

**Increased consumption of the indigestible components of plant foods is recommended as it reduces the risk of various chronic diseases.**

**C**ONSUMERS generally pay a great deal of attention to the amount of energy in a food, as well as its nutrient content (carbohydrate, protein, fat, and vitamins and minerals.) They may not give the same recognition to dietary fibre because it does not provide nourishment to the body. Hence, dietary fibre often becomes the neglected “nutrient” and is not considered an important component of the diet.

Health authorities all over the world have recognised the importance of dietary fibre in health and disease.

Whilst we recognise that excessive energy intake is an important cause of chronic diseases such as obesity and diabetes, it is equally well known that a reduced intake of complex carbohydrates, dietary fibre, and fruits and vegetables increases an individual's risk of developing a number of these diseases.

Let me provide you with some scientific information on dietary fibre, convince you of the health benefits of fibre and provide guidance on how to achieve the recommended amount of these indigestible plant components. Take positive action to obtain sufficient dietary fibre daily.

### What is dietary fibre?

The term dietary fibre was first adopted in 1953 to describe the plant cell wall component of food. The physiological significance of dietary fibre was highlighted in 1971 when an increase in dietary fibre intake was recommended to improve bowel function. In 1972, Trowell first defined dietary fibre as the remnants of the plant cell wall that are not hydrolysed by the alimentary enzymes of man.

Dietary fibre is therefore the indigestible portion of plant foods. That means it is not digested by enzymes in the human body and absorbed in the small intestine. Instead, it passes into the large intestine, where it induces a range of effects. It is also sometimes known as “roughage”.

The term unavailable carbohydrate is sometimes used as an alternative to non-digestible carbohydrate, as distinct from available carbohydrate, i.e. carbohydrate that is digested and absorbed and becomes available for the body to be metabolised to provide energy.

The terms soluble and insoluble fibre have also been used. These terms developed out of the early chemistry of non-starch polysaccharides, which showed that these polysaccharides can be separated by changing the pH of the solutions. They proved very useful in the initial understanding of dietary fibre and provided a useful simple categorisation of dietary fibre with different physiological properties.

On one hand, there are fibres that principally affect glucose and fat absorption. Historically, these were referred to as soluble because many of them were viscous and formed gels in the small intestine (e.g. pectin).

In contrast, types of dietary fibre with a greater influence on bowel function were referred to as insoluble (including cellulose and lignin).

It is now apparent that this simple physiological distinction is inappropriate because some insoluble fibre is rapidly fermented and some soluble fibre does not affect glucose and fat absorption.

As the terms soluble and insoluble may be misleading, the World Health Organization (WHO) and the Food and Agricultural Organisation (FAO) recommended that these terms should no longer be used.

### Current dietary fibre concept

For 40 years, after the introduction of die-

# Fibre me up



tary fibre, a great deal of research has been carried out on its definition, physical and physiological properties, and health benefits.

Till today, non-digestibility remains the key characteristic of dietary fibre and, thus, key in its definition. However, it is now recognised that physiological properties of dietary fibre determine its importance in the human body and its requirement in the human diet.

Therefore, most scientists now agree that the definition of dietary fibre should be physiologically based.

Therefore, recent definitions have been extended to include non-digestible carbohydrates such as resistant starch and non-digestible oligosaccharides.

The recently adopted definition by Codex Alimentarius (an international standard-setting organisation) include the element of non-hydrolysis by endogenous enzymes in the small intestine as well as exerting physiological effects beneficial to health.

These include: (1) edible carbohydrate polymers naturally occurring in food; (2) carbohydrate polymers which have been obtained from food raw material by physical, enzymatic, or chemical means; and (3) synthetic carbohydrate polymers.

Examples of these physiological effects are: (a) decrease intestinal transit time and increase stool bulk; (b) fermentable by colonic microflora; (c) reduce total and/or low-density lipoprotein (LDL) cholesterol levels; and (d) reduce blood glucose and/or insulin levels.

With the current understanding, dietary fibre consists mainly of carbohydrate polymers (non-starch polysaccharides) that are components of plant cell walls such as cellulose, hemicelluloses and pectin, as well as non-digestible oligosaccharides, e.g. beta-glucan, gums, mucilages, fructans, inulin, and fructo-oligosaccharide/oligofructose.

The other main components of dietary fibre are (1) analogous carbohydrates (e.g. resistant starches, indigestible dextrans, modified or synthesised carbohydrate compounds, modified celluloses, and polydextrose; and (2) lignin and other associated substances (e.g. waxes, phytate, cutin, and tannins).

### Food sources

The major food sources of dietary fibre and indigestible carbohydrates are plant foods such as cereal grains, legumes, vegetables, fruits, and seeds. Whole grain or relatively unprocessed cereals have a higher content of dietary fibre, including resistant starch and non-digestible oligosaccharides, and are also rich in nutrients and potentially beneficial phytochemicals. The major cereal grains are rice, wheat, maize, oats, barley, and sorghum.

