Diet Specialist

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Online nutrition training course

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Welcome to the Diet Specialist online nutrition training course. This is a detailed and comprehensive course that will enable you to become a successful nutrition adviser by covering a wide range of topics on nutrition.

We would like to wish you all the best for the future.

Muna Alrawi
Diet Specialist, BSc, MSc, RD, Director

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An introduction to nutrition

Why is healthy eating important?
The type and amount of food we eat has a major impact on our health and can influence our risk of developing various diseases including diabetes, heart disease, stroke, osteoporosis and some types of cancer. Healthy eating should be incorporated into all individuals' daily routine no matter what age, disease state or weight .

The overall population is consuming too much saturated fat, added sugars and salt and not enough fruit, vegetables, oily fish and fibre. The National Diet and Nutrition Survey data for 2008 to 2012 shows children aged 4 to 10 and 11 to 18 years were consuming 3.7% and 4.6% more added sugars than the recommended amount retrospectively. The intake of saturated fat intake in all age groups exceeded the recommended level of more than 11% with adults aged 19 to 64 years reaching 12.6% for average saturated fat intake. The average salt intake for older adults aged 65 years was 7.2g per day which is 1.2g over the recommended daily limit. With regards to fruit and vegetables we are advised to have at least 5 portions a day and adults aged 19 to 64 years consumed on average 4.1 portions per day with 30% of adults and 41% of older adults meeting the recommended daily amount.

The average consumption of oily fish was significantly below the recommended one portion per week in all age groups. There was low vitamin D levels in 23% of adults and 22% of children aged 11-18 years and significantly increased to 40% for both in winter months due to less sunlight. Finally 46% girls and 23% of women had low iron consumption. This data shows the UK is lacking a varied and balanced diet across all age groups and raises the importance for dietary change to prevent dietary related diseases. Current statistics show in 2014 39% of adults in the world are overweight and more specifically 33% of children currently in England are overweight indicating early intervention is essential to prevent these statistics rising in years to come when these overweight children reach adulthood.

The Eatwell Plate – balanced and varied diet
To achieve a balanced and varied diet the broad aim is to follow the eatwell plate which highlights the different types of food which should make up our diet and the recommended proportions we should aim for.

The Eatwell Plate (NHS Choices, 2013).
Throughout this course we will focus on different aspects of each food group depending on the topic, for example when we discuss weight management the proportions of the plate will change by encouraging a higher intake of vegetables and lower intake of foods high in fat and/or sugar.

Is the Eatwell Plate suitable for everyone to follow?
This idea applies to a wide range of people whether they are a healthy weight or overweight, meat eaters or vegetarians, and any ethnic origin. The only age it doesn't apply to would be children under two due to their frequently changing nutritional requirements. Those who have particular dietary or medical requirements should seek advice from a registered dietitian (NHS Choices, 2012).

Getting the balance right (NHS Choices, 2012)
There are 5 main food groups to eat from to ensure a balanced and variety of nutrients and fibre in the in the diet:

1. Starchy foods which includes bread, pasta, rice and potatoes

2. Fruit and vegetables
3. Milk and other dairy foods
4. Meat, fish, eggs, beans and other non-dairy sources of protein
5. Foods high in fat or sugar

The eatwell plate does not detail frequency of servings and recommended portion sizes apart from fruit and vegetables and fish which should be at least five portions a day and two portions a week retrospectively. This is because it is a tool suitable for most adults and therefore it would be misleading to exact frequencies or proportions of each group when some individuals may have specific requirements. If there is need for specific dietary advice then it would be suggested to attend a one to one dietetic led consultation.

This is the broad aim of the course and as a nutrition adviser, you will be equipped to be able to help people achieve this goal.

Understanding the different types of nutrition adviser
Before embarking on this course of study, it is helpful to understand the different types of professionals who work within the field of nutrition and in particular those who may advise others on dietary issues on a one-to-one basis. The broad categories of nutrition advisers include:

1. Dietitians
2. Nutritionists
3. Nutrition advisers

Dietitians
Dietitians are the experts in diet and nutrition as they can give advice on all aspects of eating and diet including dietary related illnesses. The title 'dietitian' is the only title from the above that is protected by law and to be a dietitian you have to have met certain educational and clinical experience requirements to be able to register with the HCPC. Dietitians can work completely unsupervised and the professional association for dietitians is the British Dietetic Association.

Nutritionists
The term nutritionist is not protected by law and can include those individuals who have completed various nutrition courses including those completed via e-learning. However to be a Registered Nutritionist with the Association for Nutrition, the individual must in most instances complete a university degree in nutrition and then complete a set number of years' worth of relevant work experience. Registered Nutritionists can give advice on most matters related to nutrition but cannot give advice on special diets for medical conditions.

Nutritional advisers
This is a broad category that could include personal trainers, weight loss consultants and any other individual who advises on nutrition. There is no formal body that oversees nutrition advisers and hence it is advisable that such individuals should work as part of a multi-disciplinary team that includes registered dietitians and nutritionists. To become a nutrition adviser there is no set path, however it is advisable that individuals do so by completing a course endorsed or certified by the British Dietetic Association or the Association for nutrition, to ensure that they are learning science based nutrition advice.

What can you do by completing this course?
The main goal from this course is to help you make healthy choices for yourself and your family. If you would like to advise more widely on nutrition, we would advise that you join a multi-disciplinary team. More specifically the following advice is provided upon completion of each section:

Food and Nutrients
Upon completion of this section you will have a strong understanding of all the food groups and you will be able to advise individuals with no underlying health conditions on how to make healthier choices with the assistance of a registered nutritionist or dietitian. However if an individual has a medical condition, ensure that you direct them to their GP for advice so that you do not recommend a nutrient that could damage their health due to their condition.

Healthy Eating and Obesity
Here you will gain a strong understanding of the different diets and how to effectively reduce obesity. You will understand the fundamental role of food in an individual's, what situations a diet needs to be adjusted to meet particular needs and how people can make correct decisions about food when they purchasing it. Similar to the first section, with the assistance of a registered nutritionist or dietitian, this will form the basis of excellent advice for those looking to lose weight and do not have an underlying medical problem.

Influencing Behavioral Change
Here you will learn a range of tips that will help you to overcome the physiological barriers that prevent people from making changing, with the assistance of a registered nutritionist or dietitian. However if the individual has a history of physiological problems or a traumatic history, it is important that you direct them to their GP for more specialist advice.

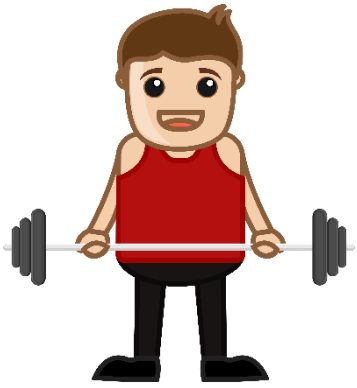
Dietetics and Disease
This will give you an excellent understanding of the main diseases that are affected by diet and it will help you prevent developing any of these diseases. However, you should not seek to treat these conditions as they are medical conditions and this should only be done by a registered dietitian and a doctor who specialise in the condition.

Contents

Aims of section:

1) To understand the key functions of proteins including their enzymatic function, transport, hormonal and other functions.
2) Understanding how proteins are structured.
3) Examine the types of amino acids including essential, semi-essential, non-essential and conditionally essential amino acids.
4) Understanding the difference between HBV and LBV.
5) To understand the daily requirements for protein.
6) To understand what the consequences are of the deficiency of protein.
7) Understanding protein supplementation and its consequences.
8) Practical tips on how to increase protein intake.

According to Thomas and Bishop (2007), there are several functions of protein as discussed below. This section will further discuss the structure of protein and type of amino acids.



Function

Proteins are vital for both the structure and metabolic operations of the human body. Tens of thousands of different proteins can be found within the body, each having a different and essential role.

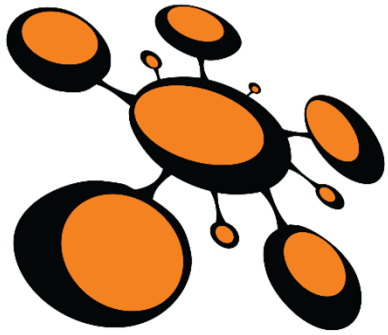
Protein is a major component of body tissues and about half of the body's protein is present in structural tissues such as muscle and skin. Protein is thus essential for growth because there is a continuous turnover of body tissues and body structure maintenance throughout life. In addition to their structural role, proteins have a number of diverse functions including:

- **Enzymatic function:** enzymes are catalysts that bring about specific biochemical reactions. All enzymes are considered to be proteins and these are essential for different chemical processes which the body depends upon. For example, digestive enzymes break down food into its constituent nutrients in the human body and metabolic processes are regulated by cellular enzymes.
- **Transportation function:** haemoglobin, is a protein which carries oxygen around the body and thus transportation is another role that proteins play both within the blood and body fluids. Proteins play this role both across cells and to help regulate the movement of nutrients and metabolites (small molecules that are the product of metabolism). This is performed between compartments within the cells and external to the cells.

- **Hormonal function:** Hormones such as insulin and thyroxin are proteins. Insulin is a hormone that is made in the pancreas and helps to control the levels of glucose (sugar) in your blood. Thyroxin is responsible for the regulation of metabolism.
- **Immune function:** antibodies, which are an essential part of the body's immune system are types of protein. They are synthesised (ie made) by lymphocytes which are part of the lymphatic system and help drain the lymph (a colourless fluid containing white blood cells) from the tissues into the blood.

- **Buffering function:** the body has to function within a very narrow pH range and this is maintained by proteins. Albumin in the blood is specifically responsible for the maintenance of the acid-base which it achieves through releasing hydrogen ions when required.

Structure
Proteins consist of amino acids. About 21 amino acids are found in nature and just as the 26 letters of the alphabet can be arranged into almost infinite number of words, so can these amino acids create a vast array of different proteins. Each protein is unique, with its own specific number and sequence of amino acids.



The proteins that we eat, known as dietary proteins are broken down by digestive enzymes into their build-blocks, that is their amino acids. The body has a pool of amino acids where these will join to be used to make proteins and others may be converted to further amino acids, which is also known as transamination. Surplus amino acids will be removed from the amino group through a process referred to as deamination. These amino acids are converted to urea and excreted by the kidneys, and the remainder are converted to glucose or used as a source of energy.

