

**Factors Influencing Consumer Behavioural Intention  
To Choose Functional Foods.**

Prepared by

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## **ABSTRAK**

Kajian ini menyelidik faktor-faktor yang mempengaruhi niat konsumen di Malaysia dalam memilih makanan berfungsi. Model theoretikal dibina berasaskan 'Theory of Planned Behaviour' (TPB). Terdapat enam pengubah bebas dalam model iaitu sikap terhadap kelakuan, norma subjektif, persepsi kawalan kelakuan, persepsi kepentingan rasa, nilai kesihatan dan persepsi kemungkinan jatuh sakit. Pengubah tidak bebas ialah niat konsumen. Hipotesis diuji menggunakan data yang dikumpul daripada 220 responden dari Pulau Pinang. Keputusan menunjukkan niat adalah kuat dipengaruhi oleh norma subjektif dan diikuti oleh persepsi kemungkinan jatuh sakit, nilai kesihatan, sikap terhadap kelakuan dan akhirnya persepsi kawalan kelakuan. Adalah mengejutkan didapati bahawa persepsi kepentingan rasa tidak mempunyai impak yang signifikan terhadap niat. Kajian ini juga mendapati bahawa niat dan persepsi kawalan kelakuan merupakan penunjuk yang lemah terhadap kelakuan sebenar konsumen terhadap makanan berfungsi.

## **ABSTRACT**

This research examined the factors that influence Malaysian consumers' behavioural intention towards choosing functional foods. The theoretical framework was developed based on Theory of Planned Behaviour (TPB). There were six independent variables in the model – attitude towards behaviour, subjective norms, perceived behavioural control, perceived importance of taste, health value and perceived susceptibility to illness. The dependent variable was consumers' behavioural intention. Hypotheses were tested using data collected from 220 respondents in Penang island and mainland. The result showed that intention was strongly predicted by subjective norms followed by perceived susceptibility to illness, health value, attitude towards behaviour and finally perceived behavioural control. It was startling to discover that perceived importance of taste did not have significant impact on intention. The study also found that intention and perceived behavioural were weak predictors of actual consumer behaviour towards functional foods.

## Chapter 1

### INTRODUCTION

#### 1.1 Introduction

This chapter begins with an overview of the current general health status among Malaysians in recent years. The possible reasons for the increasing statistics of unhealthy lifestyle related health problems among Malaysians and actions taken by the government and non-government organizations (NGOs) in combating these problems would be discussed. Besides that, this chapter includes the problem statement of this study, research objectives and research questions. The key terms and significance of this study will also be highlighted.

#### 1.2 Background of the study

##### *1.2.1 Unhealthy lifestyle and health problems among Malaysians*

The rapid socio-economics growth in Malaysia since its independence in 1957 has also changed the lifestyles of the people. As quoted from the speech by Minister of Health Malaysia, Dr. Chua Soi Lek at the 20<sup>th</sup> Scientific Conference of the Nutrition Society of Malaysia in March 2005, these dramatic economics advances also brought major changes in the dietary patterns of the local community. According to him, the consumption of complex carbohydrates from cereals, grains and tubers has declined significantly and replaced with higher intakes of meat, fish, fats and oils. As a result, the health and nutritional problems in the country have changed in the last 30 years, from undernourishment and symptoms of nutrient deficiencies to problems associated with excesses of fat and energy intake and lack of dietary fiber.

This dietary pattern change coupled with reduced physical activities led to more Malaysians being overweight and obese. In an interview with New Straits Times

Malaysia in December 2001, Pauline Low, executive director and physiotherapist of Weight Management Information Center said that the general local public has misleading views regarding obesity as a cosmetic problem instead of a major source of diseases and possible death. To determine of whether a person is overweight or obese is through the measurement of body mass index (BMI). BMI is a mathematical formula based on a person's height and weight (  $BMI = \text{kg/m}^2$  ). According to WHO, a BMI over  $25 \text{ kg/m}^2$  is defined as overweight, and a BMI of over  $30 \text{ kg/m}^2$  as obese. However, according to Dr. Mohd. Ismail, president of the Malaysian Association for the Study of Obesity in same news article, Asian people tend to accumulate abdominal fat without developing generalized obesity. Therefore, the new recommended BMI index for obesity for Asians is  $25 \text{ kg/m}^2$  as compared to WHO figure of  $30 \text{ kg/m}^2$  (Kaur, 2001).

