

Food Facts Asia

CURRENT TOPICS IN FOOD SAFETY AND NUTRITION
Issue 14, March 2002

Essential Fats of Life



Historically, as income levels rise, and people are able to choose foods more on the basis of pleasure than what is locally available or affordable, the proportion of fat in the diet tends to rise.

In some countries in Asia, it is estimated that fat makes up 40% of calories consumed.

Experts agree that this is too high. High fat diets have been linked to many of the so-called 'lifestyle diseases,' such as obesity, coronary heart disease strokes, and some cancers. Experts agree that limiting dietary fat intake, especially saturated fats is a priority health goal.

Facts and figures - the recommendations

National guidelines vary (Thailand, Malaysia and Singapore recommend 20-30% of total energy, Indonesia, Japan and S Korea all recommend less than 25%), but in the main, current research suggests that fat should make

up a maximum of 30% of total energy content of the diet, and 25% is probably the most common dietary recommendation. For an adult consuming 2200 kilocalories a day, this might be translated in food items as 15 g of fat each for breakfast and lunch and 20 g for dinner, with 10 g for snacks between meals and drinks.

A sensible target for dietary fat intake would be no more than 30% of total energy from fat, made up of one third saturated, one third, monounsaturated and one third polyunsaturated.

Know your fats.

Fat is the common name used to describe a whole family of compounds, including triglycerides, the phospholipids and sterols. About 95% of fats consumed in the diet are triglycerides. These may be visible (eg white fat on cuts of meat, cooking oils) or invisible (eg oils and solid fats used in bakery products, the oil in peanuts, coconut milk).

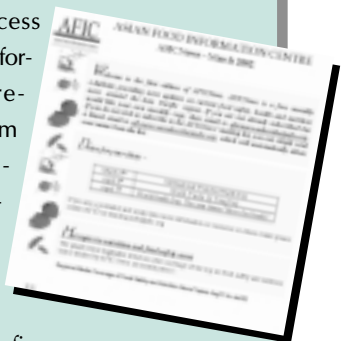
All pure oils and solid fats, have the same calorific value. One gram of fat provides 9 calories of energy which is more than double the amount of calories for the same weight of carbohydrates or proteins.



Chemically the triglycerides can be classified, according to their degree of saturation or hydrogenation: Fat molecules may be described as saturated, monounsaturated or polyunsaturated. In fact most foods contain a mixture of saturated and unsaturated fats, as the table overleaf illustrates

News from AFIC

AFIC has launched a new e-bulletin. AFICNews is a free monthly update on current food safety and nutrition news and issues in the region. AFICNews also provides details how to access the latest information resources from AFIC's extensive web-site. Subscribing is easy, just email info@afic.org.

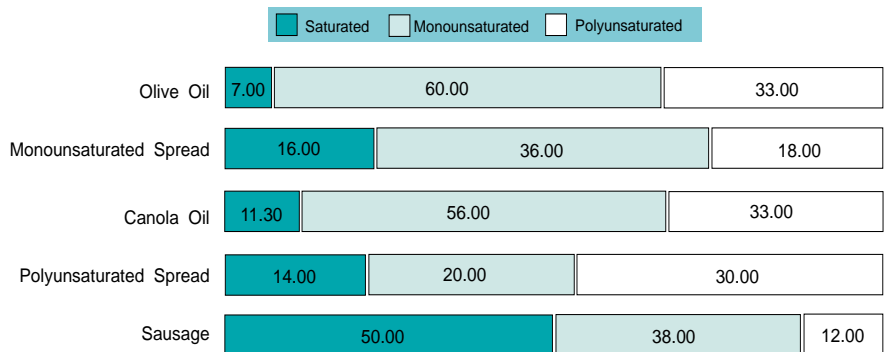


AFIC has a new mailing address.
PO Box 140, Phrakonong Post Office,
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Or contact by emailing info@afic.org.

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Typical Fatty Acid Composition of Common Food



Low-fat or no-fat ?

