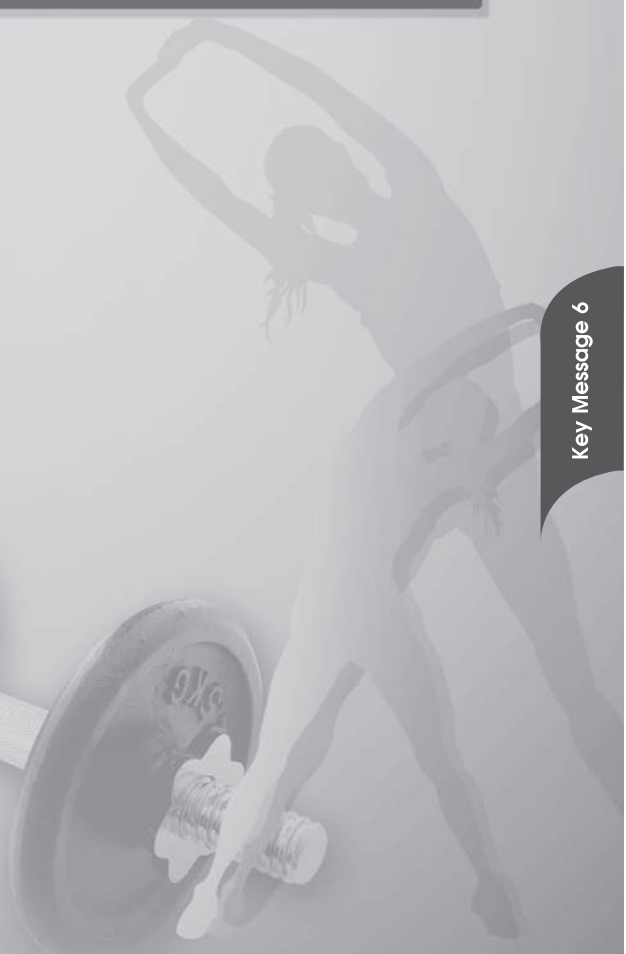


Key Message 6



Consume moderate amounts of fish, meat, poultry, egg, legumes and nuts



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1. Terminology

Egg

Egg usually refers to chicken egg but can also include eggs from other birds, for instance duck and quail.

Fish

Fish is any aquatic vertebrate animal that is covered with scales, and equipped with two sets of paired fins and several unpaired fins. The term includes all marine and fresh water fishes. It does not include shellfish.

Legumes

Legumes belong to the family of plants known as *Fabaceae* (or *Leguminosae*). These include peas, lentils and beans. Legumes that grow in a pod include the whole range of beans, peas and lentils such as baked beans, kidney beans, soya beans, pinto beans, red, green, yellow and brown lentils, black-eyed peas or garden peas.

Meat

Meat includes all or part of the carcass muscle component of any cattle, sheep, goat, buffalo, deer, pig or rabbit. It includes organs and glands such as liver, kidney, brain and heart.

Nuts and seeds

Nut is a general term for the large, dry, oily seeds or fruit of some plants. While a wide

variety of dried seeds and fruits are called nuts, only a certain number of them are considered by biologists to be true nuts. All nuts are seeds, but not all seeds are nuts. Nuts are both the seed and the fruit and cannot be separated. Seeds come from fruit and can be removed from the fruit, like almonds, cashews, walnuts and pistachios, which were once inside fruit.

Poultry

Poultry refers to chicken, duck, goose, turkey, quail and other avian foods except eggs.

Shellfish

Shellfish are exoskeleton bearing aquatic invertebrates and species commonly used as food include molluscs (such as clams, mussels, oysters and scallops) and crustaceans (for instance shrimp, prawn, lobster and crab).

2. Introduction

Fish, meat, poultry, egg, legumes and nuts and seeds are important sources of protein. Protein in meat, fish, poultry and egg contain all the essential amino acids for building body proteins and are often referred to as high quality protein. Legumes, nuts and seeds are also valuable sources of protein. In addition to protein, many items in these food groups provide vitamins and minerals

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such as iron, zinc, magnesium and B vitamins (thiamine, riboflavin, niacin, vitamin B₆ and B₁₂).

Legumes also count as a starchy food that can serve as excellent sources of dietary fibre (FNRI/DOST, 2000; Venter & van Eyssen, 2001; Scholtz *et al.*, 2001; NHMRC, 2003; Health Canada, 2007).

