

# Dietary fibre science



## Nutri Scene

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SINCE the concept of dietary fibre was established four decades ago, a great deal of research has been carried out on its definition, physical and physiological properties, and health benefits. A seminar was recently organised by the International Life Sciences Institute to provide an update on current understandings in dietary fibre, characteristics, physiological role, and effects on human health.

A considerable part of the seminar was devoted to discussions on the regulatory aspects of dietary fibre. These aspects include the legal definition of dietary fibre, labelling of the amounts of dietary fibre, as well as nutrient content claims and nutrient function claims. The seminar provided an update on international and regional regulatory status of dietary fibre definition and conditions for claims. It also provided a forum for discussion among all stakeholders on these regulatory aspects.

More than 150 nutritionists, dietitians, food scientists and technologists participate in the seminar.

### Scientific update on dietary fibres

Three invited international speakers presented on scientific updates on dietary fibres. Prof Julie Jones, St Catherine University, US, provided an overview of current understand-

## Current science and regulatory aspects of dietary fibre were updated in a recent seminar.

ing of dietary fibre and its role in human health. According to the American Association of Cereal Chemists (AACC), dietary fibre is the edible parts of plants or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine. These include polysaccharides and oligosaccharides with three to 20 sugar units.

Countries have developed guidelines for dietary fibre intake ranging from 21 to 40 g per day, whereas the WHO recommends a total fibre intake of 25 g per day. However, estimates of actual total dietary fibre consumption in various countries range from a low of 14 g per day to a high of 29, with most countries reporting consumption levels below either national or WHO recommendations.

Dietary fibers promote beneficial physiological effects, such as laxation, and/or blood cholesterol attenuation, and/or blood glucose attenuation. They are now known to play important roles in health and disease, including in laxation and constipation, diverticular disease, cancers, coronary disease, type 2 diabetes and glycemic response, satiety and obesity, and hypertension.

Dr Peter Ellis of King's College, University of London, spoke on the physico-chemical perspectives and mechanisms of action of dietary fibre. The mechanisms of dietary fibre in the digestion and absorption of nutrients (especially starch and lipid) are dependent on the physico-chemical properties of dietary fibre, the physical form of the food, processing, etc.

The three main factors summarised were the viscosity of water-soluble non-starch polysaccharides (NSP); NSP interaction with starch and  $\alpha$ -amylase; and encapsulation by cell wall matrix. Dr Ellis summarised several studies carried out in almond seeds to investigate the release (bioaccessibility) of lipid in the gut.

Wim Caers of Beneo-Orafti, Belgium, summarised the characteristics of non-digestible oligosaccharides (including oligofructose, with degree of polymerisation 3-9) and their physiological effects exhibited by these compounds. These properties and physiological effects include non-digestibility, (selective) colonic fermentation, bulking/laxative effect, improved regularity, short chain fatty acid production, reduction of glycaemic index, reduction of cholesterol, body weight management, and improved mineral absorption. These properties and effects clearly demonstrate that oligofructose meet the criteria of a dietary fibre.

He also highlighted that oligofructose has been recognised as dietary fibre by many regulatory agencies in the world.

### Dietary fibre in Codex Alimentarius

The Codex Alimentarius Commission, the inter-governmental international standard setting body, officially adopted a definition of dietary fibre in July 2009 and provided guidelines for nutrient content claims. I presented to participants of the seminar some background of the discussions on dietary fibre which went on within the Codex system for

more than 10 years and the final decisions of the definition.

The recently adopted definition by Codex Alimentarius include the element of not being hydrolysed by endogenous enzymes in the small intestine (indigestibility) as well as having physiological effects beneficial to health. Dietary fibres are carbohydrate polymers with 10 or more monomeric units and 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 physiological effects beneficial to health are: (a) decreased intestinal transit time and increased stool bulk; (b) fermentable by colonic microflora; (c) reduce blood total and/or low-density lipoprotein (LDL) cholesterol levels; and (d) reduce blood glucose and/or insulin levels.