Types of amino acids
Amino acids can either be made by the body or need to be included in the diet. Types of amino acids include:

Essential amino acids
These are referred to as essential because they cannot be made at all or not at a fast enough rate, as required by the body. They are also referred to as indispensable amino acids. There are nine essential amino acids.

Semi-essential amino acids
These are made from other amino acids as long as the other amino acids are present in sufficient quantities. These other amino acids are referred to as precursor amino acids.

Non-essential amino acids
These are referred to as non-essential because they can be easily made from other carbon and nitrogen containing compounds. They are also referred to as dispensable.

Conditionally essential amino acids
There are some amino acids that are required in higher quantities during an illness or following a trauma. These are referred to as conditionally essential because they only become essential in these unusual circumstances.

Protein quality
The biological value of dietary protein is determined by its content of essential amino acids as discussed above. Proteins which contain all of the essential amino acids in amounts sufficient to meet protein synthesis are termed high biological value (HBV). In general, proteins derived from animal foods such as meat, fish, poultry, eggs and milk are of high biological value.

Foods which lack one or more essential amino acids are termed low biological value (LBV) protein or 'incomplete' protein, which are those which come from plant sources. Since different types of plant protein have different limiting amino acids, a combination of plant

proteins creates HBV protein mixtures. For example, the limiting amino acid in wheat is lysine, while that in pulses is methionine but a diet containing both wheat-based foods and pulses will provide sufficient quantities of both lysine and methionine to meet requirements for protein synthesis.

Protein requirements

In the body, protein is constantly broken down and resynthesized, resulting in a continuous requirement for new sources of protein. The process of growth during childhood or pregnancy additionally increases the requirement for protein so that new tissues can be created.

Based on nitrogen balance studies, the UK dietary references values (DRVs) assume that healthy adults consuming a mixed diet require 0.75 grams (g) protein/kg ideal body weight per day British Nutrition Foundation (2015). An adult weighing 60 kilograms (kg) is therefore assumed to require 60 x 0.75 = 45g protein/day. Further increments are set for the additional demands of pregnancy and lactation, which is the process of milk being secreted by the glands. In the UK, protein intakes are usually well in excess of requirements with typical mean daily intakes being 88.0 g in adult men and 64.0 g in women.

Changing protein requirements

Where protein levels are not at their optimum level, specialist advice should be sought. However the following scenarios will give you some insight into what may be examined.

Protein deficiency

Protein deficiency is defined as inadequate intake of protein, most likely to occur as a result of:

- If the energy requirements of the body are not being met, the body may resort to the usage of dietary and/or tissue protein as an energy source.
- When the breakdown of protein exceeds the body's ability to replace it, such as during trauma such as burns, surgery or injury, this results in a period of negative nitrogen balance. A protein deficiency may occur due to the body's response as the proteins are broken down during this period.
- If the body is suffering from gastrointestinal disorders or liver disease, this may also result in protein deficiency.
- If an individual has renal (kidney) disease, excessive protein losses may occur.

Long-term deficiency of protein can result in:

- Stunted growth in children.
- Decrease in the mass of the muscle known as muscle wasting, including that of the heart.
- Increased susceptibility to infection.
- Wounds will heal much less effectively.
- Anaemia, a condition in where there is a deficiency of red blood cells or of haemoglobin in the blood.
- Oedema, a condition in which liquid collects in the body tissues between the cells.

Protein Surplus

Over-consumption of protein offers no benefits to the body because surplus protein cannot be stored by the body. In fact it may result in some health risks by causing renal function and possibly demineralisation, which is a process that reduces the content of mineral substances in the body's tissue. It is therefore recommended that adults should avoid protein intake of more than twice the RNI (Reference Nutrient Intakes), i.e. 1.5 g protein/kg per day, however doing so will not necessarily cause harm due to the reasons mentioned above.

Although athletes may require a protein intake approaching or even exceeding this limit in order to develop and maintain their high muscle mass, this does not necessitate a diet disproportionally high in protein-rich foods. Because the athlete's energy requirements are also extremely high, protein needs can usually be met by consuming sufficient quantities of a diet containing 12-15% protein energy. Athletes energy requirements are high (more than twice the BMR), hence the current intake of the UK average of 16% protein energy diet will provide >1.8g/kg/day protein intake for a 70kg male. Athletes require trivial amounts of protein above average levels to develop and maintain their high muscle mass.

Protein supplements
The use of amino acid supplements is not recommended as little is known about their effects, and their safety remains to be evaluated.

Tips on how to increase protein intake in diet
In the module on Different Diets we will discuss 'high protein diets' in detail, covering both their advantages and disadvantages. For those looking to increase their protein intake, the following tips should be considered:

Milk and milk products:
- Add skimmed milk powder into milkshakes, soups, sauces, gravies, casseroles, and meatloaf.
- 1 cup protein fortified milk = 210 calories, 21 g protein

Cheese:
- Cook low fat cheese based casseroles, or sprinkle low fat cheese on top.
- Use low fat cheese or cream sauces over meats or sprinkle grated low fat cheese on vegetables, baked potatoes, and salads.
- Prepare low fat cheese spreads or dips for crackers or raw vegetables.
- Make grilled low fat mature cheese or low fat cheese sandwiches.
- 1 cup cottage cheese contains 28 grams of protein and is low in fat allowing larger for volumes at mealtimes.

Yogurt:
- Eat light plain or fruit flavoured yogurt.
- Make desserts, dips and milkshakes with light yogurt.

Meat alternatives:
- Include more tofu, Quorn and falafel as alternatives to meat.

Nuts:
- Snack on nuts, sunflower or sesame seeds and granola.
- Add nuts to cereals, breads, and cookies.
- Spread low fat peanut butter on bread, crackers, celery, apples or bananas.

Lean meats, chicken and eggs:
- Add lean meats, chicken, turkey and tuna where possible even to salads
- Use eggs as a main dish. Try hard or soft boiled, scrambled, poached or made into an omelette.
- Make egg based casseroles, quiche or egg salad sandwiches.
- Add hard-boiled eggs to potato or macaroni salads.

Aims of the section:

1) Understanding the function and structure of carbohydrates.
2) Examining the difference between simple and complex carbohydrates.
3) Understanding the effect of carbohydrates on blood sugar levels.
4) To understand the daily requirement of carbohydrates for men and women.
5) Understand the relationship between Non-Milk Extrinsic Sugars and starch.
6) Understand how carbohydrates should be consumed in an individual's diet.

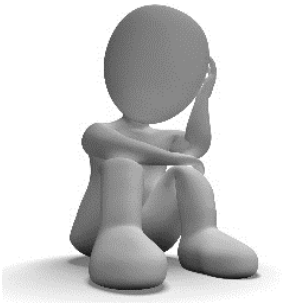
Function

Carbohydrates are an important source of energy in the human diet. All carbohydrates are ultimately converted to, and absorbed into the blood in the form of glucose. Glucose is a vital fuel source for all body tissues, especially the brain, and blood glucose levels are usually maintained within tight parameters to meet fuel demands. Following the consumption of carbohydrates, blood glucose levels rise, triggering increased insulin production and increased cellular uptake of glucose. Insulin is a substance, which promotes the absorption of glucose from the blood into skeletal muscles, ie muscle that covers the skeleton.

As surplus glucose is removed from the blood, insulin production declines and the blood glucose level gradually returns to its normal level. Once in the body cells, glucose is oxidized (combine chemically with oxygen) as a source of energy. Glucose surplus not required immediately is stored as glycogen in the liver or skeletal muscles. When glycogen reserves are saturated, excess glucose is converted into fat for long-term storage in the adipose tissues, which is found beneath the skin (subcutaneous fat), around internal organs (visceral fat) and in bone marrow (yellow bone marrow).

Excess carbohydrates

A diet too high in carbohydrates can upset the delicate balance in the blood sugar level causing fluctuations in energy and mood which can leave you irritable and tired. Therefore it is recommended to balance your intake of carbohydrates with protein, a small amount of fat and increased fibre.



Types of carbohydrates

There are two types of carbohydrates:

1. Simple carbohydrates known as refined sugars - monosaccharaides and disaccharides

Simple sugars are divided into two categories, monosaccharaides which include glucose, fructose and galactose and disaccharide, which include sucrose, lactose and maltose.

Sugars are found in nutrient-rich foods in nature such as milk, vegetables and fruit. These provide nutrients such as vitamin C, beta-carotene, calcium and soluble fibre. Sucrose can also

be extracted from foods and used as a sweetener to add directly to beverages or used to create foods such as cakes, biscuits or confectionary. Such foods tend to have a high content of sugars in a readily absorbable form, and also low in essential nutrients such as micronutrients such as vitamins and minerals and fibre, but high in fat and energy. Therefore the Scientific Advisory Committee on Nutrition has stated that carbohydrates should be divided into two distinct groups:

Intrinsic sugars (free sugars): these are sugars that are found in whole fruit where there are intact cells. The sugars in milk are also placed in this category due to their metabolic effects being similar. These sugars are lactose and galactose.

Non-milk extrinsic sugars (NMES): those not found in cells, but rather a free and easy to absorb state. These types of sugars tend to be added to food.

This distinction is a useful one as an indicator of the quality of an individual's diet. Essentially the sucrose in a bar of chocolate and that in an apple is not different, however people consuming chocolate are more likely to have a diet high in sugar-rich foods and low in starchy cereals, fruits and vegetables. Overall the diet is more likely to be inadequate in terms of dietary fat, fibre, vitamins and mineral. This diet is also likely to not satiate the individual hence resulting in overeating. These diets are less likely to be appropriate for long-term health. It is also known that food and drinks containing added sugar also tend to be used as snack foods. These are likely to be consumed frequently throughout the day, thus resulting in a high intake of NMES which can also impact on dental hygiene.