With all the information on the risks of a high fat diet, it might be easy to forget that fats are actually an essential part of the diet. Research has found that a healthy diet requires at least 15% of calories to be derived from fat. Fats are required for the efficient absorption of the fat soluble vitamins (vitamins A, D, E and K); and also the source of the 2 essential fatty acids which the body cannot manufacture itself. As long as the diet contains linoleic acid and linolenic acid, the two building block fatty acids, the body can manufacture all other omega-3 and omega-6 long chain unsaturated fatty acids that it requires. For this reason, these two substances are known as the essential fatty acids and the best source of these, are generally plant oils.

Recently there has also been a great deal of interest in possible health benefits from increased consumption of other non-essential fatty acids to boost the body's own natural production levels. Most interest has focused on docosahexanoic acid and eicosapentaenoic acid (derived from oily fish such as herring, mackerel and tuna and some vegetable oils). Evidence is not conclusive, but benefits seem to include reduced risk of thrombosis (blood clotting), reduction of triglyceride levels (associated with reduced risk of heart disease and atherosclerosis) and improvements in visual and mental abilities. In summary, the omega-3 fatty acids from plant and marine sources, as well as the omega-6 fatty acids

all have slightly different functions and a healthy diet will include rich sources of all three types of these polyunsaturated fatty acids. Fat is also an important source of energy and in a varied diet, helps to regulate appetite. Children under 2 years of age have relatively small appetites in relation to their energy needs, and should not be given low fat diets. Similarly anyone whose appetite is depressed or who finds it difficult to eat bulky foods may need to eat more fat than required by a normal healthy adult.

Food is for pleasure as well as health

A no-fat diet would be very unpalatable. Fats and oils are an essential part of an enjoyable diet. Fats and oils bring important 'mouthfeel' and flavour to many of the foods we eat.

The creaminess and smoothness of many foods is due to their fat content, the lightness of many baked products is based on the ability of fat droplets to trap air, the crunchiness of some foods is due to the ability of fats to be heated to very high temperatures. In addition, oils and fats are important carriers and blenders of many flavours and aromas, which make food appetising and help us to enjoy subtle combinations of flavours.

The cholesterol story

The body manufactures cholesterol and it forms a necessary part of the body's cells. Some cholesterol in the body comes from food. However, the cholesterol from food does not automatically become cholesterol in the blood: Saturated and unsaturated fats in the diet have different effects on the cholesterol which is naturally present and circulating in the blood. We now know that saturated fats push up the LDL or 'bad' forms of cholesterol, increasing the risk of heart disease and other cardiovascular diseases. Unsaturated fats decrease the 'bad' LDL cholesterol, and increase levels of the 'healthy' HDL cholesterol. Polyunsaturated fats have a slightly greater effect than the monounsaturated

Essential fatty acids dietary guidelines



WHO recommends that essential fatty acids make up at least 3% daily calorie consumption. A varied balanced diet which includes some of the following rich sources of essential fatty acids provide all the body's daily requirements.

polyunsaturated vegetable oils and margarines based on canola, soya, corn, safflower, sunflower, sesame, cottonseed, nuts and wholegrains, oily fish, lean meats, some leafy green vegetables, soyabeans and wheat germ.

ted fats.

Those with elevated blood cholesterol levels definitely benefit from a low cholesterol, low saturated fat diet but for those with normal blood cholesterol levels, controlling the amount of saturated fat in the diet seems to be more important than restricting cholesterol consumption.

The health benefits of monounsaturated fats

Monounsaturated fats have a similar effect on blood cholesterol as polyunsaturated fats, but do not produce as many free radicals in the body. Free radicals are damaging to body cells and require antioxidant nutrients to neutralise their effects. Cold-pressed olive oil is rich in both monounsaturated oleic acid and antioxidants and these are thought to be two of the reasons for the health benefits of the traditional 'Mediterranean diet'. In fact, other oils also contain high levels of oleic acid and antioxidants. Plant breeding for example has resulted in the development of high-oleic safflower, sunflower, peanut, canola and soybean oils also.