The Codex definition of dietary fibre outlined above had one area that was left to national authorities to decide. This is in relation to whether to accept carbohydrate polymers that are between the chain lengths of three to nine. This would mean that individual countries will decide whether non-digestible oligosaccharides with three to nine monomeric units can be accepted as dietary fibres.

In addition to the definition, the criteria for nutrient content claim for dietary fibre was

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also recently adopted by Codex. The minimum amount of dietary fibre that must be present in a food in order to claim as "source of" dietary fibre is 3g per 100g for a solid food or 1.5g per 100kcal or 10% of daily reference value per serving.

In order to qualify to make a "high in" claim, a food must contain at least 6g of dietary fibre per 100g or 3g per 100kcal or 20% of daily reference value per serving. The conditions for content claims for liquid foods have also been left to national authorities to decide.

### Dietary fibre regulations in the South-East Asia region

Officials from regulatory agencies in Malaysia, Philippines, Singapore, and Thailand presented on the regulatory status of dietary fibre in their respective countries, especially in relation to its definition and nutrition claims.

Norrani Eksan from the Food Safety and Quality Division of the Ministry of Health Malaysia updated participants on the status of dietary fibre in the Malaysian Food Regulations (1985). I have provided a detailed summary of this status in a later section of this article.

Helena Alcaraz of the Philippines Bureau of Food and Drugs (BFAD) informed the seminar that her bureau supports the adopted Codex definition of dietary fibre. Furthermore, BFAD will consider carbohydrates with three to nine monomeric units as fibre. BFAD supports the Codex proposed conditions for nutrient content claim for dietary fibre and will use the conditions of 3g per 100g or 1.5g per 100kcal as "source" and 6g per 100g or 3g per 100kcal as "high".

With regards to health claims, the Philippines approved claims are based on the generally accepted health benefits of dietary fibre such as normal laxation, reduction of the risks of developing heart disease and constipation, and improvement of gastro-intestinal health.

Lim Lee San of the Agri-Food and Veterinary Authority (AVA) summarised the regulatory status on dietary fibre in Singapore. There is currently no legal definition of dietary fibre under existing Singapore Food Regulations. However, various guiding principles have been used for consideration of various forms of carbohydrates as dietary fibre.

The AVA will be reviewing the existing guidelines based on Codex's latest recommendation, in particular, for carbohydrates from three to nine monomeric units. Emphasis will be placed on establishing scientific evidence to support physiological effects of benefit to health, as recommended by Codex.

Nutrient content claims for dietary fibre are permitted if a food complies with national nutrient claim guidelines and are very similar to those proposed by Codex. AVA has permitted a nutrient function claims that states that dietary fibre aids functioning of digestive system.

Since April 2009, AVA has permitted five nutrient specific diet-related health claims. Two of these claims are in relation to dietary fibre in whole grains, fruits and vegetables and the reduced risk to heart disease and some types of cancers. Various conditions have to be met before these function and health claims can be made.

Dr Tipvon Parinyasiri of the Thai Food and Drug Administration (FDA) briefed participants on the situation in Thailand. There is currently no legal definition of dietary fibre. The Thai FDA will be following the recently adopted Codex definition and will be making a decision with regard to compounds with three to nine monomeric units. Emphasis will be given to consideration of the physiological effects of a particular compound.

Nutrient content claims such as "good source", "contain", "provide", "high", "rich", "rich in", "excellent source of" are permitted for dietary fibres. The criteria for making these claims are in relation to the Thai Recommended Dietary Intake (RDI) per reference amount of the food. There is a total of 29 nutrient function claims in the current positive list approved by the Thai FDA. One of

# Fibre forges ahead



Since April 2009, the Agri-Food and Veterinary Authority in Singapore has permitted five nutrient specific diet-related health claims. Two of these claims are in relation to dietary fibre in whole grains, fruits, and vegetables and the reduced risk to heart disease and some types of cancers.

these relate to the ability of dietary fibre to help increase mass in the digestive system and stimulate bowel movement.