2.1 Fish

Fish contain amounts of protein equivalent to those in meat and poultry. The amount of iron and zinc in fish are lower than those in meat, but they are of high bioavailability. In contrast, the vitamin B₁₂ level of fish is similar to that of meat or even higher, depending on the species. Fish are also a valuable source of iodine which may be lacking among communities living in inland areas. The fat content of fish is variable, ranging from 1% to 10% or more by weight for oily fish. The cholesterol content of fish is marginally lower than that in meat and poultry. Some fish (such as salmon, trout and herring) are high in a type of polyunsaturated fatty acids (PUFA) called “omega-3 fatty acids” or *n*-3 fatty acids. These fatty acids have been shown to provide specific health benefits, notably in relation to cardiovascular health (FNRI/DOST, 2000; NHMRC, 2003; WHO, 2003; Lichtenstein *et al.*, 2006).

Small fish consumed with edible bones such as *ikan bilis* are good sources of calcium. These can help to contribute to dietary calcium intake, especially for individuals who do not consume milk. Other sources of calcium include soya bean curd and green leafy vegetables (FNRI/DOST, 2000; WHO, 2003).

2.2 Shellfish

Shellfish such as clams, crabs,

lobsters, mussels, oysters, scallops and shrimps are all generally low in fat and provide essential nutrients. Shellfish have a nutrient profile similar to that of eggs, although the cholesterol content is variable, with prawns and squid having relatively high levels, mussels, crabs and lobster being intermediate and scallops having low levels. In prawns, removing the head removes most of the cholesterol in it (NHMRC, 2003).

2.3 Meat and poultry

Meats and poultry are a valuable source of dietary protein, containing about 20 grams per 100 grams. They are also valuable sources of highly bioavailable iron. The amount of iron in beef and lamb (sometimes known as red meat) is much higher than that found in pork and poultry. They also provide substantial amount of zinc and vitamin B₁₂. The lean varieties of meat provide from two to five gram per 100 gram of fat, with almost equal contributions from saturated and monounsaturated fats and a small amount of polyunsaturated fat. Chicken with skin removed has a similar amount of fat as that for lean beef or pork. It also has a higher proportion of both monounsaturates and polyunsaturates compared with the other meats (NHMRC, 2003).

Meat and poultry does not include offal such as liver and kidneys, heart, gizzard and visceral organs. Some of these are also good sources of some nutrients such as protein, bioavailable iron and zinc, and vitamin B₁₂. Also known as organ meat, they are not encouraged to be consumed regularly as they are somewhat high in cholesterol (NHMRC, 2003).

2.4 Eggs

Eggs have slightly lower protein

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content than meat. Quality of egg protein is however excellent. They are good sources of vitamin B₁₂ and provide substantial amount of iron and zinc, although the iron is not as bioavailable. Egg yolk also contains substantial amount of cholesterol but unlike dairy products and meat, does not provide saturated fatty acids. Hence, because of the high nutritional value of eggs, as well as since exogenous sources of cholesterol are minor determinants of blood cholesterol level, eggs should be recommended for consumption by all healthy individuals. For healthy adults, egg can be part of their daily intake. Especially if intake of dairy fat and meat are controlled, there is no need to severely restrict egg yolk intake, although some limitation remains prudent. Thus, for adults with hypercholesterolaemia, a healthy diet would be to limit to three eggs per week. Eggs can become an important source of protein for children. They are also relatively less expensive compared to other animal-derived foods (Scholtz *et al.*, 2001; NHMRC, 2003; WHO, 2003).

2.5 Legumes

Legumes are generally good sources of protein and also count as a starchy food that can serve as excellent sources of dietary fibre. Consumption of legumes, nuts and seeds is encouraged for everyone. Mixing two plant proteins are encouraged such as legumes and grains or legumes and nuts or seeds so as to produce a complete protein from two incomplete ones. Their inclusion in the diet is also recommended to minimise the amount of saturated fat found in meat and poultry (Venter & van Eyssen, 2001; Lichtenstein *et al.*, 2006).

Legumes also provide other nutrients such as iron and zinc. However, the iron and zinc from plant sources are less bioavailable

than from animal sources. To help the absorption of these nutrients, legumes can be taken together with other food such as dark green vegetables or a fruit or drink rich in vitamin C. Legumes are also very good sources of the B-complex group of vitamins, with the exception of vitamin B₂ (riboflavin) (NHMRC, 2003).