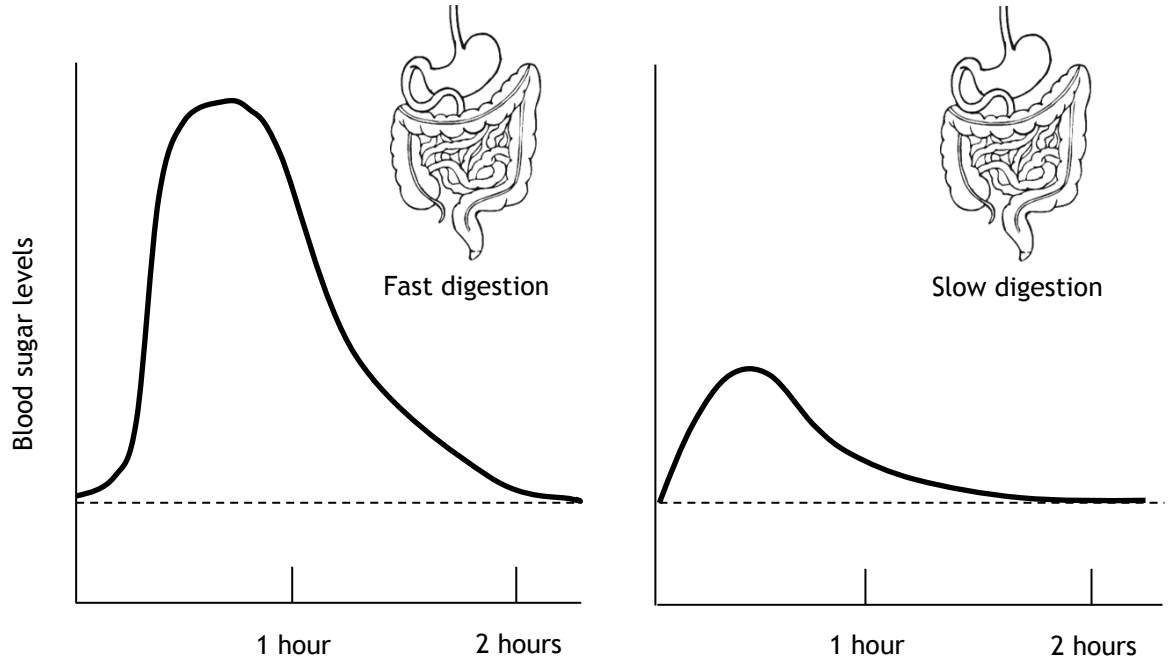
2. Complex carbohydrates – starchy food known as polysaccharides

These are found in a variety of foods including bananas, beans, brown rice, chick peas, lentils, nuts, oats, root vegetables, wholegrain cereals, pasta and bread. Starches are predominantly found in foods, which provide other essential dietary components such as B vitamins, minerals, protein and fibre.

The difference between simple and complex carbohydrates

All carbohydrates form glucose when digested. Glucose is transported around the body via blood and taken into cells to be converted into energy. The pancreas gland in your abdomen secretes the hormone insulin, which controls the uptake of glucose by your cells. If you have any excess glucose this is converted into glycogen, which is stored in the liver or in fat around the body. The more refined the carbohydrate, the faster the glucose is released into your blood. Complex carbohydrates take longer to digest and provide a slower and more sustained release of energy than simple carbohydrates. In their natural form they contribute to long-term good health, appetite control and sustained energy levels. You can see from the graphs below how the blood sugar levels rise very quickly for simple carbohydrates and for complex carbohydrates the rise is less sharp and more sustained. Therefore it is very important to increase our complex carbohydrate intake and reduce our intake of simple carbohydrates or NMES due to their health implications.

Simple carbohydrates **Complex carbohydrates**

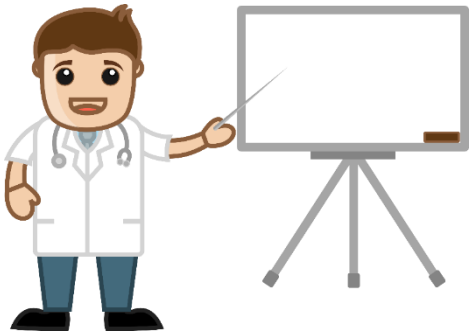


Recommended intake of carbohydrates
The current advice is that we should get 45-60% of our energy needs from carbohydrates, with at least one third of our daily intake of food being starchy carbohydrates. But not all carbohydrates are equal; refined sugars should make up only 11% of your daily diet. Starches, intrinsic and milk sugars should therefore contribute to approximately 39% of energy intake.

The above information has been taken from The Scientific Advisory Committee on Nutrition (SACN) (2014) Draft Carbohydrates and Health report.

The targets stated here may not be appropriate for young children or those with compromised appetites. For these cases, they may require diets of greater energy density in order to meet their energy needs and obtain the following percentages from sugars:

- Infants derive about 40% of dietary energy from sugars
- Pre-school children obtain about 25-30%
- Older children and adolescents between 17-25%.



According to the National Diet and Nutrition Survey (2008-2012) cited in SACN (2014) the average adult's daily diet meets this target with women getting 48.2% of their daily energy from carbohydrates and men 47.8%. The intake of the NMESs exceeds the recommended percentage of 11% with an average intake of 17%. Additionally the starches and intrinsic sugars on average provide less than the requirement, contributing 35% of the energy requirement in men and 37% in women as opposed to the recommended 39%. Therefore the recommendation is to increase the intake of complex carbohydrates.

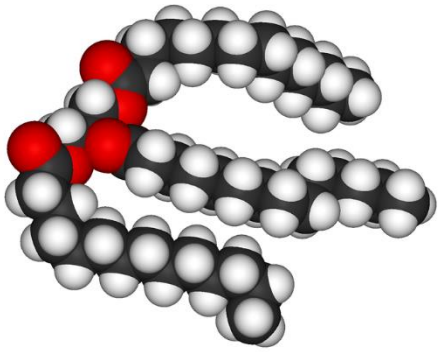
Tips to reduce sugar intake in diet.

- Reduce your sugary foods and drinks as much as possible. These foods are classified as empty calories as they are very high in calories with no other nutrients.
- Cut down on processed and packaged foods, salad dressings, spaghetti sauces, soups and even pizza crusts as these all contain sugar.

- If you take sugar in tea or coffee try cutting it down, or replace it with an artificial sweetener (sugar free), ideally from a natural fruit source.
- When buying canned fruits, always look at fruit in fruit juice instead of syrup.
- Try to use freshly squeezed juices instead of sweetened or sugary juices.
- Use low sugar foods e.g. light yoghurt, sugar free jellies and mousses.
- Avoid foods high in sugar e.g. biscuits, cakes, and chocolate. If this is difficult replace these with complex carbohydrates such as mentioned above.
- Know your sugars; fructose, glucose, lactose, maltodextrin, dextrose and syrup are all types of sugar masquerading under their scientific names. It is helpful to read food labels so that you know what you are putting into your body.

Aims of the section:

1) To understand the structure of fat.
2) To understand the different functions of dietary fat.
3) To understand the difference between saturated, monounsaturated and polyunsaturated.
4) To understand the two types of fat, Omega 6 and Omega 3.
5) Understanding the recommended intake of the different types of dietary fat.
6) A detailed understating of what trans fats are and their recommended daily intake.
7) Understanding the role of dietary cholesterol and how to reduce intake.
8) Understanding practical ways to reduce fat intake.



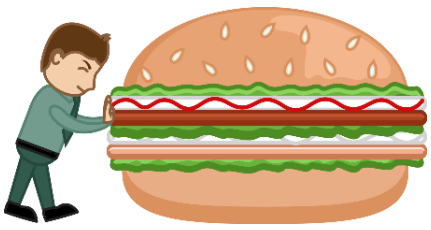
Structure

Dietary fats consist primarily of what are referred to as triglycerides as well as other components such as cholesterol, phospholipids, sterols and carotenoids. The structure of triglycerides is shown to the left. This diagram shows the glycerol backbone in red and the three long or medium-chain fatty acids attached to this backbone. The fatty acids attached to the glycerol backbone can be from more than one type and determine not only the physical characteristics of the fat, such as its degree of softness, but also its nutritional properties and physiological effects. Fat is the most concentrated source of energy as each triglycerides provide 9kcal per gram.

Function

Fats are distributed universally amongst all body cells and fulfil a wide range of structural, storage and metabolic functions which include:

- Fuel for cells: fats combine with oxygen to provide energy as they are the most concentrated form of dietary energy.
- The body requires essential fatty acids which are derived from fat.
- Fats have a transportation function by carrying fat-soluble vitamins (discussed further later on), and antioxidants, molecules that inhibit the oxidation of other molecules.
- Insulation is an important function of fat, through subcutaneous fat stores, ie those that exist just under the skin.
- They protect essential organs by forming a protective layer.
- A structural component of brain tissue.
- Being a molecule upon which an enzyme acts, known as a substrate, for making hormone and prostaglandins. Prostaglandins are a group of hormone-like lipid compounds that are derived enzymatically from fat.
- Acts as a reserve supply of energy in the form of adipose tissue.



Types of fatty acids

There are three types of fatty acids, which include:

1. Saturated fatty acids
2. Monounsaturated fatty acids
3. Polyunsaturated fatty acids

Saturated fatty acids (SFA)

These are chemically stable, both within the body and where present in foods. The main source of SFA is from the storage fats of animals and food derived from animals such as lard, meat fat, milk, butter, cream and cheese. Some plant foods such as coconut oil and palm oil contain high levels of SFA as well as foods derived from plant oils such as manufactured margarines and fat spreads, however generally speaking foods of plant origin contain much lower levels of SFA.

There are two types of cholesterol, high-density lipoprotein (HDL) and low-density lipoprotein (LDL), with HDL seen to be 'good' cholesterol and LDL is considered to be 'bad' cholesterol. SFA tend to elevate the level of low-density lipoprotein (LDL) cholesterol and increase levels of total cholesterol in the blood. Therefore a high intake enhances the process of atherogenesis, which is where artery walls thicken and increases the risk of cardiovascular disease.

Monounsaturated fatty acids (MUFA)

These are usually liquid at room temperature. The most concentrated dietary sources of monounsaturated fatty acids are olive oil and rapeseed oil, however they can also be found in canola oil, peanut oil, sunflower oil and sesame oil. Other sources include avocadoes, peanut butter and many nuts and seeds.

Dietary MUFA are regarded as the most beneficial type of fatty acid as they do not have a hypercholesterolaemic effect ie they do not increase cholesterol levels and when substituted for SFA, they lower the LDL-cholesterol level without unfavourably affecting high-density lipoprotein (HDL) concentration, also known as 'good' cholesterol, hence protecting from coronary heart disease. They also provide nutrients to help maintain the body's cells.