The 2<sup>nd</sup> National Health and Morbidity Survey conducted Ministry of Health Malaysia in 1996 and 1997, found that 16.6% of Malaysian adults above 18 years old were overweight and 4.4% were obese. Dr. Chua Soi Lek also highlighted in his opening speech for the "I Decide" campaign on obesity by The Academy of Family Physicians of Malaysia in June 2005 that this statistics figures mean that about 3.3 million Malaysian adults in present are either overweight or obese and if these rates persist, the number would reach 4.4 million by 2020. Recently, it was reported that Malaysia has the most overweight and obese people in Asia, about 25 percent (Darshni, 2006).

Overweight and obesity lead to adverse metabolic effects on blood pressure, cholesterol, triglycerides and insulin resistance. In general term, this means overweight and obese people have increased risks of suffering from diseases such as coronary heart diseases, stroke, Type 2 diabetes and cancers. These diseases are

coined as chronic “lifestyle diseases” in a recent prime news report by Darshni in New Straits Times Malaysia in April 2006.

It was reported that more than 10,000 people in Malaysia died each year from diseases linked to hypertension like stroke, heart attack and renal failure including about 6,000 deaths due to coronary heart disease. At present, 3 million Malaysians are suffering from high cholesterol while another 2.1 million Malaysian have diabetes. Annually, more than 40,000 new cancer cases are reported, the country’s second killer after heart attack. Besides that, on the daily basis, about 110 Malaysians suffer a stroke which is the country’s third killer (Darshni, 2006).

Indeed, it is very clear that Malaysia is facing critical unhealthy lifestyle related health problems together with other countries across Asia. China, India, Pakistan and Indonesia are also facing this worsening health “time bomb”. While the Asian governments are busy being preoccupied with preparations to face possible flu pandemic and on-going AIDS battle, the people are dying from these chronic “lifestyle diseases”. It was estimated that 270 million Asians will die from these diseases in between 2005 and 2015 (Darshni, 2006).

The most apparent reason behind these weighty health problems is unhealthy lifestyle including unhealthy eating habits, lack of physical activity and tobacco use. According to Pauline Low, Malaysians tend to eat high-fat foods and put taste and convenience ahead of nutrition in choosing food products (Kaur, 2001). In addition, Dr. Chua Soi Lek also mentioned that Malaysians also tend to rely more on dietary supplements and do not follow the general healthy balanced eating patterns as recommended by the government and other health organizations (Chua, 2005b).

### ***1.2.2 Efforts to curb health problems among Malaysians***

In the face of growing health problems among Malaysians, the prevailing question is, if there is any effective solution to combat such problems. The WHO representative for Brunei, Malaysia and Singapore, Dr. Han Tieru provided a simple yet direct answer; eat healthy, exercise and quit smoking. He also highlighted the importance of government's roles in creating the right and supportive environment for the people to change their unhealthy lifestyle (Darshni, 2006).

The Ministry of Health Malaysia and various NGOs such as Nutrition Society of Malaysia, Malaysian Health Informatics Association, Malaysian Dietitians Association, Malaysian Association for the Study on Obesity, National Stroke Association of Malaysia and The Heart Foundation of Malaysia recognized these growing health problems.

Thus far, various efforts have been taken to create and educate Malaysians regarding healthy diet and active lifestyle. For example, public healthy lifestyle campaigns and events are relentlessly organized in schools, hospitals and road shows. In the coming month of July 2006, Ministry of Health Malaysia will be launching an event called "Let's Eat Healthily and Family Day" with the slogan "Healthy Family, Happy Life" (Ministry of Healthy Malaysia, 2006). Additional example is the frequent "Heart Week" campaign held in shopping malls by The Heart Foundation of Malaysia to create awareness and educate public pertaining to heart risk factors and the importance of healthy diet coupled with active lifestyle (The Heart Foundation of Malaysia, 2006).