The trans story

There has been much concern about the effect of trans fatty acids on the body. Trans fatty acids are partially unsaturated fats. Their effect on the body is similar to saturated fats in that they raise total 'bad' LDL cholesterol and lower the 'good' HDL cholesterol. Trans fatty naturally occur in small amounts in some foods such as full fat milk and butter. Trans fatty acids are also found in 'shortening' fats, which have been hardened by a process, called hydrogenation. Hydrogenation is used to turn liquid polyunsaturated oils into solid fats in baked goods such as biscuits and pastries. Good quality margarine's with high levels of polyunsaturated fats contain very low levels of trans fatty acids.

Wise shopping choices can help

The food industry has responded to concerns about rising dietary fat intake in many ways. Non-fat food ingredients such as emulsifiers and thickening agents have been developed to replace fats in some processed foods; improved hydrogenation processes have reduced the production of trans fatty acids; nutritional labelling enables consumers to monitor their own total and saturated fat consumption, and in some countries alternative lipids have been developed and marketed to actively reduce levels of 'bad' cholesterol in the blood.

Consumers can use these innovations to their advantage : Choose low fat options, use information on labels, to check for total fat and proportions of saturated and unsaturated fats, or look at the lists of ingredients which are given in order of weight to check fat content.

Translating scientific knowledge into smart food choices

Dietary guidelines around the region are based on research that aims to define optimal levels of nutrients we should eat in our daily diet. However, for consumers it is clearly not feasible to calculate nutritional values of all the foods bought, prepared and eaten. All foods are made up of a combination of nutrients and therefore all foods can be included in a healthy diet, but attention needs to be paid to the overall balance and variety. For this reason, many countries have now developed food based dietary guidelines, which provide a simple structure around which consumers can plan meals and daily eating patterns. The Low Fat Tips list below brings together advice from many countries in the region designed to ensure dietary fat intake does not exceed 25-30% of total energy intake, and there is a balanced, healthy mix of saturated and unsaturated fats.

Low Fat Tips

- Eat at least five portions of fruit and vegetables per day.
- Use low fat cooking methods such as grilling or baking instead of frying.
- Choose lean meats and trim all visible fat from meat before cooking.
- Choose low fat dairy foods.
- Use a variety of unsaturated cooking oils and spreads sparingly
- Check fat content on food labels.
- Choose high fat foods such as rich pastries, crisps and fried foods only occasionally.
- Choose oily fish such as tuna, herring, mackerel, and sardines twice a week and white fish regularly also.
- Eat a wide variety of foods.
- Include wholegrains, beans and nuts in your diet regularly (nuts are high in calories - so limit consumption).



Overweight ?

The Exercise Prescription



Many countries in Asia have reported a rise in the numbers of obese and overweight adults and children during the last decade.

Traditionally, lowering caloric intake was the solution for reducing obesity.

However, in recent years, growing evidence suggests that lack of exercise is a primary reason for the rise in obesity and overweight.

It seems increasing caloric output, is just as important, as reducing caloric consumption...

Dieting without exercise is unlikely to be successful

The promise of quick weight loss in a short span of time lures many. However, the human body is too concerned about survival to allow us to lose weight quickly. As soon as calorie intake is reduced, the body starts to slow down to conserve energy. Hence, after a few weeks of dieting, a plateau effect is experienced and weight loss slows or even stops in spite of calorie reduction. Reducing calorie intake even further will restart the weight loss temporarily, but with time, will result in another drop in the body's use of its energy resources, and the plateau effect is repeated.

Severe calorie-restricted dieting usually results in the loss of fat free mass (FFM), for example muscle tissue. Body muscle has a

higher resting metabolic rate than body fat. This is another reason for the drop in metabolic rate when dieting. Equally importantly, muscle tissue lost during dieting, will not be regained without exercise. The long term effect of muscle loss from dieting therefore is a reduction in resting metabolic rate. This means a dieter may be able to eat fewer calories

Promoting Physical Activity

Worldwide ...