Polyunsaturated fatty acids

These fatty acids are susceptible to oxidation within foods or the body and are liquid (oils) at room temperature. These fatty acids have a pivotal role in many metabolic processes. They are key components of cholesterol metabolism. Polyunsaturated fatty acids are divided into types:

- N6 (Omega-6)
- N3 (Omega-3)

Two types of polyunsaturated: Omega 6 and Omega 3

These have distinctly different metabolic effects. Omega 6 linoleic acid (n-6) and Omega 3 alpha-linolenic acid ALA (n-3), are referred to as essential fatty acids (EFA) because humans (and other mammals) do not have the enzymes to make each and therefore they need to be consumed from an external sources including plant foods such as oils, nuts and seeds.

Omega-3 can also be of a different type known as long-chain fatty acids docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) which are known to be particularly good for us. These can be found in oily fish or can be derived from the essential fatty acid ALA mentioned above. These are precursors ie a requirement, of many metabolic intermediaries, such as prostaglandins, which are a type of hormone that has the functions of controlling processes such as inflammation, blood flow and the formation of blood clots. Therefore having long-chain fatty acids is important for a healthy diet.

Because these long-chain derivatives can be made by the body, obtaining the long-chain fatty acids from oily fish is not essential. However, they may become so if the dietary supply of

their essential fatty acid precursors ie n6 and n3, is limited. This is why Omega 3 is recommended as part of our dietary intake and current advice is to eat two portions of fish a week, one of which should be oily. Most dietary polyunsaturated fat is in the form of n6 fatty acids, principally linoleic derived from vegetable oils such as sunflower, safflower, corn, palm, groundnut, canola and soya oils.

Omega 6 (n6) – Polyunsaturated fatty acids (PUFA)
The intake of n6 PUFA has been actively encouraged in the past to help lower LDL and total cholesterol levels as they have a hypocholesterolaemic effect (decreases cholesterol levels). However due to the adverse effects of excessive n6 PUFA intake, this advice has been moderated. It has been noted that although PUFA lower LDL cholesterol, they also lower HDL-cholesterol which is important for the protection from coronary heart disease. Therefore the level of n6 PUFA intake should be sufficient but not excessive. If the desired income is to lower lipid levels, substituting SFA with MUFA rather than PUFA is probably preferable.

Omega 3 (n3) – Polyunsaturated fatty acids (PUFA)
A much smaller proportion of dietary PUFA intake is made up of the parent fatty acid of Alpha-linolenic acid and its principal long-chain n3 derivatives known as EPA and DHA discussed above. They have important physiological effects.

n3 polyunsaturated fatty acids (PUFA) have minimal effects on blood cholesterol levels because unlike n6 PUFA, in pharmacological doses (the amount of drug that produces a therapeutic response or desired effect in some fraction of the subjects taking it) they can reduce the triglyceride (the building blocks of fat as discussed above) concentrations. This is both when people are fasting and after a meal (known as post-prandial). This can have an effect of protecting from coronary heart disease.

EPA, high concentrations of which are found in fish oils, is considered to be an important measure for the protection against coronary heart disease. The two types of Omega-3, docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), also have important structural roles in brain, retinal and nervous tissue, which is why two portions of oily fish are recommended as part of our weekly intake.

Recommended intake
It has become increasingly apparent in recent decades that diets containing an excessive proportion of energy from dietary fat, especially from saturated fat, contribute to the high prevalence of obesity, cardiovascular diseases and other major health problems in Western societies. The UK dietary reference values (DRVs) for fat are therefore expressed in terms of desirable percentages of energy, which should be derived from fat and its constituent types. The recommended percentages of where our energy should come from are shown below as stated by the British Nutrition Foundation (2015):

	Energy intake should not exceed	Current average UK intake
Total fat intake	**33%**	**35% energy**
Saturated fat	10%	13% energy
Monounsaturated fat	12%	13% energy
Unsaturated FA (n-6)	6%	6%
Unsaturated FA (n-3)		0.1 g/day
Trans FA (Fatty Acids)	2% - 5g per day	0.7% energy

Therefore the current advice is to reduce saturated fatty acids as well as the total fat intake.

Trans fats
The type of fatty acids created in an industrial process by adding hydrogen to liquid vegetable oils are high sources of PUFA. When these PUFA are hydrogenated, it creates more solid spreading fats. Companies like using trans fats, because they are:

- Easy to use
- Inexpensive to produce
- Have a long shelf life
- Palatable and desirable in texture

However the problem is that they appear to be metabolised in a very similar way to saturated fats and they are considered to have similar and potentially adverse nutritional effects if they are consumed to excess. As a result, these trans fatty acids raise our LDL 'bad' cholesterol levels and lower our 'good' HDL levels. Eating them increases the risk of developing heart disease and stroke. They are also associated with a higher risk of type 2 diabetes. Trans fats can be found in many foods, but in particular they are found in:

- Fried foods like French fries and donuts.
- Baked goods like pastries pies, biscuits, pizza and some margarines.

Therefore, we should be very careful with regards to how much of these foods we consume.

Identifying trans fats
You can identify trans fats in any given food product by looking at the nutritional information section on food labels which will state whether there are any trans fats or looking at the ingredients label for the term 'partially hydrogenated oils'. This will help you build an understanding as to how much trans fats are contained within any given product.

Cholesterol
Cholesterol is a wax-like substance belonging to the steroid family. Most cholesterol that circulates within the body is endogenous in origin ie it has an internal cause or origin, hence its consumption has little effect on our blood cholesterol levels. If an individual has a diet high in shellfish and liver or very high in animal products then significant effects may be noted. In general, excessive consumption of dietary cholesterol can be reduced by any measure which reduces the intake of saturated fats.

Functional foods to help reduce your cholesterol levels
Previously guidelines suggested fat spreads, yogurts and drinks containing plant sterols and stanols are recommended to lower LDL cholesterol whilst the HDL cholesterol stays the same having an overall positive effect on cholesterol level. Previous trials showed that replacing a conventional spread with one high in stanols or sterols would reduce blood cholesterol by 10-15% (NICE, 2008). However since then new guidelines state that if you are at high risk of cardiovascular disease then you should not use spreads, drinks and yogurts containing plant sterols and stanols, to lower cholesterol as there is not enough evidence to suggest it could prevent cardiovascular disease. There is also no evidence to suggest that omega-3 fatty acid compounds (such as fish oil supplements) help to reduce cardiovascular disease risk (NICE, 2014).

Tips on how to reduce fat intake in diet

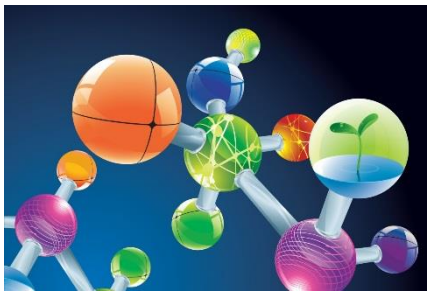
- Choose lean cuts of meat and trim off any visible fat.

- Choose low fat, polyunsaturated or monounsaturated spread instead of butter.
- Measure oil for cooking rather than pouring it from the container and a suggested volume would be one teaspoon of oil per person.
- Avoid additional fat to foods, e.g. glazing vegetables.
- Grill, bake, boil, poach, microwave, steam or roast instead of frying where possible to reduce additional fat.
- Choose lower fat versions of dairy foods such as semi-skimmed or skimmed milk, reduced-fat yoghurt and low fat cheeses.
- Avoid processed foods and hidden fats found in pies, pastries, quiche, Yorkshire puddings, sausage rolls, cakes, biscuits and crisps.
- Use low calorie salad dressing rather than mayonnaise or dressing on sandwiches and salads.
- Use Quorn, quark, tofu or falafel as an alternative to meat products due to a lower content of saturated fats.

Aims of the section:

1) Understanding the structure of fibre
2) To understand the different types of dietary fibre
3) To understand the physiological actions relating to fibre
4) Understanding what the benefits are of fibre
5) To understand the daily requirements and current intake of fibre
6) Exploring practical tips to increase fibre intake

Structure



Dietary fibre is made up of a mixture of what are known as polysaccharides and lignin. Polysaccharides consist of monosaccharide units bound together as discussed in detail within the carbohydrates module. Lignin is an integral part of plant cell walls and is a complex polymer of alcohols known as monolignols. They are also characterised as not being broken down by the endogenous enzymes (enzymes developed within the body) of vertebrate animals (such as humans), in other words fibre is not broken down during digestion by humans. Starches and fibre are names of carbohydrates found within bread, cereal, potatoes, rice and pasta. Starches are not fattening until we consider the way in which they have been prepared or cooked unless the starch's consumption contributes to an excess calorie intake.

Types of fibre

There are two types of fibre, 'soluble' and 'insoluble'. It was developed through the assessment of solubility ie the ability to be dissolved, especially in water, of components of fibre at a controlled pH. This division helps in understanding the diverse physiological effects of fibre observed. In summary the soluble fibres minimise glucose and lipid absorption (any of a class of organic compounds that are fatty acids or their derivatives), whereas insoluble fibres contribute more to increased stool weight and reduced intestinal transit times, thus reducing constipation.

Benefits of fibre – soluble fibre

There are several benefits of having fibre components in the diet, including:

It helps you stay satiated

In the chapter on carbohydrates, we discussed the glucose response that the body has after a meal for complex and simple carbohydrates. Soluble fibre blunts the postprandial (post-meal) blood glucose response, which allows a person to stay longer without getting hungry.

Reduces cholesterol

Additionally the soluble fibre helps to reduce the total cholesterol levels, especially the low density lipoprotein

cholesterol (LDL) discussed in the Fats Module, which has a large impact on lowering the risk of coronary heart disease. This is discussed further below.

Benefits of fibre – insoluble fibre

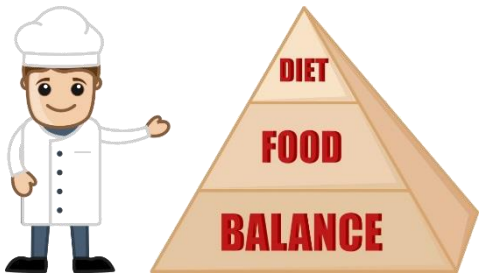
Reduces the risk of colorectal (bowel) cancer
The insoluble fibre components resist digestion in the small intestine and become substrates or platforms for bacterial fermentation in the large intestine. Short-chain fatty acids produced from bacterial fermentations are absorbed by the mucosa (the thin skin that produces mucus), found within the colon. The production of short-chain fatty acids influences faecal pH levels and colonic cellular proliferation and differentiation, ie they have an effect on cellular activity within the colon. Such effects may contribute to a reduction in the risk of colorectal cancer.