Furthermore, a food pyramid as shown in Figure 1.1 has been introduced to guide the people on healthy diet. The food pyramid represents how much of each five

food groups that people should consume each day to achieve a well-balanced diet in the long term (Nutrition Society of Malaysia, 2006).



*Figure 1.1* Malaysian food pyramid

In April 2006, Ministry of Health Malaysia has also launched a new web portal named “MyHealth” in conjunction with World Health Day. This web portal aims to further reach every Malaysians and provide up-to-date online health information (Ministry of Healthy Malaysia, 2006).

However, much still need to be done to ensure that such efforts are effective in battling these health problems to prevent further losses of economics resources towards increased health care expenditure and eventually a loss to the productivity of the society as a whole. It is also especially important now in pursuit of the newly launched Ninth Malaysian plan (9MP) that focuses on the development of human capital.

### ***1.2.3 Dietary changes for better health among Malaysians***

Foods have always been recognized to be part of medicine. The link between diet and health has been established for thousand of years in traditional medicine. In the wake of this new century, there is a renewed interest in the role of diet and proper nutrition to maintain health and prevent diseases among the people.

Looking back, healthy diet is usually linked to well-balanced diet. The primary role of a balanced diet is to prevent nutritional deficiency (Falk, 2004). However, the development of food technology and nutrition researches has expanded the roles of diet on health beyond basic nutrition. There is a growing body of evidence documenting the positive health benefits of food components not included in the traditional classes of basic nutrients (IFT panelists, 2005). The six basic essential nutrients are water, protein, carbohydrate, fat, minerals and vitamins (Hasler, 1996).

Therefore, an outcome of these advancements is a new class of food called functional foods. Functional foods are either whole foods or fortified, enriched or enhanced processed foods which have potentially beneficial effect on health besides basic nutrition when consumed as part of a varied diet on a regular basis at effective levels (Hasler, Bloch, Thomson, Enrione & Manning, 2004). The primary purpose of

these foods is to prevent disease by optimizing health rather than preventing under-nutrition (Falk, 2004).

Hence, as reported, Malaysians are no longer facing undernourishment and symptoms of nutrient deficiencies but increasing health problems due to diet rich in fats, sugar and excessive calories (Chua, 2005a). Thus, one of the effective ways to curb these growing health problems is to change Malaysians' dietary pattern to include functional foods. For example, increasing the intake of soluble fiber known as beta-glucan found in oat products has significant cholesterol-lowering effect and thus, helps to prevent coronary heart diseases.

Furthermore, Clydesdale (1998) highlighted that functional foods should be integral components of established public health programs to reduce the risk of specific diseases. Heasman and Mellentin (1999) also pointed out that development of functional foods have enormous implications for consumers, public health and health promotion policy.

Lastly, IFT panelists (2005) reported that functional foods fit into a continuum that ranges from health maintenance or promotion to disease treatment. Health benefits may result from increasing the consumption of health-promoting substances already part of a person's diet or adding new health-promoting substances into the diet.

### **1.3 Problem Statement**

The various campaigns organized by Ministry of Health Malaysia and other NGOs in promoting and educating the public regarding healthy lifestyles in particularly, healthy diet can be enhanced if there is a clearer understanding of the Malaysian consumer behaviour in choosing healthy food products such as functional foods.

In addition, the consumer behavioural information gathered would further equip food manufacturers in joining effort with the government and NGOs to promote healthy diet. Food manufacturers could increase their investment in the development of new functional food products that better meet the consumer needs and enhance their marketing and distribution channels to reach wider market segments.

Therefore, this study seeks to examine and gain further understanding on the factors that influence Malaysian consumers' behavioural intention towards choosing functional foods where such study in the local setting is still lacking.

#### **1.4 Research Objectives**

It has been noted that consumer research within the functional foods sector is still in its infancy. Thus, it is important that more research is to be conducted to provide further understanding of consumer needs, attitudes and perceptions towards these foods (Childs & Poryzees, 1998 and Bogue & Ryan, 2000).

Therefore, this study attempts to gain clearer understanding of the Malaysian consumer behaviour towards functional foods by investigating the identified factors that influence their intention in choosing these foods. The three objectives of this study are to:

- (1) Assess the effects of consumers' underlying beliefs that determine their attitude, subjective norms and perceived behavioural control in influencing their behavioural intention in choosing functional foods.
- (2) Examine the additional determinants such as perceived importance of taste, health value and perceived susceptibility to illness towards influencing consumers' behavioural intention in choosing functional foods.