* The theme for World Health Day 2002 on April 7th is Move for Health. Activities will emphasise the benefits of physical activity and highlight ways in which individuals and communities can influence their own health and well being.

In the region...

In response to the emerging issue of childhood obesity in the region, the International Life Sciences Institute South East Asia (ILSI SEA), initiated a study to determine the impact of changing food habits and physical activity patterns among Asian children. Following on from this, ILSI SEA embarked on a Physical Activity and Nutrition (PAN) program in collaboration with the education and health authorities in Singapore. A series of nutrition and physical activity modules were developed to support children in making responsible choices about nutrition and physical activity. In 2001, the program was extended and made available to all primary schools in Singapore and will also be used as a model for PAN initiatives in Malaysia, Thailand and the Philippines.

without gaining weight after dieting, than they were able to eat before the diet.

No wonder, less than a third of people who lose weight are able to keep it off !

Why exercise help to fight the flab

Exercise boosts the body's metabolic rate and calorie expenditure, hence minimizing the plateau effect. It is not uncommon for a beginner exerciser to expend energy at the rate of 5 to 7 times above resting levels. Exercise keeps the metabolic rate (energy or calories needed to stay alive with minimum activity) raised, and extra calories burning for some time after exercising has stopped. Thus, a jogger continues to expend more calories even after taking a shower and having gone on to other things.

Preservation of FFM tissue whilst dieting is important for maintenance of resting metabolic rate. Exercise helps preserve FFM whilst dieting. In one study, it was found that 24% to 28% of weight loss came from FFM in the non-exercising dieter, whilst only 11% to 13% of weight loss came from FFM in the dieter who engaged in aerobic and resistance exercise.



The Exercise Prescription ...

Thirty minutes or more of physical activity or three 10-minute bouts of aerobic exercise per day, can yield significant health benefits. Recent research also reports that:

- Inactive people can improve their health and well-being by becoming moderately active on a regular basis.
 - Strenuous physical activity is not the only way to achieve health benefits. A good start is to walk instead of using cars and buses, use the stairs instead of lifts and escalators.
- A note of caution - To avoid soreness or injury, individuals contemplating an exercise

regime should start slowly and gradually build up to the desired duration and intensity of exercise, to give the body time to adjust. People with chronic health problems, such as heart disease, diabetes, or obesity, or men over age 40 and women over age 50 should first consult a physician before beginning a new program of physical activity.

What's stopping you ?

Four common barriers to regular exercise are lack of time, embarrassment at taking part in an activity, inability to exercise vigorously and lack of enjoyment of exercise. Of

these, lack of time has consistently been reported as the greatest obstacle to being active.

Getting started might be the most difficult step, but once established the benefits are potentially huge. Long-term successful weight control depends on continuing good eating and exercise habits developed whilst losing weight. It takes time to make new behaviour a life-time habit, but with slow and gradual changes in eating pattern and exercise levels a healthy and attractive body weight is an achievable goal.

There are many other benefits to regular exercise

Research shows that regular physical activity also reduces the risk for several diseases and improves the overall quality of life. In one study, men aged 30 to 83 years were followed for 8 years. Researchers concluded that physical activity is very beneficial to overall health, even if no weight is lost.

Heart Disease - Various studies have shown that heart disease is almost twice as likely to develop in inactive people than in those who are active. In a study involving 40,000 women, slow walking for just an hour a week, cut the risk of heart disease in women in half. Overall, many scientific studies have reported that daily physical activity can help prevent heart disease and stroke by strengthening the heart muscle, raising high-density lipoprotein (HDL- good cholesterol) levels, lowering low-density lipoprotein (LDL - bad cholesterol) levels, reducing the risk for developing blood clots and diabetes, and helping control weight gain. The best exercises to strengthen the heart and lungs are aerobic ones like brisk walking, jogging, cycling and swimming.