Helps control constipation
Fibre contributes to faecal weight as a result of the amount which remains undigested and unfermented, and also through the contribution to bacterial bulk following the entry of substrate (that is the substance acted upon by enzymes) into the colon. In turn, both of these factors affect the water-holding capacity of the contents of the colon, which leads to a benefit of increasing the stool weight and reducing the time it takes for the stool to move within the intestine, which helps to control constipation.

Impact on the CCK hormone
This is the hormone that helps make us feel satiated and its release is increased through the consumption of insoluble fibre.

Fibre foods are more bulky
This will result in enhanced and increased chewing which helps to slow down the time it takes to empty the bowels and thus helps the food stay longer in the stomach.

Helps with weight management
This food replaces other more high energy dense foods, which helps with weight management.



Recommended intake levels
A healthy adult requires 18g of fibre per day. The National Diet and Nutrition Survey (NDNS) reported that 72% of men and 87% of women were not meeting the recommended 18g of NSP per day. The scientific advisory committee on nutrition reported that 84% of adults eat less than 16g of wholegrain intake per day with 29% reporting no intake at all. In a survey of the diets of over 2000 British adults, the fibre intake of men was found to vary little with age, however there was a trend towards increased fibre consumption in women as they increased with age. This survey also concluded the oldest group were having a significantly higher intake of fibre than those aged 16-24 years. Women of all ages had higher intakes of fibre per unit energy than men. The average intake is 12.8g/day for women and 14.8g/day for men as stated by the British Nutrition Foundation.

How to increase fibre intake
- Try to introduce high fibre cereals into your diet.
- Add bran to muffins, breads and casserole.
- Try to have baked potatoes with the skin.

- Go for wholemeal or wholegrain bread instead of white bread. Look out for high-fibre breads and breads with added seeds.
- Try wholemeal pasta and brown rice instead of white pasta and white rice. Remember, brown rice does take longer to cook than white rice so give yourself plenty of time when you first use it.
- Eat fruits and vegetables raw where possible. Boiling can result in a loss of up to one-half of the fibre to be lost in the water and consider steaming or stir frying to retain more fibre. Puréeing doesn't destroy fibre, but juices will lose the fibre of the whole fruit is the pulp is strained away.
- Aim for 5 pieces of fruits and vegetables every day. They are low in calories and full of fibre to give that fuller feeling for longer. They will fill you up.
- Add beans and lentils to salads, soups and stews. Consider beans on toast as a light meal or try some salads with added kidney beans, chickpeas and butterbeans.

Aims of the section:

1) Understanding the definition of vitamins, minerals and trace elements.
2) Understanding the function of vitamins, minerals and trace elements.
3) Examining the definition of fat soluble vitamins such as A, D, E and K.
4) Understanding what water soluble vitamins are including C, B vitamins and folic acids.
5) Understand the minerals that each individual should consume.
6) Understand what trace elements are.
7) Explore practical tips on how to increase vitamin and mineral intake.

Vitamins - definition and function

Vitamins are only required in very small quantities which is just a few micrograms or milligrams per day. They are a diverse range of chemicals, however they are not chemically related but they are essential for key processes that are carried out by the body.

Vitamins are not chemically related. The classification of vitamins was originally with a letter, and once a chemical structure was identified a specific chemical name could be identified. However it should be noted that some vitamins consist of a family of related compounds such as vitamin A and D whilst others are single chemicals such as vitamin C also referred to a ascorbic acid.

Classification according to principal functions and actions in the body can be a useful way of describing roles and predicting the effects of inadequate intakes. Some vitamins, e.g. many of the B group, act as cofactors (a substance whose presence is essential for the activity of an enzyme) for enzymes required in energy production pathways. Other vitamins have actions that are specific to the development or maintenance of body tissues, e.g. blood (folate and vitamin B12) or bone (vitamin D). In addition to such functional roles, vitamins have been described through possible effects on general systems such as the description of antioxidant functions (molecules that inhibit the oxidation of other molecules) for ascorbic acid and vitamin E.

Another way to classify vitamins is based on how well they dissolve, ie their solubility in water or in lipids such as fat. Those classed as water soluble include the B group vitamins and vitamin C (ascorbic acid) and those classified as lipid soluble (fat-soluble) vitamins are vitamin A (retinol), vitamin D (cholecalciferol), vitamin K and vitamin E (tocopherols). Some of the benefits of this type of classification includes a better understanding of their function, distribution in the body, potential toxicity and their food sources.

Characteristics of fat-soluble and water soluble

Some of the differences in the characteristics of each type of vitamin include:

	Fat-soluble vitamins	Water-soluble vitamins
Risk of deficiency	Deficiency may occur where a diet is low in fat as well as when the absorption of fat has been impaired.	There may be risk of deficiency where when a diet lacks in variety
Stability in foods	Fat-soluble vitamins are robust in foods and do not get affected by heat and light	Generally speaking these types of vitamins are quite labile (susceptible to change) to heat and light or lost in water used for cooking. Therefore best to steam or grill.
Storage in body	These vitamins can be large and long term with regards to storage which is why they do not need to be eaten every day.	The body does not store these types of vitamins well and hence regular intake is required.
Risk of toxicity	High. The body can store them up ready for when required. If more is consumed than needed it can be harmful and thus caution is needed with supplementation.	Low. The body gets rid of high intake of these vitamins through urination and therefore the risk of toxicity through excess consumption is low

There are two types of vitamins discussed below with their functions, sources and requirements.

The fat soluble vitamins
These include:

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K

Name of vitamin	Function of vitamin	Where food found
Vitamin A (Retinol or Beta-carotene)	Eye health, bone development, protection of the respiratory, digestive and urinary tract linings, and maintains healthy skin and hair. Beta carotene fights free radicals (chemicals that damage cells).	Liver, egg yolk, dairy products, margarine. Beta carotene (pro-vitamin A) is found in dark green and deep yellow fruits and vegetables.
Vitamin D (Cholecalciferol)	Builds strong bones and teeth and maintains the nervous system.	For most people, sun exposure is the primary source of vitamin D. Food sources include vitamin D-fortified milk, eggs, fish-liver oils and fatty fish such as herring, mackerel and salmon.
Vitamin E (Tocopherol)	Protects the lungs, nervous system, skeletal muscle and the eye's retina from damage by free radicals; may reduce risk of heart disease by protecting against atherosclerosis.	Vegetable oils, nuts, wheat germ and whole-wheat products, egg yolks and green leafy vegetables.
Vitamin K	Promotes normal blood-clotting.	Dark green leafy vegetables, eggs, cheese and liver.

Water soluble vitamins
These include:

- Vitamin C
- Vitamin B
- Folic acid

Name of vitamin	Function of vitamin	Where food found
Vitamin C (Ascorbic Acid)	An antioxidant fights and resists infection, heals wounds, promotes growth and maintenance of bones, teeth, gums, ligaments and blood vessels.	Almost exclusively fruits and vegetables (especially citrus fruits, tomatoes, peppers, strawberries, and cantaloupe) although breast milk and organ meats contain small amounts.
Vitamin B1 (Thiamine)	Promotes healthy functioning of the nerves, muscles and heart and metabolises carbohydrates.	Whole grains, cereals and enriched grain products; also legumes (dried beans, peas, and nuts), organ meats, lean pork and eggs.
Vitamin B2 (Riboflavin)	Metabolises carbohydrates, fats and proteins, produces hormones, and promotes eye and skin health.	Organ meats, enriched breads and cereals, legumes, almonds, cheese, eggs, meat, fish and dark green vegetables.
Vitamin B3 (Niacin)	Metabolises carbohydrates and fats, helps functioning of digestive system and maintains health skin.	Meat, organ meats, whole grains and cereals, and legumes, eggs, milk, green leafy vegetables and fish.
Vitamin B5 (Pantothenic Acid)	Produces hormones and maintains the body's immune system.	Organ meats, yeast, raw vegetables, eggs and dairy products.
Vitamin B6 (Pyridoxine)	Metabolises protein, helps produce haemoglobin, and promotes functioning of digestive and nervous systems, and healthy skin.	Whole-grain products, poultry, fish, nuts, meat, most fruits and vegetables, eggs and dairy products.
Vitamin B12 (Cyanocobalamin)	Builds genetic material of cells and produces blood cells.	Primarily organ meats as well as fish, lean meats, poultry, cheese, and eggs.
Folic acid (folate)	Folate works with B12 to form healthy red blood cells, thus preventing central nervous system defects such as Spina bifida in unborn babies, caused by the incomplete closing of the embryonic neural tube. Therefore it is recommended as a supplement during conception up until the first trimester.	Broccoli, brussels sprouts, liver, spinach, asparagus, peas, chick peas, brown rice and fortified breakfast cereals
Vitamin B7 Biotin	Biotin works with several enzyme systems involved in the synthesis of fatty acids and in gluconeogenesis	Egg yolk, liver, kidney, nuts, pulses, wholegrain cereals and yeast

Minerals

Like vitamins, these are essential for the normal function of the body, however they are only require in small or even trace quantities. Those required in milligram quantities (sometimes several hundred milligrams) tend to be referred to as minerals. Those required in smaller amounts (microgram quantities) are usually called trace elements.

Functions of mineral and trace quantities

They have a variety of roles and may be necessary for:

1. **Structure of tissues:** iron is essential for the production of haemoglobin in the blood and phosphorus and calcium are required as structural components of bones.
2. **Enzyme systems:** Minerals are the catalysts that enable enzyme systems to operate, either by being part of the enzyme itself or function as a cofactor which enables the enzyme to work properly.
3. **Fluid balance:** for there to be fluid balance within the body, the regulatory mechanism needed to achieve this is driven by the concentration of elements such as sodium and potassium in body fluids and their movement between extracellular and intracellular compartments.
4. **Function of the cells:** some minerals are required for inter and extracellular transport mechanism and the stability of membranes.
5. **Neurotransmission:** Some have an essential role in nerve function and influence electrical activity.