- (3) Evaluate the extent of consumers' behavioural intention and perceived behavioural control in predicting actual consumer behaviour towards functional foods.

### **1.5 Research Questions**

The result of this study aims to answer the following research questions:

- 1) What are the effects of consumers' underlying beliefs that determine their attitude, subjective norms and perceived behavioural control in influencing their behavioural intention in choosing functional foods?
- 2) How do other additional determinants such as perceived importance of taste, health value and perceived susceptibility to illness towards influencing consumers' behavioural intention in choosing functional foods?
- 3) What is the extent of the relationship between consumers' behavioural intention and perceived behavioral control in predicting actual consumer behaviour towards functional foods?

### **1.6 Definition of Key Terms**

The following are the key terms and their definitions used throughout this study.

#### ***1.6.1 Consumer Behaviour***

Consumer behaviour is termed as the study of how individuals make decisions to spend their available resources such as time, money and effort on consumption-related items such household products, foods and etc. (Schiffman & Kanuk, 1997).

In other words, consumer behaviour is defined as the study of the processes involved when individuals or groups select, purchase, use or dispose of products, services, ideas or experiences to satisfy needs and desires (Solomon, 2004).

### ***1.6.2 Consumer Research***

Holbrook (1987) defined consumer research as the study of consumer behaviour that entails consumption. Consumption aspects include acquisition, usage and disposition of goods, services, ideas and any other entities in ways that provide value. Value is achieved when a need is fulfilled, a goal is achieved or a want is satisfied.

### ***1.6.3 Consumer Decision Making***

Consumer decision making is defined as the behaviour patterns of consumers, that precede, determine and follow on the decision process for the acquisition of need satisfying products, ideas or services ( Du Plessis, Rousseau & Blem, 1991).

### ***1.6.4 Functional Foods***

American Dietetic Association defines functional foods as whole foods or fortified, enriched or enhanced processed foods which have potentially beneficial effect on health when consumed as a part of a varied diet on a regular basis at effective levels. The International Food Information Council (IFIC) defines functional foods as foods that provide health benefits beyond basic nutrition (Hasler et al., 2004). The six basic essential nutrients are water, protein, carbohydrate, fat, minerals and vitamins (Hasler, 1996).

Examples of functional foods are broccoli, carrots and tomatoes which are rich in physiologically active components such as sulforaphane, beta carotene and lycopene respectively. Other examples are oats with bioactive components of beta glucan and fatty fish with essential n-3 fatty acids.

### ***1.6.5 Behavioural Intention***

Behavioural intention is the indication of how hard people are willing to try or how much an effort they are planning to exert in order to perform the behaviour. Therefore, behavioural intention is assumed to capture the motivational factors that influence a behaviour such as attitude, subjective norm and perceived behavioural control (Ajzen, 1991). Behavioral intention is also assumed to be the immediate antecedent of behaviour (Ajzen, 2002b).

### ***1.6.6 Attitude***

Ajzen and Fishbein (1975) compiled the descriptions of attitude from various investigators and described attitude as a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object. In 1991, Ajzen defined attitude toward the behaviour as the degree which a person has a favorable or unfavorable evaluation or appraisal of the behaviour in question. Thus, attitude can be measured either through direct or belief-based measure. Belief-based measure of attitude is the weighted average of the strengths and outcome evaluation of person's behavioural beliefs (Ajzen, 2002b).

### ***1.6.7 Subjective Norms***

Subjective norms refer to the perceived social pressure to perform or not to perform a certain behaviour. It can be measured either through direct or belief-based measure. Belief-based measure of subjective norms is the weighted average of the normative expectations of others such as from family, friends or doctors and motivation to comply with their expectations (Ajzen, 1991 & 2002b).

### ***1.6.8 Perceived Behavioural Control***

Perceived behavioural control is the perceived ease or difficulty of performing the behaviour. It can be measured either through direct or belief-based measure. Belief-based measure of perceived behavioural control is the weighted average of the strength of control beliefs and facilitation power of these beliefs (Ajzen, 1991, 2002a & 2002b).