Dietary fibres are now added to a variety of foods that do not originally contain them, e.g. milk powder and beverages. These include a variety of non-digestible polysaccharides and oligosaccharides, e.g. inulin, fructo-oligosaccharide, galacto-oligosaccharide, a mixture of these oligosaccharides, polydextrose, resistant dextrin, and resistant starch. This helps to increase the dietary fibre intake of individuals.

### Health benefits of dietary fibre

It has been suggested that insufficient consumption of dietary fibre contributes to a number of chronic disorders such as constipation, diverticulitis, haemorrhoids, appendicitis, varicose veins, diabetes, obesity, cardiovascular disease, and cancer of the

large bowel as well as various other cancers. These hypotheses have been developed largely from early observational studies. Evidence obtained in recent years has confirmed the beneficial effects of dietary fibre.

These health benefits that dietary fibre confer on the individual are a result of various beneficial physiological effects these plant components have in the body. A wide variety of these effects are well documented.

Dietary fibres are not digested by human

enzymes; most of them are partially or completely fermented by the bacteria in the colon. This property of fibre brings about a number of important physiological effects, including its prebiotic effect, i.e. promoting the growth of “good” bacteria (e.g. bifidobacteria and lactobacillus) and inhibiting the growth of “bad” ones. Fermentation also improves the overall colonic environment as

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well as providing a small amount of energy. Through these activities, dietary fibres are able to improve the immune status of individuals.

Related to the fermentation property of dietary fibre is its beneficial effects on bowel habit. It is able to increase stool bulk, decrease transit time (so that stools do not stay in the gut for too long), and regulate frequency of bowel movement. Indeed, one of the best known effects of dietary fibre is the ability of various types of dietary fibre to

prevent and relieve constipation.

An improved bowel habit is extremely important as it reduces the risk of various diseases of the large intestine.

Sufficient dietary fibre intake is known to protect against diverticulosis, which is an inflammation of diverticula or pouches that may occur along the large intestine.

There are also indications that dietary fibre may be able to reduce the risk of cancer of the colon and rectum. Recognising the available evidence, the 2007 World Cancer Research Fund strongly advocated



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the increased consumption of plant foods for cancer prevention.

The health benefits of dietary fibre in a number of other diet-related chronic diseases are well recognised. A WHO expert consultation in 2003 concluded that there is convincing evidence that high dietary intake of dietary fibre decreases risk of overweight and obesity.

Foods rich in dietary fibre tend to be bulky and have a low energy density. Thus, dietary fibre could promote satiation and satiety and play an important role in the control of energy balance and body weight.

The WHO consultation also reported that dietary fibre may be able to reduce the risk of coronary heart disease.

This could be through the ability of some fibres to lower blood levels of total and LDL cholesterol. Other studies have also indicated possible beneficial effects of dietary fibre on type 2 diabetes.

Another beneficial effect of some dietary fibres is the ability of some non-digestible oligosaccharides to improve the absorption of minerals such as calcium, magnesium, and iron. This could have positive implications, such as increasing bone mineral density.

### Recommended intakes

There are considerable differences in the amount of recommended daily dietary fibre amongst various countries, ranging from 20-40g per day. WHO has recommended a total dietary fibre intake of at least 25g per day.

The Malaysian Dietary Guidelines recommend that the amount of fibre intake should range from 20 to 30g per day.

The increase in fibre in the diet should be gradual, and approached in a practical manner.

Taking all of the fibre in one sitting may increase the chances of undesirable side-effects such as flatulence, and maybe diarrhoea, especially if one is not accustomed to fibre at all. The approach should ensure that the diet is not only rich in fibre, but also balanced in the other nutrients the body needs.

In order to meet the recommended intake, foods rich in

dietary fibre must be included in the daily diet. These include relatively unprocessed cereals, legumes, and pulses, and a variety of non-starchy vegetables and fruits every day. The way towards achieving the recommended intake is to follow the food guide pyramid.

- Eat at least five servings of a variety of non-starchy vegetables and fruits every day

- Consume relatively unprocessed cereals (grains) in every meal

- Include legumes (peas, beans, and lentils) more often in daily meals

- Limit intake of refined carbohydrate foods

### Scientific update on dietary fibre

In order to provide an update on scientific and regulatory aspects of dietary fibre, a seminar on dietary fibre has been scheduled for September 28, 2009, in Kuala Lumpur.

The seminar aims to provide updates on current understandings in dietary fibre, characteristics, physiological roles, and effects on human health.

It is also aimed at providing an update on international and regional regulatory status of dietary fibre definition and conditions for claims.

Further information on the seminar is available at [www.nutriweb.org.my](http://www.nutriweb.org.my)

■ *NutriScene* is a fortnightly column by Dr Tee E Siong, who pens his thoughts as a nutritionist with over 30 years of experience in the research and public health arena. For further information, e-mail [starhealth@thestar.com.my](mailto:starhealth@thestar.com.my).

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