Difficulties in estimating the amount absorbed

The absorption of minerals by the body is influenced by a number of factors. Not only are there differences between minerals and trace elements in terms of the extent to which a nutrient can be used by the body, known as bioavailability, but they are also influenced by the following factors:

- **Their dietary source:** calcium in vegetables and cereals is absorbed less effectively than calcium in milk.
- **Chemical form:** Haem iron is found in meat and non-haem is found in foods of vegetable origin. Haem iron is aborbed more effectively than non-haem iron.
- **Inhibition of absroption when other components are present:** minerals and trace elements can form un-absorbable complexes when they combine with phytates, oxalates or some types or fibre.
- **Enhancement of absroption when other components are present:** an example of this is the presence of vitamin C which improves the absorption of non-haem iron.
- **Other minerals consumed:** some minerals compete for the same absorption site, hence if one is consumed, this may affect the absorption of the other. An example of this is iron and zinc.
- **Level of intake:** absorption increases when the level of dietary intake is low and conversely it decreases when the level or intake is high.
- **Physiological factors:** absorption may increase with a physiological need such as pregnancy, lactation (the secretion or formation of milk) or conditions of depletion.
- **Age:** as the age of the individual increases, the level of absorption decreases.

Essential minerals
These are named essential as they are essential components of the human diet. They include:

- Calcium
- Phosphorus
- Magnesium
- Sodium
- Potassium
- Iron
- Zinc

Name of mineral	Function of mineral	Where food found
Calcium (Ca)	Builds bones and teeth, promotes blood clotting, contraction of muscles and nerve impulses.	Primarily in milk and dairy products but also found in dark-green vegetables, legumes, shellfish, fish with edible bones, tofu and calcium-fortified orange juice.
Phosphorus (P)	Present in all cells of the body with a close link to calcium and protein metabolism. Also releases oxygen and energy into the cells and mediation of intercellular hormones.	Milk and milk products, cereal products, meat and meat products, vegetables and potatoes.
Magnesium (Mg)	Builds bones and teeth, involvement in functioning of muscular and nervous systems, as well as hearing and circulatory system.	Legumes, whole-grain cereals, nuts, dark-green vegetables, meat, seafood and dairy products.
Sodium (Na)	Found in fluid external to the cells and plays an important role in blood pressure, fluid balance and transmembrane gradients (relative concentration across membranes). Many foods contain small amounts of sodium but none contain large amounts. Can increase radically when food is preserved because of salt addition or other sodium containing additives such as sodium bicarbonate, sodium nitrate or mono-sodium glutamate.	Bread and other cereals, meat and meat products in particular ham, and bacon, products in brine, milk and milk products including cheese and butter, pickles, sauces, smoked fish salted foods and yeast extracts.
Potassium (K)	Helps nerves and muscles function, regulates heart's rhythm and regulates bodily fluids.	Potatoes, dried fruits, bananas, legumes, raw vegetables, avocados and mushrooms, lean meat, milk and fish.
Iron (Fe)	Helps produce haemoglobin and red blood cells, delivers oxygen to muscles and other body tissues and protects against effects of stress.	Iron is poorly absorbed from food. The richest sources are red meat and organ meats. Other sources include whole-wheat products, shellfish, nuts and dried fruit. Many breads and cereals are enriched with iron. Vitamin C aids absorption of iron and is often added to iron supplements.

Zinc (Zn)	Involved in growth, skin health and wound healing, development of the reproductive organs, protein metabolism and energy production.	Shellfish (particularly oysters), organ meats and lean red meat, yeast, whole-grain cereals, and legumes.

Trace Elements
Only trace elements are required of these minerals, which include:

- Copper
- Chromium
- Manganese
- Molybdenum
- Selenium
- Iodine

Name of mineral	Function of mineral	Where food found
Copper (Cu)	Builds bones, red blood cells and haemoglobin, metabolises iron, maintains connective tissue and blood vessels.	Organ meats, shellfish, whole-grain products, legumes and dried fruits.
Chromium (Cr)	An essential nutrient required for normal sugar and fat metabolism, which influences how hormone insulin behaves in the body. May also help prevent high cholesterol and atherosclerosis.	Whole wheat and other whole grains and molasses.
Manganese (Mn)	Helps produce and activate some of the enzymes in the body as well as a component of bone and cartilage	Tea, bread, nuts, cereals, green vegetables peas and runner beans.
Molybdenum (Mo)	Makes and activates some enzymes used in repairing and making genetic material	Nuts, tinned vegetables, cereals, peas, broccoli, spinach and cauliflower.
Selenium (Se)	An antioxidant, which helps protect cells and tissues from damage by free radicals (highly reactive molecule which can damage cells when produced in excess); may also protect against some cancers.	Whole-grain cereals, fish and shellfish, meat and dairy products.
Iodine (I)	Thyroid gland functioning and thyroxin functioning of thyroid hormone. Maintenance of metabolic function, thermal regulation, protein synthesis and integrity of protective tissue.	Sea vegetables, yoghurt, cow's milk, eggs, fish and shellfish.

Tips on how to increase vitamins and minerals intake in diet.

- Aim to have 5 different portions of fruits and vegetables per day. A portion of fruit, approximately 80g or a handful equates to one apple, orange, pear, nectarine, kiwi or small banana. A portion of vegetables is approximately 3 heaped tablespoons, a small bowl of salad, 150g carrots, turnip, swede, cabbage, spring greens, cauliflower or broccoli, or 2 tablespoons tinned/stewed fruit in natural or fruit juice. With regards to dried fruit it is 3-4 dried apricots, prunes, figs or apple rings, and 150ml (small glass) of unsweetened juice.
- Keep healthy snacks easily to hand (e.g. fresh fruit in a bowl, fruit salad).
- When hungry snack on raw vegetables such as cucumber, celery or carrots.

- Try to load up on freshly squeezed juices instead of a usual coffee, tea or cola but be aware of the natural sugars in fresh orange juice.
- Use plenty of vegetables, and pulses while making soups, and try to put some extra vegetables beans or lentils in your casseroles and stews reducing the volume of meat.
- Try to have salad, vegetables and/or fruit with every meal.
- Stock up on frozen vegetables for easy cooking in the microwave or oven.
- Keep cupboard stores of canned and frozen fruit choosing fruit canned in natural fruit juice instead of syrup.
- Add chopped, fresh or dried fruit onto your breakfast cereal.
- Limit the intake of dried fruits; they are good source of vitamins and minerals but very high in sugar and calories.
- Try some fruit desserts like unsweetened fruit crumbles or sugar free jelly with added chopped fruit.
- Aim for 1/3 of your lunch and 1/3 of your dinner plate to consist of vegetables or salad.
- If you feel you are not getting a nutritionally balanced diet, speak to a doctor or dietitian about taking one multivitamin and mineral supplement per day and ensure not to exceed your upper limit.

Aims of the section:

1) In this section, we will cover both the affects and the recommended intake of water, caffeine and alcohol. We will also just practical tips on how to moderate them.
2) Understanding the health benefits of drinking water
3) Understanding what the recommendations are for fluid intake
4) Understanding the effects of dehydration.
5) Understanding the effects of caffeine and fluid intake on our bodies.
6) Practical tips on increasing fluid intake in diet.
7) Understanding alcohol and fluid intake.
8) Practical tips on reducing alcohol intake.

Health benefits of water intake

The research shows that there are a number of benefits of drinking water including that it:

- Regulates the appetite.
- Aids healthy digestion.
- Boosts energy levels.
- Aids with the elimination of harmful substances and toxic products.
- Helps reduce water retention.
- Helps reduce blood pressure.
- Eases joint pains.
- Reduces the risk of cancers such as bowel cancer.
- Maintains the function of the kidneys, thus reducing the risk of kidney stones.
- Helps maintaining the moisture in skin.

What are the recommendations for water intake?

It is recommended that the average person should drink 1.2 litres (6-8) glasses of water per day, which means, fluid requirements are 25-35ml/kg body weight. However this water should not be done all at once, but rather constantly throughout the day. If taken all at once, it will overload the kidneys, hence it must be done consistently and frequently.

Research shows that thirst and hunger sensations are triggered together. If there is a slight dehydration in your body the thirst mechanism may be mistaken for hunger and you may eat when your body is actually craving fluid. This is very important in weight management, as the signals can be misinterpreted resulting in eating out of physical hunger instead of drinking for thirst. Water is a natural appetite suppressant therefore consider drinking a glass of water, preferably hot before you eat any meal or snack, as this will help fill you up and eat less.

Dehydration

Some conditions are caused by dehydration, ie a lack of water including:

- Pressure ulcers
- Constipation
- Kidney and gallstones

Good hydration can really help with the prevention of each of these conditions.

Cognitive impairment
This is another potential result of dehydration and can lead to:

- Light headaches and dizziness
- Tiredness
- Reduced alertness and ability to concentrate

Thirst is felt at around 2% dehydration levels and at this level, mental performance may drop with mental performance progressively decreasing as dehydration is increasing. Hence it is essential to maintain good hydration for maximum mental performance.

Caffeine

Research shows that 93% of workers drink on average 1 caffeinated drink per day. Caffeine acts as a stimulant to the nervous system, and whilst its mild action may help to prevent a feeling of fatigue, it is also a diuretic, meaning it makes the body produce more urine, which in turn can lead to dehydration. A 250ml cup of fairly strong coffee contains about 50-160mg caffeine. The average cup of tea made from a tea bag contains 40-70mg caffeine. Cocoa also has up to 10mg of caffeine in a 250ml average cup. Caffeine is also present in some carbonated soft drinks. If you like to enjoy a cup of coffee at work, try to drink water after it to minimise the effects of caffeine and to flush the kidneys.

Tips on how to increase fluid intake

- Drink after visiting the toilet. This is a very practical tip that will help you to remember to drink water.
- Carry a bottle with you at all times to increase access.
- Use a straw or try sparkling water with a slice of lemon.
- Have water with each meal.
- Set goals for the number of glasses you aim to drink every day.
- Drink water after brushing your teeth, another tip to help you remember to drink water.
- Ask for water when offered a drink in work settings, or carry a bottle to meetings.
- Every time you drink coffee or tea also drink water.

Alcohol

According to it is reported that maximum intake of alcohol is 3-4 units per day for men, which adds up to 21 units of alcohol a week. For women it is 2-3 units per day, which adds up to 14 units of alcohol a week. A unit is 25ml of spirits (standard pub measure), 75ml of wine (small glass), half a pint of ordinary strength lager, cider or beer.