### ***1.6.9 Perceived Importance of Taste***

According to the Oxford Study Dictionary (1991), taste is defined as the sensation of produced by or as if by a substance placed in the mouth. This sensation could be sweet, sour, salty, or bitter qualities or a combination of these senses with sight, touch and smell. In 1997, Gummeson and team defined perceived importance of taste as the extent of this factor in influencing the choice of foods for breakfast among the children in Sweden.

### ***1.6.10 Health Value***

Health value is defined as the level of importance consumers placed on having good health (Conner, Kirk, Cade & Barrett, 2001).

### ***1.6.11 Perceived Susceptibility to Illness***

Perceived susceptibility to illness is defined as consumers' perception of the likelihood to develop a range of common personal health problems such as coronary heart disease in the light of perceived effects of certain health behaviour such as taking dietary supplements in Conner et al. (2001).

## **1.7 Significance of the Study**

The outcome of this study aims to benefit the government healthy ministry and NGOs as well as the food manufacturing industry involved in promoting and educating healthy lifestyles to Malaysians in particularly, healthy eating. This is because unhealthy diet has been identified as one the risk factors leading to chronic “lifestyle diseases” among Malaysians (Darshni, 2006).

Therefore, clearer understanding of the factors influencing Malaysian consumers’ behavioural intention towards choosing healthy food products such as functional foods will facilitate the organization of healthy eating campaigns. This is because intention is the immediate antecedent to actual behavior (Ajzen & Fishbein, 1980, Ajzen, 1991 & Ajzen, 2002b). Organizers of such campaigns will be able to exploit the identified factors accordingly to their influential importance such as subjective norms factors and better reach the targeted group in combating health problems. For example, organizers can target family doctors to participate more actively in introducing alternative choice of complex carbohydrates rich in dietary fibers such as brown rice in place of refined carbohydrates such as white rice to their patients. This channel could be more effective than just reaching out to the public in general.

Furthermore, as noted by Dr. Chua Soi Lek in his speech, Malaysians tend to rely more on dietary supplements (Chua, 2005b). This is not a healthy prolong habit because dietary supplements only provide selected nutritional components in concentrated form and not the diversified nutrients and phytochemicals that occur naturally in foods (Richardson, 1996). Thus, to promote functional foods as the better choice of diet is more effective to reduce health problems among Malaysians in a long term.

Additionally, food manufacturers in Malaysia can also gain better understanding of the key factors that influence Malaysian consumers' behavioural intention in choosing functional food products. This would further equip their marketing plans with the best strategies to reach their targeted consumer market. Besides that, it would also help these manufacturers to produce functional food products that would better meet and satisfy the local consumers' needs and wants.

The findings of this study also hope to help local food manufacturing companies to compete with the international companies in gaining better market share and improving their profit in this globally growing functional food industry.

Lastly, this study will contribute in expanding the reference list of Malaysian consumer behaviour researches especially in the area of healthy diet because there is a lack of studies in this aspect within the local environment. Childs (1997) also highlighted that consumer research in the health food area including functional foods and nutraceuticals is still in its infancy stage. Thus, further studies are required to address the beliefs and attitudes of the consumers to seize interesting marketing potentials.

The previous researches by MBA students in USM covered on different food products such as organic food products (Ng, 2001) and herbal supplements (Abbas, 2004). The definitions and functional characteristics of these food products are different than functional foods. In addition, the frameworks of their studies have been expanded in this study. All these points are further discussed in Chapter 2.

## **1.8 Organization of Remaining Chapters**

In chapter 2, literature review of conceptual and empirical researches would be highlighted. The focus would be an overview of functional foods, concepts in

consumer research and consumer decision making models, theories in health behaviour researches, development of expectancy-value model and the Theory of Planned Behaviour. This would be followed by theoretical framework of this study and the generated hypotheses. The following chapter 3, methodology carried out in this study would be discussed. This includes research design, variables and measurement, data collection method, and the definition of statistical analysis used. In chapter 4, the statistical results and findings from the analysis of data collected which include profile of respondents, factor analysis, reliability test, descriptive statistics, correlation analysis, multiple regressions, discriminant analysis and summary results of all hypotheses would be presented. Lastly, chapter 5 would conclude with discussions and implications from the interpretation of the results. Limitation of this study will also be stated and suggestions for similar future research will be highlighted.