Diabetes - By reducing body fat, physical activity can help prevent and control Type 2 or Non-Insulin Dependent Diabetes and the complications associated with it. Besides, working muscles use glucose, thus exercise lowers blood sugar levels naturally. Regular exercise also reduces the need for medication or insulin, by improving insulin sensitivity and glucose tolerance.

High Blood Pressure - Exercise is a non-drug therapy for treating mild-to-moderate high blood pressure. Exercise, especially when combined with weight loss, could reduce blood pressure at rest and in situations that typically increase blood pressure, such as intensive physical activity and emotional distress.

Cancer - The link between physical activity and cancer prevention was confirmed in 1997, by a panel of 16 renowned scientists assembled by the American Institute for Cancer Research in conjunction with the World Cancer Research Fund. There is convincing evidence that physical activity decreases the risk of colon, breast and lung cancer. Conversely, obesity linked to inactivity increases the risk of cancer of the kidney, endometrium, breast, bladder, colon and rectum.

Osteoporosis - Regular weight-bearing physical activity is critical for building bone mass early in life and for preventing bone loss in the later years. Exercise also builds flexibility, strength and coordination - all of which can help older individuals avoid falls, hip fractures and other injuries.

Back Pain - By increasing muscle strength and endurance and improving flexibility and posture, regular exercise helps prevent back pain.

Mental Health - Individuals who exercise regularly are less likely to be depressed, have a higher self-esteem, and have improved body image. Regular exercise also reduces stress, anxiety, anger and fatigue; improves mood and increases feelings of well-being.

The Benefits are for Children too - According to researchers from Southern Cross Institute of Health Research in New South Wales, Australia, physically active children are not only healthier during their childhood, but may reap the benefits as they age. Physical activity, they explain, improves the strength of bones, lowers the risk of developing heart disease, type 2 diabetes, high blood pressure and boosts the immune system.

Biotechnology Food and Safety Assessment—the how, why and what



Modern crop biotechnology uses new techniques to do what farmers and plant breeders have been doing for centuries : making small changes to the genetic makeup of plants to improve growing or eating characteristics.

The new knowledge and techniques that biotechnology has brought to plant breeding have significantly improved the precision and the speed of the breeding process, thereby significantly improving the efficiency with which scientists can develop new crop varieties for Asia.

Genetically modified foods are the most studied food products ever produced, but it is sometimes difficult for consumers to understand the exhaustive checking and testing processes that are applied to biotechnology-derived foods. Improving public knowledge of the safety assessment of biotechnology-derived foods is now thought to be an even greater priority and challenge than further development of the science and technology itself.

What people in Asia think about biotechnology

AFIC's own consumer research found that ordinary people feel poorly informed about this topic area. They would like to know more, but in language and terms that are understandable and acceptable to scientists

and non-scientists alike. Indeed consumers have a right to know that their food is safe and nutritious. However, in order for consumer to feel confident that foods derived from modern biotechnology methods are safe to eat, they need some basic understanding of the safety tests and precautions that are applied the new varieties of crops and produce that are becoming available.

New technologies, new language and knowledge

As personal computers and the worldwide web emerged, a whole new family of words and phrases also emerged, which consumers have quickly adopted and become quite comfortable with. Similarly, modern biotechnology brings with it new language and new knowledge needs. One example of this is

Countries in Asia have a long history of producing foods using biotechnology including soy sauce, tempeh and natto (fermented soybeans), belacan (fermented shrimp paste), cinaluk (fermented shrimps), budu and ngoc nam (fermented fish sauce), tapai (fermented milk), toddy (fermented young flowers of palm) and sake. Foods such as pickles, vinegar, bread, yoghurt and cheese are also the products of biotechnology. **Modern** advances in biotechnology are not a panacea for all the challenges that Asia currently faces in providing its growing population with a varied, safe and high quality food supply. Nevertheless, biotechnology could contribute to this goal, through the development of crops that can give improved yields, require less pesticides, result in less environmental degradation, better nutritional profiles, and better keeping and eating qualities to name but name but a few of the potential benefits

In many Asian countries, the most readily understandable terms for foods derived from modern biotechnology breeding methods are *food biotechnology* or *genetically modified foods*. Abbreviations such as "GM food" or GMOs are perceived as jargon. Such terminology may lead to confusion, miscommunication and even misinterpretation of the topic and related issues.