Tips on how to reduce alcohol intake

- Avoid binge drinking.
- Do not drink on an empty stomach.
- Use low calorie/diet mixers to reduce your calorie intake further and to make your drinks last longer.
- Check the label as many drinks labels indicate how many units are contained.
- Don't eat snacks like crisps and peanuts with your drinks, the added salt will make you want to drink more and may raise your blood pressure.
- If you drink at home, buy a measure so that you know how much you are drinking.

- Keep a drinks diary, as writing this down on a regular basis will help you to work out how much you're drinking.
- Try drinking each drink more slowly or alternating alcoholic drinks with soft or low alcohol ones.
- Have alcohol-free days. Get out of the habit of drinking because you are stressed or have nothing else to do. Look for other ways to relax. Activities like swimming, yoga or going to the cinema. These will make you feel better and don't involve alcohol.

Aims of the section:

1) To understand how energy is obtained from food and the concept of calories.
2) The balance of calories in and calories out.
3) How this changes from person to person with different requirements.
4) Understanding the difference between micro and macro nutrients.
5) Understanding how to calculate the energy content of food.
6) Understand basal metabolic rate (BMR).
7) Understanding how to calculate the BMR.
8) Understanding how to vary the BMR calculation depending on activity levels.

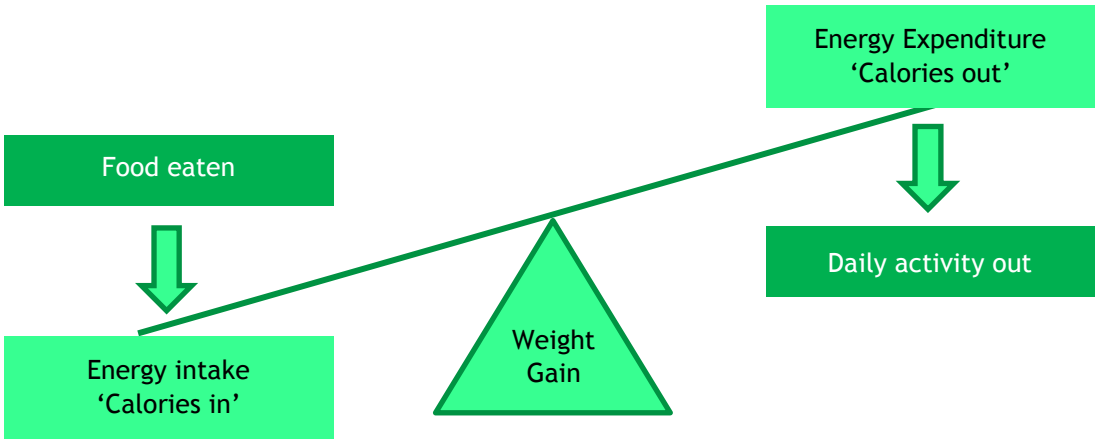
The energy balance

The energy we obtain for day to day living is obtained from the calories in the food that we consume. The energy balance is calories consumed when eating and drinking, compared to the energy burned through physical activity. The simple equation is as follows:

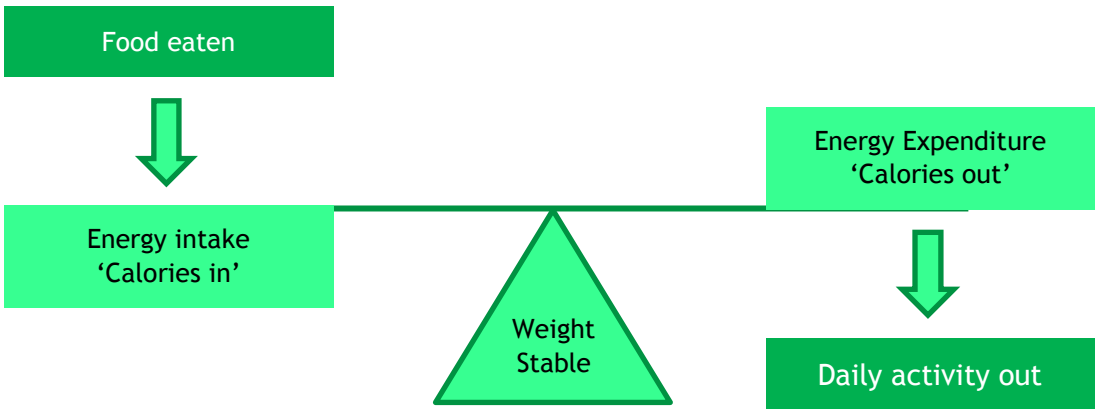
Eating and drink = energy in
Activity levels = energy out

Use energy in daily routine

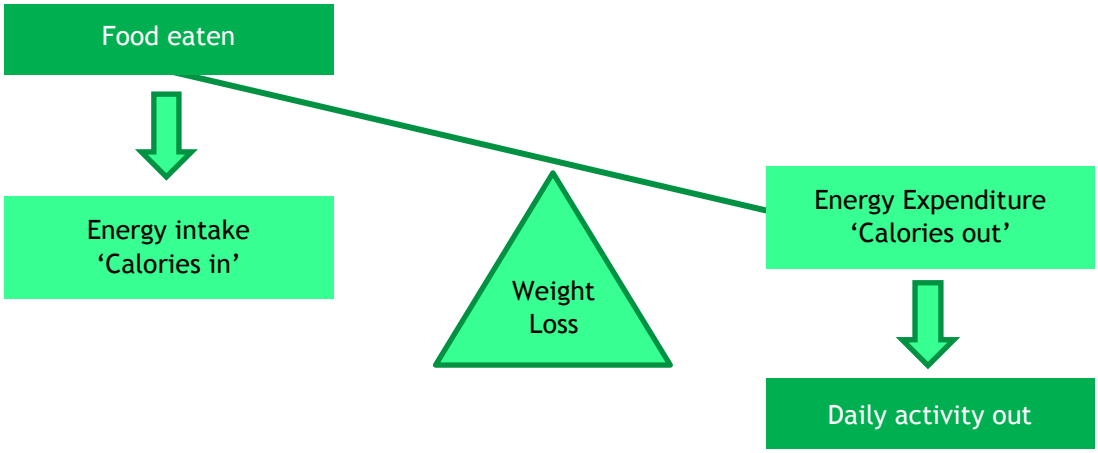
We burn calories by breathing air and eating food alone. You also burn additional calories just through your daily routine. The more physically active a person is, the more energy that is needed and this can be illustrated through the following diagrams:



Because the calorie intake here is greater than the activity levels, it results in weight gain.



If the intake and expenditure are the same, the weight remains stable, however if the expenditure is greater, the following is the result:



Note that the balance does not have to be the same every day. As long as it is consistent over a prolonged period of time the outcomes outlined above will result. With children their needs will be different as the energy intake needs to be able to support natural growth, without promoting excess weight gain.

Weight loss objectives
Depending on an individual's weight loss objectives, the energy requirements will differ. Other factors that need to be taken into consideration include:

- Shape
- Size
- Age
- Activity levels

As a general rule the following guidelines should be followed:

Weight maintenance **Weight Loss**

Weight maintenance: if this is the desired goal, the split should be one third starchy foods such as bread and pasta, ideally taken from the wholegrain varieties, one third proteins foods such as cheese and meat and one third fruits and vegetables.

Weight loss: here the shift should change to just having one quarter starchy foods, one quarter protein foods and one half fruits and vegetables.

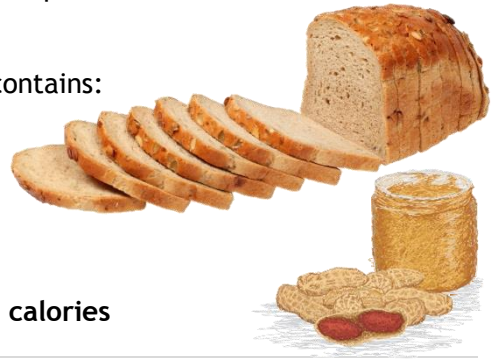
Micronutrients and macronutrients

These are labelled based on how much is needed of the nutrient and how much energy they provide. In the 'Food and Nutrients' section we discussed these micronutrients and macronutrients in detail. However here we discuss how energy is derived from them and how essential they are for our body's growth and metabolic functions. Micronutrients include minerals and trace elements which do not form the bulk of our energy intake. For macronutrients, these provide the bulk of our energy intake and are thus needed in large amounts covering the main food groups; carbohydrates, proteins and fats. By understanding the amounts provided by each macronutrient, it will better help the designing of the diet for those desiring weight loss, maintenance or weight gain. The quantity of calories that they provide varies as follows:

- 1g Carbs - 4 calories per gram
- 1g Protein - 4 calories per gram
- 1g Fat - 9 calories per gram
- 1g Alcohol - 7 calories per gram

Although alcohol has been included here as a provider of calories, it is not considered as being a macronutrient. The following example illustrates the concept further:

How much energy can be found in the following?



1 slice of bread with a tablespoon of peanut butter on it contains:

16 grams carbohydrate, 7 grams protein and 9 grams fat:

16g carbohydrate x 4 calories per gram =	64 kcal
7g protein x 4 calories per gram=	28 kcal
9g fat x 9 calories per gram=	81 kcal
Total =	**173 kcal, ie calories**

Basal metabolic rate - BMR
The basal metabolic rate (BMR) calculation is a calculation of the energy requirement for a person each day who has done nothing but rest. This energy is required to help them keep breathing, with the heart beating and all body processes functioning. It quantifies the number of calories required in the day and represents the minimum energy requirements. The most commonly cited equation is known as the Harris-Benedict equation.