## **Chapter 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter would cover the review of literatures which would start with an overview of functional foods. The overview includes definitions and examples of this new food group, development of functional foods and the challenges involved. Next, the concept of consumer research and main consumer decision making models would be described and the debates behind these models would be briefly reviewed. Additionally, since this study involves health behaviour, various theories used in previous health behaviour researches would be highlighted. Lastly, the theory used in this study, Theory of Planned Behaviour would be discussed together with examples of previous application in consumer behaviour researches.

#### **2.2 Overview of Functional Foods**

##### ***2.2.1 Defining Functional Foods***

“Let food be your medicine and medicine be your food” was a tenet from Hippocrates nearly 2,500 years ago ( Hasler, 1998). Early civilizations from Greek, Egypt, India to China have long recognized food as medicine. The increasing health problems in this modern age, has spurred a renewed interest in diet and proper nutrition to maintain health and prevent diseases among the people.

In 1994, Food Technology Trend Report named the “increasing role of food and food ingredients in self-medication and disease prevention” as the number one top trend facing the food industry in the coming years (Sloan, 1994).

First and foremost, it is important to highlight the definition of functional foods before further review of these foods (Head, Record & King, 1996). IFT

panelists in their comprehensive expert report on functional foods in 2005 also highlighted that to define what is involved is the first step of a review.

Thus far, there is still no universally accepted definition of functional foods. The term functional foods was first introduced in Japan in the mid-1980s. These foods are categorized as 'Foods for Specific Health Use' or FOSHU (Hasler, 1998). FOSHU is defined as foods with specified health effects that can be expected from the available scientific research data concerning the relationship between the food contents and health (MacDonald, 2004).

In the United States of America, the Institute of Medicine's Food and Nutrition Board defines functional foods as "any food or food ingredient that may provide a health benefit beyond the traditional nutrients it contains" (Hasler, 1998). The International Food Information Council defines functional foods as "foods that provide health benefits beyond basic nutrition". Similar definition is provided by the International Life Sciences Institute of North America which defined functional foods as "foods that have physiologically active food components that provide health benefits beyond basic nutrition" (Hasler et al., 2004). The six basic essential nutrients are water, protein, carbohydrate, fat, minerals and vitamins (Hasler, 1996).

The largest organization of dietetics professional, American Dietetic Association classified that all foods as functional at some physiologic level. The term functional foods includes whole foods and fortified, enriched or enhanced foods which have potentially beneficial effect on health when consumed as a part of a varied diet on a regular basis at effective levels (Hasler et al.,2004).

Likewise, the Institute of Food Technologists, an international scientific society of members from various food industries, academia and government defines functional foods as "foods and food components that provide health benefit beyond

basic nutrition (for the intended population). These substances provide essential nutrients often beyond quantities necessary for normal maintenance, growth and development, and/or other biologically active components that impart health benefits or desirable physiological effects (IFT panelists, 2005).

However, the Institute of Medicine of the National Academic of Sciences in America limits functional foods to those with concentrations of one or more ingredients that that been manipulated or modified to enhanced their health benefits (Hasler et al., 2004).

Besides the United States of America, functional foods have also attracted wide range of definitions from other countries around the world. The scientists in the Commonwealth Scientific and Industrial Research Organization in Australia terms functional foods as “a group of foods that have strong metabolic and physiological roles above the wide range of common foods. It is also a class of foods that can achieve a defined endpoint that can be monitored such as reduction of blood pressure and products refer to as special dietary foods” ( Head et al., 1996).

Furthermore, there is also no official regulatory recognition or status for functional foods within the European Union. In general, functional foods are referred to foods and not pills, capsules, powders or dietary supplements in Europe (Heasman & Mellentin, 1999).

Last but not least, Health Canada defines functional foods as “foods similar to appearance with conventional food, is consumed as part of usual diet and is demonstrated to have physiological benefits and/or reduce the risk of chronic disease beyond basic nutritional functions” (Brodeur, 2003).