Legumes (as well as nuts and certain seeds along with other plant foods), are also known to contain a wide variety of phytochemicals. A great deal of research data have been accumulated on the potential health benefits of many of these phytochemicals, some of which acting as antioxidants (Venter & van Eyssen, 2001; NHMRC, 2003).

In view of their high nutrient content, consuming dry beans and peas are recommended for everyone, including people who also eat meat, poultry and fish regularly. Vegetarians should consume more dry beans and peas as alternatives to meat (FNRI/DOST, 2000; NHMRC, 2003).

2.5.1 Traditional soya bean products

Soya bean is one of the most widely consumed legumes. The bean has been used to prepare a wide variety of traditional Asian foods. Soya bean foods are high in protein, fibre, unsaturated fat and rich in vitamins and minerals. Studies have also indicated that soya bean contains isoflavones, phytochemicals that have been studied for their possible role in relieving menopausal symptoms, maintaining healthy bones and preventing certain cancers (Venter & van Eyssen, 2001; NHMRC, 2003).

Tauhu (soya bean curd) is a bland, cheese-like cake formed from soya milk by

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adding a coagulant (typically calcium sulphate) to the milk to form curds that are shaped and pressed into cakes. Depending on the coagulant used, *tauhu* is rich in minerals and is an excellent source of high-quality protein, polyunsaturated fats (including linoleic and linolenic acids) and B vitamins. Versatile and nutritious, *tauhu* can be used in soups, salads, pastries, sandwiches and spreads. It can also be used as an alternative to yoghurt or soft cheese. Other soya bean curd products that are commonly consumed are *taukua* and *ficuk*.

Tempe is made of whole, cooked soya bean infused with a culture usually spores of *Rhizopus oligosporus* to form a dense, chewy cake. It is a good source of fibre, protein, polyunsaturated fats and lecithin, as well as useful amounts of calcium, iron, magnesium, potassium and some B vitamins.

Soya bean sprouts are rich in vitamins A, B and C and are eaten raw in salads or cooked.

Miso is a thick, high-protein paste made from soya bean, salt and a fermenting agent (usually an *Aspergillus oryzae* mould culture), that is similar in taste and colour to soya sauce. Sometimes a grain, such as rice and barley, is fermented with the soya bean for additional flavour.

2.5.2 Nuts and seeds

Nuts and seeds are a tasty source of protein and other nutrients. Nuts are also high in fibre and rich in a wide range of vitamins and minerals. They can be a good alternatives to snacks high in saturated fat and a good source of monounsaturated fat, which can help reduce the amount of cholesterol in the blood. They also contain other unsaturated fats called essential fatty acids, which the body needs for good health. However, nuts are also high in

fat. Hence, they should not be consumed too much. Intake of salted nuts should also be reduced as they are high in sodium (WHO, 2003; Health Canada, 2007).

There are many different types of seeds such as sunflower, pumpkin, sesame, poppy or flax seeds.

Seeds contain protein, fibre and vitamins and minerals. They also add extra texture and flavour to various dishes and can be used to coat breads. They make a healthy snack and can be added to salads, casseroles and breakfast cereals.

Seeds can be eaten raw, or dry fried or roasted in a frying pan or in a roasting tin without any oil.

The consumption of these plant-based alternatives to meat, fish and poultry is encouraged for everyone. They are particularly valuable in a vegetarian diet as an alternative source of protein and other important nutrients. For vegetarians, these foods, together with cereal foods, can provide most (but not all) of the nutrients provided by meats, fish and poultry.

2.6 Vegetarians

Vegetarians are people who do not consume meat. Some people choose to become vegetarians as a lifestyle choice or for religious reasons. There may also be social reasons to be a vegetarian. There are three types of vegetarianism (ADA, 2009):

- **Lacto-ovo vegetarians**
people who avoid meat, but include dairy foods (such as milk and eggs) and plant foods.

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- *Lacto-vegetarians*
people who avoid meat and eggs, but include dairy foods and plant foods.

- *Vegans*
people who consume only plant foods.