### Dietary fibre regulations in Malaysia

The Malaysian Food Regulations 1985 have made it compulsory for most prepackaged foods to be labeled with four core nutrients, namely energy, protein, carbohydrates, and fat in the nutrition information panel. Other nutrients that may be labeled include several vitamins and minerals, provided they are present in significant amounts. Dietary fibre is another optional nutrient that may be declared in the panel.

There is no official definition of dietary fibre in the Malaysian Food Regulations 1985. The Health Ministry has however recognised several compounds as dietary fibre, based on applications from the food industry. Each application has been reviewed by an expert committee, guided by established criteria that are based on the physical and physiological properties of dietary fibre, as outlined above for Codex definition.

Some of these compounds include a variety of non-digestible polysaccharides (e.g. high amylose maize resistant starch, beta-glucan, polydextrose, and resistant dextrin) and oligosaccharides (e.g. galacto-oligosaccharide, inulin, oligofructose, and oligosaccharide mixtures).

In a recently published gazette, to take effect from Jan 2010, the criteria for nutrient content claim for dietary fibre were announced. The minimum amount of dietary fibre that must be present in a food in order to claim as "source of" dietary fibre is 3g per 100g for a solid food or 1.5g per 100ml for a liquid food. In order to qualify to make a "high in" claim, a food must contain at least 6g of dietary fibre per 100g or 3g per 100ml for solid and liquid food respectively.

Current food regulations also permit a number of nutrient function claims to be made on dietary fibre. These claims have also been approved arising from applications from the food industry and have been approved based on scientific data submitted. These function claims relate to the physiological functions of dietary fibre, for example, increase intestinal bifidobacteria and helps maintain a good intestinal environment; bifidogenic; prebiotic; promote regular bowel movement; improve the intestinal immune system of babies; helps lower or reduce cholesterol; helps to lower the rise of blood glucose; increase calcium absorption, and increase bone mineral density.

Various conditions are required before a food is permitted to make these claims. Firstly, there must be a minimum amount of the dietary fibre that is the subject of the claim present in the food. Additional condi-

and oligosaccharides.

The food industry has taken the initiative to declare dietary fibre content on their product labels. Several products are also making "high fibre" content claims as well as nutrient function claims related to dietary fibre. The industry is responsible in this respect and ensure that the labelling and claim information are accurate.

FMM calls on the regulatory authority to adopt a clear definition of dietary fibre. In this regard, the food industry recommends to include non-digestible oligosaccharides (with three to nine monomeric units) in the definition of dietary fibre.

FMM also suggested to provide consistent labelling guidance on dietary fibre in order to improve consumer understanding and education. The organisation also suggested that analytical methodologies applied to determine dietary fibre should be aligned to the adopted definition. Different methods are required to determine the range of dietary fibres present in a food and the differences in food matrices should also be taken into consideration.

■ *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. The information provided is for educational and communication purposes only and it should not be construed as personal medical advice. Information published in this article is not intended to replace, supplant or augment a consultation with a health professional regarding the reader's own medical care. The Star does not give any warranty on accuracy, completeness, functionality, usefulness or other assurances as to the content appearing in this column. The Star disclaims all responsibility for any losses, damage to property or personal injury suffered directly or indirectly from reliance on such information.*

tions or criteria have been imposed on several types of dietary fibres.

### Industry perspectives of dietary fibre

Chor Yin Fun, representing the Federation of Malaysian Manufacturers (FMM), presented the food industry perspectives of dietary fibre.

Dietary fibres are now added to a variety of foods that do not originally contain dietary fibres so as to further increase the availability of fibre-rich foods.

This will help to increase the dietary fibre intake of individuals. The efforts include the increased use of the traditional non-digestible carbohydrates such as cereal grains as well as a number of non-digestible polysaccharides