Thus, to sum-up, all these definitions described that unmodified natural whole foods such as fruits and vegetables represent the simplest form of a functional food.

Modified and processed foods including those that have been fortified with nutrients or enhanced with phytochemicals also fall into this group. As summarized by Heasman and Mellentin (1999), the key characteristic of functional foods in Japan, the United States of America, the European Union and other countries is that these foods deliver recognized health benefits.

### ***2.2.2 Distinguishing Functional Foods***

There are various terms used interchangeably to describe foods for disease prevention and health promotion besides functional foods. The most famous terms are nutraceutical and designer foods (Hasler, 1996).

The term designer foods was first coined in 1989 to describe foods that naturally contain or enriched with non-nutritive, biologically active chemical component of plants such as phytochemicals that are effective in reducing cancer risk (Hasler, 1996).

Whereas, the term nutraceuticals, as generally used, implies something more than just food. Nutraceuticals have been defined by Health Canada as products that are prepared from foods but sold in the form of pills or powders (potions) or in other medicinal forms not usually associated with food. Similarly to functional foods, nutraceuticals also demonstrate physiological benefit and/or provide protection against chronic disease (Brodeur, 2003).

In a group research by the International Food Information Council, consumers are found to prefer, recognize and accept the general term of “functional foods” more readily as compared to “nutraceuticals” (Food Insight, 2002).

Additionally, it is also very important to distinguish functional foods from dietary supplements. The Dietary Supplement Health and Education Act (DSHEA)

1994 in America defines dietary supplement as a product that is intended to supplement the diet and contains one or more of the dietary substance such as vitamins, minerals or herbs. It is a dietary substance to supplement the daily intake of these substances. Dietary supplements unlike functional foods are intended to be consumed in pill, capsule, tablet or liquid form. It is also not to be presented as conventional food or sole item of a meal or diet (Kalra, 2003). Thus, herbal supplements would fall into this category if the final products of herbal preparation are no longer in form of foods.

Furthermore, increased intake of functional foods has added advantage over dietary supplements because the latter only provide selected components in concentrated form and not the diversified nutrients and phytochemicals that occur naturally in foods (Richardson, 1996).

Besides that, in view of the popularity of organic foods, it is necessary to differentiate these products from functional foods. The National Organic Standard Board of the United States Department of Agriculture (USDA) states that organic foods are defined from the way these foods are grown, cultivated and processed without the use of toxic chemical pesticides and fertilizers, genetic engineering, growth hormones, irradiation and antibiotics. Thus, organic foods are considered to be healthier choice compared to conventional foods or modified foods (Golingai, 2005).

Lastly, organic foods can be developed into organic functional foods. It is not necessary through genetic or chemical modifications but through breeding and nutrient fortification. Moreover, the organic food industry is expected to gain higher profit from this effort. This is because consumers are found to be willing to pay even greater premiums for organic foods with functional properties (Larue, West, Gendron & Lambert, 2004).

### ***2.2.3 Examples of Functional Foods***

Functional foods can take many forms. Firstly, functional foods can appear as general form of conventional foods or whole foods targeted to healthy or normal population with intention to enhance health, protect against diseases or help to prevent risk factors associated with disease and illness (Heasman & Mellentin, 1999).

According to a consumer survey, the top 10 functional foods that would fall into this category are broccoli, fish or fish oil, green leafy vegetables, oranges or orange juice, carrots, garlic, fiber, milk, oats or oat bran or oatmeal and tomatoes (Food Insight, 2002). Other examples not included in the list are soy protein, cranberries and flaxseed (IFT panelists, 2005).

These foods contain bioactive components besides basic nutrients that are identified and linked to positive health benefits (IFT panelists, 2005). An example of these bioactive components is phytochemicals in the plant-based functional foods. Phytochemicals have just been recently scrutinized by scientists to contain potential efficacy in protecting against human diseases such as cancer. These components are non-nutritive secondary plant metabolites present in relatively small amounts (Hasler, 1996).

Besides that, soluble fiber known as beta-glucan found in oat products has also been widely studied and documented to have significant cholesterol-lowering effect. The high quality soy protein is also found to have preventive and therapeutic roles in cardiovascular diseases, cancer and osteoporosis. Additionally, other example from animal-based is Omega-3 fatty acids derived primarily from fish oil. Omega-3 is an essential class of polyunsaturated fatty acids that has preventive roles in cardiovascular diseases and cancer (Hasler, 1998).