Vegetarian diets can meet all the recommendations for nutrient needs of an individual. The key is to consume a variety of foods and the right amount of foods to meet the nutrient needs. Vegetarians should give particular emphasis to consuming legumes, nuts and seeds. A vegetarian diet may have health benefits, but can result in some vitamin and mineral deficiencies if it is not carefully planned. Nutrients that vegetarians need to focus on include protein, iron, calcium, zinc and vitamin B₁₂ (FNRI/DOST, 2000; NHMRC, 2003; Scholtz *et al.*, 2001; USDHHS & USDA, 2005; Health Canada, 2007; ADA, 2009):

- Protein needs can easily be met by eating a variety of plant-based foods. Combining different protein sources in the same meal is not necessary. Sources of protein for vegetarians include beans, nuts, nut butters, peas and soya products (*tauhu, taukua, fucuk, tempe*). Milk products and eggs are also good protein sources for lacto-ovo vegetarians.
- Vegetarian diets are generally high in non-heme iron from plant foods; however, this iron is not absorbed as well as the iron in meat. Good food sources include green leafy vegetables, peas and wholegrains, enriched cereals and legumes. Combining these foods with foods high in vitamin C will help the body to absorb the iron.
- Sources of calcium for vegetarians

include fortified breakfast cereals, soya products (*tauhu, taukua, fucuk*, soya-based beverages), calcium-fortified juices and some dark green leafy vegetables (spinach, *sawi, kailan, kau-kei* and watercress). Milk products are excellent calcium sources for lacto-vegetarians.

- Sources of zinc for vegetarians include many types of beans (white beans, kidney beans and chickpeas), zinc-fortified breakfast cereals, wheat germ and pumpkin seeds. Milk products are a zinc source for lacto-vegetarians. Vitamin B₁₂ is found in animal products and some fortified foods. Sources of vitamin B₁₂ for vegetarians include milk products, eggs and foods that have been fortified with vitamin B₁₂. These include breakfast cereals, soya based beverages and nutritional yeast.

3. Scientific basis

Foods in the fish, meat and poultry group as well as legumes and nuts provide nutrients that are vital for health and maintenance of the body (FNRI/DOST, 2000; Venter & van Eyssen, 2001; Scholtz *et al.*, 2001; NHMRC, 2003; WHO, 2003; Health Canada, 2007). These nutrients include protein, B vitamins, iron, zinc and magnesium.

- Protein has many important functions in the body and is essential for growth and maintenance. They function as building blocks for bones, muscles, cartilage, skin, and blood. They are also building blocks for enzymes, hormones and vitamins. Proteins are one of three nutrients that provide calories. The others are fat and carbohydrates.
- B vitamins found in this food group serve a variety of functions in the body. They

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help the body release energy, play a vital role in the function of the nervous system, aid in the formation of red blood cells and help build tissues.

- Iron functions primarily as a carrier of oxygen in the blood. Adolescent girls and women in child-bearing age are susceptible to iron-deficiency anaemia. They should eat foods high in heme-iron (such as meats) or eat other non-heme iron containing foods along with food rich in vitamin C, which can improve absorption of non-heme iron.
- Zinc is necessary for many biochemical reactions and also helps in the proper functioning of the immune system.
- Magnesium is used in building bones and in releasing energy from muscles.

In view of their nutritional value, it is important to recommend the inclusion of these foods in the daily dietary intake of Malaysians. Insufficient or excessive intake of these foods should, however, be avoided as both situations have important health implications (FNRI/DOST, 2000; Venter & van Eyssen, 2001; Scholtz *et al.*, 2003; NHMRC, 2003; Health Canada, 2007).

3.1 Deficiencies and excessive intakes

Deficiencies

Protein deficiency

Protein deficiency usually accompanies a deficiency of calories and other nutrients. The effects of protein loss during illness and injury are far reaching. The most evident result is the wasting of muscle tissue and consequent loss of weight. A lowering of serum protein levels and hormonal changes may

result in oedema and the reduced production of antibodies makes the affected person susceptible to infection.

Anaemia

Anaemia is a condition in which the blood cannot carry enough oxygen. This may be because there are less red blood cells than normal, or because there is not enough haemoglobin in each cell. Iron is the main component of haemoglobin. Lack of dietary iron is the world's leading nutritional deficiency and the most common cause of anaemia. Other vitamins that are needed for the body to make red blood cells include folate (folic acid) and vitamin B₁₂. A lack of these nutrients in the diet can cause anaemia.