'substantial equivalence'. This is a term unfamiliar to most non-specialists, but which is fundamental to the principle of safety assessment for genetically modified foods.

The Food and Agriculture Organization (FAO) and the World Health Organization (WHO) of the United Nations advocate the concept of 'substantial equivalence' as the most practical approach to address the safety evaluation of foods or food components derived by modern biotechnology.

What is Substantial equivalence ?

Substantial equivalence is based on the principle that, 'if a new food or food component is found to be substantially equivalent to an existing food or food component, it can be treated in the same manner with respect to safety.' For a foodstuff to be assessed as substantially equivalent to currently available products, the products in question is subjected to multiple tests and checks. These include molecular characterisation of the genetic modification, agronomic characterisation, nutritional assessment, toxicological assessment and safety assessment. For example, typical questions that have to be addressed are:

- Does the genetically modified food have a traditional counterpart that has a history of safe use?
- Has the concentration of any naturally occurring toxins or allergens in the food changed?
- Have the levels of key nutrients changed?
- Do new substances in the genetically modified food have a history of safe use?

- Has the food's digestibility been affected?
- Has the food been produced using accepted, established procedures?

The overall goal of these tests is to determine whether the plant is substantially equivalent (in terms of chemical and nutritional composition and characteristics) to food derived from a conventional source that has a history of safe use.

A substantial equivalence evaluation focuses on the *product* rather than the *process* used to develop the product. If the new product is substantially equivalent to the conventional food or feed, then the product derived through biotechnology is considered to be as safe as the conventional counterpart. If the food produced using biotechnology contains a new trait, which changes the levels of nutrients or anti-nutrients, such as a higher level of a vitamin or a lower level of an allergen, the assessment focuses on demonstrating the safety of the new trait.

Researchers must prepare comprehensive data to support the safety and wholesomeness of new crop varieties developed through biotechnology. This process requires years of laboratory and field testing before a product can be brought to the market.

This article is based on extracts from *Food Biotechnology: a Communications Guide to Enhance Understanding*. The Guide has been produced by the Asian Food Information Centre (AFIC) and the International Service for the Acquisition of Agri-biotech Applications (ISAAA). It is intended to provide anyone who needs to write or talk about biotechnology or who simply wants to understand the science and the issues related to this important topic area, with the necessary information resources.

The kit is designed to provide the most scientifically sound and up-to-date information about biotechnology products and processes, in language that both scientists and non-scientists can understand and agree upon. The guide is available in English and other languages. For more information, or your own copy please contact info@afic.org, or download a copy from www.afic.org.

Some of the tests applied to improved crop varieties, to determine whether the plant is substantially equivalent (in terms of chemical and nutritional composition and characteristics) to food derived from a conventional source that has a history of safe use.

Safety assessment - Molecular characterisation - for new plant varieties produced through modern biotechnology, the source of the gene introduced into the plant is first identified. The transformation system used to insert the gene is defined as well as the number of copies of inserted genes and the integrity and stability of the genetic insert.

Agronomic traits - Usually the starting points for evaluating substantial equivalence. For example, in the case of potatoes, the traits commonly examined are yield, tuber size and distribution, dry matter content and disease resistance.

Nutritional assessment - Involves key nutrients including fats, proteins, carbohydrates and essential vitamins and minerals.

Toxicology assessment - Toxicants and anti-nutrients are compounds known to be naturally present in some crops that could have an impact on health if their levels increased. For example, solanine glycoalkaloids in potatoes or trypsin inhibitors in soybeans). The levels of antinutrients in crops produced through biotechnology are compared to conventionally produced varieties grown under comparable environmental and agronomic conditions.