The second general form of functional foods is fortified or enhanced foods. These foods are specially developed for consumers with recognized health or medical conditions to reduce their disease risk (Heasman & Mellentin, 1999). Examples are fortified margarines with plant sterols for cholesterol-lowering purposes and folate-fortified foods for pregnant mothers (IFT panelists, 2005). Additional examples of functional foods currently on the USA market are shown in Appendix II

#### ***2.2.4 Challenges in Functional Foods***

Functional foods present four major challenges involving regulators, consumers, scientists and food industry respectively (Falk, 2004).

##### ***2.2.4.1 Challenges for regulators.***

Firstly, the major dilemma regarding regulations of functional foods is that these foods exist at the interface between foods and drugs (Hasler, 1996). “Food” means items used for food or drink while “drug” means items intended for diagnosis, cure, mitigation, treatment or prevention of disease. In the USA, a food product can be both, but in practice, either food law or drug law is applied to the regulation of these hybrid “drug-food” products (Glinsmann, 1996). Thus, there is no clear provision in the current USA laws and regulations in functional foods (Childs, 1997).

The Japanese whom are credited with inventing the term “functional foods” in the 1980s dropped it in 1991 in favor of Foods for Specified Health Use (FOSHU). The main reason was to allow health claims on these food products that had undergone approval process by Japan’s Ministry of Health and Welfare. It was also to avoid confusion with the term “functional” between regulation of pharmaceutical drugs and food products (Heasman & Mellentin, 1999).

FOSHU has specific regulatory approval process separate from foods fortified with vitamins, minerals and dietary supplements. These foods are defined as “foods with specified health effects that can be expected from the available data concerning the relationship between the food contents and health”. The Japanese government also enforced strict labeling regulations where all functional foods in the market need to have the seal of approval from the Japanese Ministry of Health, Labor and Welfare (MacDonald, 2004). An example of this label is shown in Figure 2.1 below.



*Figure 2.1* FOSHU system symbol from Japanese Ministry of Health, Labor and Welfare (Hariani & See, 2003).

However, FOSHU system is voluntary and recently most of the Japanese food manufacturers opted not to apply for this time-consuming and money intensive system. Most companies have chosen to launch functional food products without making or using explicit health claims. Up till 1998, there are more than 1,700 functional foods introduced in Japan compared with only 126 FOSHU approved products (Heasman & Mellentin, 1999).

The primary reason is that the general public in Japan is assumed to be considerably educated in nutrient deficiencies and knowledge on the links between

diet and diseases. Therefore, food manufacturers could highlight a certain ingredient in their products without having to express full disease or health-related claims and still able to dominate the marketplace (MacDonald, 2004).

Besides that, there are few other weaknesses in the FOSHU system, MacDonald (2004) highlighted that FOSHU does not forbid claims on health links and some of these links could be misleading. He added that FOSHU also does not have limitations on the level of so-called 'unhealthy' ingredients such as salt and sugar and consequently might lead the consumers to conditions such as hypertension and obesity.

In recent years, there has been major progress in the development of regulations for functional foods in USA. Although there is still no legal classification for functional foods but the Food and Drug Administration (FDA) oversees the health claims used on food label through three main legislations which are the 1990 Nutrition Labelling and Education Act (NLEA), the 1997 Food and Drug Administration Modernization Act (FDAMA) and the 2003 FDA Consumer Health Information for Better Nutrition Initiative (MacDonald, 2003).

According to the new amendments, NLEA will allow labeling claims for conventional foods that characterize the relationship of any substance to a disease or health-related condition if the claim is first approved by an FDA regulation. The FDAMA of 1997 amended the Federal Food, Drug and Cosmetic Act (FDCA) to authorize food labeling to include certain health claims without the approval of FDA. But, these claims must be the subject of a published authoritative statement issued by a scientific body of the USA government with official responsibility for public health protection or research directly relating to human nutrition. For example, the National Institutes of Health (NIH) and Centers of Disease Control and Prevention (CDC).