluten is the protein that gives the stretchy quality to bread. It is almost impossible to make good leavened bread without at least some wheat flour in the mixture. Not all brown wheat bread is whole grain. Much is simply coloured brown with molasses to make it look more nutritious and to sell it at a premium price. Flour used for cakes has less gluten than bread flour. The two types of wheat most widely produced are bread wheat, and durum or pasta wheat.

Wild Rice or **Zizanie**, is not rice at all, but the seed of an aquatic grass originally growing around the Great Lakes region and used nowadays because of its flavour. It has twice the protein and fibre of brown rice but less iron and calcium [12].



Changing the image of whole grains

Traditionally, eating whole grains has been associated either with hippies and health food store shoppers in their Birkenstock sandals, or with old people struggling with constipation. Nowadays, whole grains are going mainstream and are even becoming fashionable. The US Dept. of Agriculture's 2005 Dietary Guidelines recommend people to double their consumption. The Organic movement has greatly contributed to this effect, as has the consumers' fear of putting on weight.

In relation to whole grains, it can really be said that *the "whole is greater than the sum of the parts"*. Precisely, it is not just the bran that accounts for the health benefits, but also the other components: the antioxidants, vitamins, minerals, complex carbohydrates and phytonutrients that protect the body against many diseases [13,14,15].

Nestlé's joint venture with General Mills, Cereal Partners Worldwide, (CPW) is committed to introducing whole grains into all of its cereal products. From the rugged, British "Shredded Wheat" (a pioneering 100% wholegrain product), to the lighter cereal mixes, plain, sweetened, or with cocoa, fruit or nuts - all varieties will contain whole grains. As 48g of whole grains per day are recommended to derive optimal health benefits, either a large bowl, or two or three small ones should cover the recommended amount.



References:

- 1 Meyer KA, Kushi LH, Jacobs DR Jr, Slavin J, Sellers TA, Folsom AR., Carbohydrates, dietary fiber, and incident type 2 diabetes in older women, *Am J Clin Nutr.* 2000 Apr;71(4):921-30
- 2 Liu S Whole grain foods, dietary fiber and type 2 diabetes: searching for a kernel of truth. *Am J Clin Nutr* 2003;77:527-529
- 3 Mark A Pereira, David R Jacobs, Jr, Joel J Pins, Susan K Raatz, Myron D Gross, Joanne L Slavin, and Elizabeth R Seaquist, Effect of whole grains on insulin sensitivity in overweight hyperinsulinemic adults, *Am J Clin Nutr* 2002 75: 848 - 855.
- 4 Jacobs DR, Marquart L, Slavin JL, Kushi LH. Wholegrain intake and cancer: an expanded review and meta-analysis. *Nutr Cancer* 1998;30:85-96
- 5 Chatenoud L, Tavani A, La Vecchia C, Jacobs DR Jr, Negri E, Levi F, Franceschi S., Whole grain food intake and cancer risk, *Int J Cancer.* 1998 Jul 3;77(1):24-8,.
- 6 Liu S, Willett WC, Manson JE, Hu FB, Rosner B, Colditz G., 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.* 2003 Nov;78(5):920-7
- 7 Koh-Banerjee P, Franz M, Sampson L, Liu S, Jacobs DR Jr, Spiegelman D, Willett W, Rimm E., Changes in whole-grain, bran, and cereal fiber consumption in relation to 8-y weight gain among men, *Am J Clin Nutr.* 2004 Nov;80(5):1237-45
- 8 Miyake K, Tanaka T, McNeil PL., Disruption-induced mucus secretion: repair and protection, *PLoS Biol.* 2006 Sep;4(9):e276
- 9 Merchant AT, Pitiphat W, Franz M, Joshipura KJ., Whole-grain and fiber intakes and periodontitis risk in men, *Am J Clin Nutr.* 2006 Jun;83(6):1395-400
- 10 Bellisle F, Rolland-Cachera MF, Deheeger M, Guillaud-Bataille M., Obesity and food intake in children: evidence for a role of metabolic and/or behavioral daily rhythms, *Appetite.* 1988 Oct;11(2):111-8. 11.
- 11 1998, Zo Eet Nederland, Resultaten. Den Haag: Voedingscentrum. www.nice-info.be/html/PROF/NUTRINEWSONLINE/Nnzoetnlln.htm.
- 12 Adapted from Whole Grains Council information for consumers.
- 13 Slavin J, Jacobs D, Marquart L., Whole-grain consumption and chronic disease: protective mechanisms, *Nutr Cancer.* 1997;27(1):14-21
- 14 Jacobs DR Jr, Marquart L, Slavin J, Kushi LH., Whole-grain intake and cancer: an expanded review and meta-analysis, *Nutr Cancer.* 1998;30(2):85-96
- 15 FDA. <http://www.fda.gov/ohrms/DOCKETS/dockets/99p2209/99P-2209-let0003.pdf#search=%22%22Health%20Claim%20Notification%20for%20whole%20grain%20foods%22%22>



This periodic bulletin on nutrition and health topics is written and edited by the Corporate Wellness Unit.

The Corporate Wellness Unit thanks

Dr. Clare Chapman, CPW, and Dr. Ian Horman, Visualising Complexity Sàrl., Blonay, for contributing to and reviewing this edition.

Concept, Writing and Editing

Veronica Roy

Design

Christian Stuker, Lausanne

Images

Getty, Corbis

Printing

Presses Centrales S.A., Lausanne