Allergenicity - Genes from common allergenic foods are not used. Allergic responses to foods are almost always due to protein molecules in the food. Tests include examination of molecular structure, stability of protein in stomach and intestinal fluids and measurement of the amount of any new protein in the food.

NEWS



BITES

Gene responsible for lactose intolerance identified

US and Finnish scientists have discovered the gene that is responsible for lactose intolerance in adults. All babies are born with the ability to synthesise lactase, an enzyme required to digest the natural sugar found in milk. However, this ability is lost in early childhood in more than 90% of Asians who then become lactose intolerant. Lactose intolerant individuals are unable to eat large quantities of dairy products, an important source of calcium. The discovery is the first step in more accurate diagnosis and understanding of the condition.

Polyphenols in wine, tea and chocolate

The recognised health benefits of the anti-oxidant polyphenols is one of the driving principles behind recommendations to eat at least five portions per day of fruit and vegetables. However, a series of studies in 2001 have revealed new evidence for the health benefits for specific polyphenols found in tea (both green and black), red wine and chocolate. Polyphenols are a broad group of compounds found in most plants. However, their bioavailability and potency in modifying metabolic processes such as platelet aggregation, neutralising free radicals and lipoprotein oxidation vary enormously. Improved research methods are revealing more about how these compounds work, and suggest that the impact of polyphenols found in these foods and beverages may have previously been underestimated.

United Nations Development Programme Report on Biotechnology

The Human Development Report 2001 commissioned by the United Nations Development Programme urges developed countries to put aside their fears of genetically modified organisms and help poorer nations unlock the potentials of biotechnology. "Biotechnology offers the best 'tool of choice' for marginal ecological zones, left behind by the green revolution but home to more than half of the world's poorest people." The report states that regulated planting of biotech crops could reduce malnutrition and starvation in developing countries. And that the benefits of GM crops to developing countries are likely to outweigh their risks if their use is properly controlled.

What's Going On ?

Meeting	When	Where	Contact
Fresh Food Conference on Food Safety	March 13-14	Kuala Lumpur	Lawrence Koh Tel +65 346 9659 Fax +65 346 9651 Email singapore@ciesnet.com
Forging Effective Strategies for Prevention and Management of Overweight and Obesity in Asia	April 22-24	Singapore	ILSI SEA, 1 Newton Road/Goldhill Plaza Podium Block/#03-45/ Singapore 308899. Tel +65 63525 220 Fax +656 63525 536
Scientific Conference on Food Antioxidants : Nutrition, Health and Consumer Perspective	April 23-24	Equatorial Hotel,Bangsi, Selangor Darul Ehsan	Department of Nutrition and Health Sciences, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia 43400 Serdang, Selangor Fax: + 603-89455075 Email: amin@medic.upm.edu.my
5 th International Diabetes Federation Western Pacific Region	May 4-7	Beijing International ISF WPR 2002, Convention Services	Chinese Medical Association, 42 Dongji Xidajie, Beijing 100710, China, Tel +86 106527 8803 Fax +86 106512 3754 Email idfwpr@chinamed.com.cn www.chinamed.com.cn/idfwpr
3rd Asian Dietetics Congress	August 18-21	Kuala Lumpur	Department of Nutrition and Dietetics, Faculty of Health and Allied Sciences, Universiti Keebangsen, Malaysia Tel +603 2719 2015 Fax +603 2719 2016

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- What You Should Know About Food Biotechnology
- What You Should Know About Diabetes
- What You Should Know About Caffeine
- What you Should know About Foodborne illness
- Kid's Bites : A Healthy Lifestyle Guide
- Children's Activity Pyramid Poster
- AFIC Review Paper on Food Biotechnology

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EDITOR GEORGINA CAIRNS, DESIGN AND PRINTING - PAN PHO CO., LTD.
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