Excessive intake

High blood cholesterol

Some food choices in this group are high in saturated fat. These include fatty cuts of beef, pork and lamb; regular (75% to 85% lean) ground beef; regular sausages, hotdogs and bacon; some processed meats such as regular bologna and salami; and some poultry such as duck. Some foods from this group such as egg yolk (egg white is cholesterol-free) and organ meats such as liver and kidney are high in cholesterol.

Diets that are high in saturated fats raise “bad” or low-density lipoprotein (LDL) cholesterol levels in the blood. High LDL cholesterol, in turn, increases the risk for coronary heart disease. Consumption of these foods should be limited to help keep blood cholesterol levels within the normal range.

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4. Current status

In the Malaysian Adult Nutrition Survey (MANS) 2003, a semi-quantitative food frequency questionnaire which consisted of 126 food items was used to evaluate the habitual intake during the previous one year period (Norimah *et al.*, 2008). Marine fish ranked second highest among the 10 most commonly consumed food daily by Malaysian adults. It was reported to be consumed daily by 41% of the adult population and the mean frequency was 1.61 per day. The total amount consumed daily was reported to be 1½ medium sized fish. Chicken egg ranked nine in the list of 10 most frequently consumed foods. Only 12% reported consuming egg daily and the mean frequency was 1.15 per day, while the amount consumed daily was one whole medium egg.

Ikan bilis or anchovies ranked 10 in the list, with 12% of the population consuming it daily. The mean frequency of consumption was 1.24 and the amount consumed daily was two tablespoons.

Chicken egg and poultry ranked second and third in a list of top 10 weekly consumed foods. A high prevalence of 72% and 69% of the population reported consuming chicken egg and poultry weekly respectively. The mean frequency of consumption per week was reported to be about 2.4. The amount consumed was three whole medium eggs and three pieces of chicken meat per week.

It would appear from this survey that the consumption of marine fish, chicken meat and egg were rather satisfactory. Legumes, nuts and seeds, however, were consumed much less frequently as they did not feature at all among the top 10 daily or weekly consumed foods.

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5. Key recommendations

Key recommendation 1

Choose fish more frequently, if possible daily.

How to achieve

1. Consume a serving of fish daily, choosing a variety of fish.
2. Fresh water fish can be consumed, alternating with marine fish.
3. Shellfish should be consumed less frequently compared with fish.

Key recommendation 2

Consume meat, poultry and egg moderately.

How to achieve

1. Consume meat or poultry dishes daily.
2. Choose a variety of meat and methods of cooking these dishes.
3. Consume eggs in moderate amounts, up to an average of one a day (whole or in dishes).



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Key recommendation 3

Practise healthier cooking methods for fish, meat, poultry and egg dishes.

How to achieve

1. Limit deep frying methods in preparing fish, meat, poultry and egg dishes as deep frying adds fat and calorie to these dishes.
2. Use lower fat cooking methods such as steaming, stewing, boiling, poaching, microwaving, grilling and roasting as well as allowing the fat to drip off.
3. Limit breading and battering of these dishes as this adds fat and calories. It will also cause the food to soak up more fat or oil during frying.
4. Use herbs, spices, lime or lemon to season and flavour fish, meat and poultry dishes instead of salt or rich sauces.
5. Tenderise lean cuts by using marinade or a slow cooking method such as stewing or braising.

Key recommendation 4

Choose meat and poultry that are low in fat and cholesterol.

How to achieve

1. Minimise the intake of saturated fat by choosing lean cuts of meat and poultry.
2. Select lean cuts of meat (round or loin). Trim, as much as possible, the visible fat before cooking.
3. Choose skinless chicken parts or remove the skin before cooking. Skinless chicken breasts are the leanest.
4. Limit the intake of organ meats.
5. If processed foods are consumed, use the ingredients listing and Nutrition Information Panel to choose lower fat and salt (sodium) varieties. Processed meat or poultry such as luncheon meats, processed meats and sausages are generally higher in fat and sodium.

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Key recommendation 5

Consume legumes daily.

How to achieve

1. Choose a variety of legumes and dhal and their products such as *tempe* and *tauhu* to prepare meals.
2. Add legumes (peas, beans or lentils) to soups and dishes.

Key recommendation 6

Include nuts and seeds in weekly diet.

How to achieve

1. Choose nuts as snacks or in main dishes, such as in stir-fry vegetables. Use nuts and seeds to replace meat or poultry, not in addition to these item.

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