Imperial BMR Formula

Women: BMR = 655 + (4.35 x weight in lbs) + (4.7 x height in inches) - (4.7 x age in years)
Men: BMR = 66 + (6.23 x weight in lbs) + (12.7 x height in inches) - (6.8 x age in years)

Metric BMR Formula

Women: BMR = 655 + (9.6 x weight in kilos) + (1.8 x height in cm) - (4.7 x age in years)

Men: BMR = 66 + (13.7 x weight in kilos) + (5 x height in cm) - (6.8 x age in years)

These calculations just provide us with the BMR which is what is required for the regular functioning of the body. To get the calorie requirements, they must be multiplied by the activity factor as follows:

- If you are sedentary (little or no exercise): Calorie-Calculation = BMR x 1.2
- If you are lightly active (1-3 days/week): Calorie-Calculation = BMR x 1.375
- If you are moderately active (3-5 days/week): Calorie-Calculation = BMR x 1.55
- If you are very active (6-7 days a week): Calorie-Calculation = BMR x 1.725
- If you are extra active (very hard exercise & physical job): Calorie-Calculation = BMR x 1.9

Practical example for the BMR calculation
A female that is 30 years old
She is 5 foot 6 inches tall (167.6 cm)
She weighs 120 lbs (54.5 kilos)
She works in an office but does light exercise 3-4 days/week

Women: BMR = 655 + (9.6 x weight in kilos) + (1.8 x height in cm) - (4.7 x age in years)
BMR = 655 + 522 + 310 - 141 = 1,346 calories per day

Having calculated the BMR, you can now calculate the total daily energy requirement by multiplying the BMR by the activity multiplier as follows:

BMR is 1,346 calories per day
Activity level is moderately active = 1.55 activity factor

Therefore the total daily energy requirement is = 1.55 X 1,346 = 2,087 calories per day

More recently the Henry equation (Henry, 2005) has been evaluated (Ramirez-zea, 2005, SACN 2011) and recommended as the most rigorously tested and applicable to modern healthy populations. However this equation is not as widely used as the Harris-Benedict equation.

The new oxford equation for BMR calculation is calculated as follows:

Gender	Age	Kcal per day
Males	0-3	61.0w - 33.7
	3-10	23.3w + 514
	10-18	18.4w + 581
	18-30	16.0w + 545
	30-60	14.2w + 593
	60+	13.5w + 514
Females	0-3	58.9w - 23.1
	3-10	20.1w + 507
	10-18	11.1w + 761
	18-30	13.1w + 558
	30-60	9.74w + 694
	60+	10.1w + 569

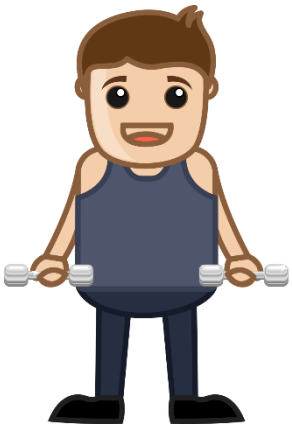
Using the example above, the new calorie daily requirement that has been calculated is:

(9.74 x 54.5kg) + 694=1,225 calories per day

Aims of the section:

1) Understanding the definition of metabolism
2) Understanding the different factors that affect an individual's metabolism
3) Understanding how food affects metabolism
4) Understanding whether some people have a faster metabolism than others
5) Understanding the role that genes play in body metabolism
6) Looking at practical ways to increase body metabolism

Definition of 'metabolic rate'



A person's metabolic rate is defined as the rate at which our body burns calories, through a series of chemical reactions in the body's cells which converts the fuel we eat consisting of fats, proteins and carbohydrates into energy that is needed by the body. This is needed for all our essential daily functions including thinking, moving, growing and sleeping.

Factors which affect metabolism

Factors such as age, weight, physical activity, medication and genetic factors all have a role to play in determining an individual's metabolic rate. By understanding the history of each of these factors, it is possible to build a qualitative picture of an individual's metabolic rate. Knowing where a person is in terms of these factors will then help the adviser give more targeted advice on what a person can do to increase their metabolic rate. The main factors, which affect an individual's metabolism, are:

- Age
- Weight
- Physical activity
- Medication
- Genetic factors

For a quantitative measure of an individual's metabolic rate there are a number of machines on the market that can be purchased and used to measure this, however most of them are quite expensive. For a more straightforward method, see the section on the Energy Balance where the BMR (Basal Metabolic Rate) calculation is discussed. This can be used to quantify the exact number of calories that an individual requires to live, which is a measure of body metabolism.

The role of food in metabolism

Food provides critical nutrients for a healthy metabolism, and to function effectively vitamins, minerals, essential amino acids and essential fatty acids must be ingested from an outside source. Missing just one of these essential nutrients could have a devastating effect on our health, which is closely linked to having a healthy metabolism.

A mixture of foods and plenty of exercise can help increase the metabolic rate of an individual. We will cover some very practical tips to achieve this at the end of this module, which in turn can help an individual to achieve their dietary goals.

Do some people have a faster metabolism than others?
From the BMR calculation in the Energy Balance module we can clearly see that the metabolic rates of individuals vary based on various factors such as key body measurements, gender and age. We also know that because muscle cells require more energy than fat cells, those with more muscle tend to have a higher metabolic rate. The older a person is, the more fat they gain and hence this is one of the reasons why metabolism decreases with age.

Also based on the difference between men and women, men tend to have more muscle mass, heavier bones and less body fat and therefore their daily calories requirement and metabolic rate tend to be higher. The average man tends to require 2,500 kcal a day, whereas for an average woman it is around 2,000 kcal a day. It is based on these factors that some individuals have a faster metabolism than others.

How big a role do genetic factors play in determining body metabolism?

It is a commonly held belief that some people have a slow metabolism based on their genes and not based on the factors mentioned above. Your metabolism may be partly determined by your genes, although this is not yet fully understood, however genes definitely play a role in muscle size and your ability to grow muscles. Both of these affect your metabolism. Overweight people may actually have a higher metabolism due to the fact that they have higher energy requirements, which is needed to help maintain their larger body size. This could be a motivating factor for those people overweight, because they may actually be able to lose their weight at a very fast pace. This is due to their faster metabolic rate if they change their lifestyle habits by eating healthier food and exercising more.

However, overweight individuals tend to be unable to increase their metabolic rate, through various methods such as exercise, to a high enough rate so that the energy being expended is higher than the energy consumed from food. Their metabolic rate may actually be fast, but it is not fast enough to burn their excess fat.

Also, research has also shown that people tend to eat more than they think they do. When asked to remember what has been eaten in the last 24 hours, many people tend to re-call less than what they have actually eaten. Hence the more common reason why people tend to put on weight is eating and drinking more calories than they are burning throughout the day, rather than a slow metabolism based on their genes.

Increasing your body metabolism
The best way to increase body metabolism is to increase exercise levels. The following are some practical tips to be able to do this effectively, especially whilst at work:

- Walk to colleagues to give reports rather than sending emails.
- Walk on the spot or do stretches regularly whilst at work to help improve circulation, mood and concentration.
- Commute to work on foot or use a bike.
- If driving, park at a distance and walk to work.
- Stand-up when on the phone or when writing.
- Start a lunchtime walking or running club with colleagues.
- Split up your lunchtime to include walking.
- Keep walking to the water machine rather than having water at your desk and use the toilet on a different floor to keep you moving.
- Wear a pedometer and constantly set yourself new goals, setting a target of 10,000 steps per day.

- Map out a walking trail that you can take during lunch breaks and vary this by choosing different paths to use at the workplace.
- Stand up and sit down at work every few hours to help loosen the muscles and speed up the metabolic rate.

Final point
Increase your satiety to prevent you from having high calorie food later on. You will be provided with more energy and it will keep your metabolism going throughout the day.

Aims of the section:

1) Understanding the history of the eat well and how it was developed
2) A detailed explanation of the recommended portion sizes for each food category
3) A specific examination of what needs to be considered for children
4) Understanding the key messages behind the eat well plate
5) Understanding the advantages of the eat well plate
6) Understanding the problems with the model
7) A detailed examination of each of the segments of the eat well plate including what it contains, portion sizes, nutrients provided and details of what they provide.

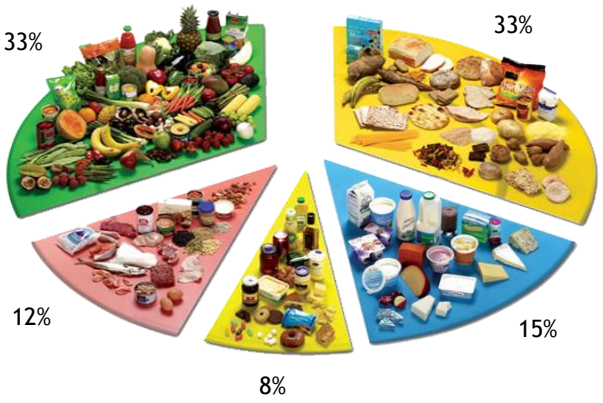
Remember

This module will give you a general understanding food groups, however to apply this advice to specific individuals, you should first consult with a registered nutritionist or dietitian.

Introduction

The concept of 'The eatwell plate' (Department of Health, 2007) was developed based on 'The Balance of good health' in 1994, where a pictorial mode of a plate was opted for as the method of demonstrating a balanced diet. The method involved the 5 food groups being represented through a plate, demonstrating a well-balanced and healthy diet. The design involved five segments:

- Bread, cereals and potatoes = 33%
- Fruits and vegetables = 33%
- Meat, fish and alternatives = 12%
- Milk and dairy foods = 15%
- Fatty and sugary foods = 8%



This guidance is based on servings (relative amounts rather than precise amounts) per day, with a young adult needing more than a child or elderly person but with the proportions always remaining the same.

Four key messages

There are four key messages which are established through the eat-well plate:

1. The first is that a meal does not need to be centred around protein rich foods such as a large steak, a piece of chicken or eggs. Instead the meal should contain a good amount of starchy foods, vegetables and fruits and these should in total, form a larger part of the individual's meal.
2. To be healthy does not require cutting out certain foods altogether. Instead there should be a focus on proportions and reduction of consuming certain foods over time.
3. A healthy diet can be flexible. A variety of foods can be consumed if the overall proportions of each category are the same.
4. There is no food that has all the nutrients that are required, hence a mixture of foods that contain all the nutrients required should be the desired objective.

The advantages of The eatwell plate:

1) A key advantage is the flexibility of the model because it is based on proportions and hence it is suitable for all age groups over the age of 2 and all energy requirements.
2) An individual can compare the proportions of their current diet to The eatwell plate and identify inadequacies hence it is a very useful as an identification tool.
3) It is also useful to understand what modifications are required to improve the diet.
4) Food choice can be tailored to individual's needs, for example:
   - Those who are overweight can be recommended low energy density, low fat foods.
   - Those who are under-nourished can be recommended more energy dense foods.
   - If an individual has constipation they can be recommended high fibre foods.
   - If an individual has a high risk of cardiovascular disease, they can be recommended more oily fish.
   - If an individual is anaemic, they can be recommended red meat which is high in iron.

It should be noted however, that The eatwell plate is not designed for those with special dietary needs and such individuals should seek specialist advice as it is only intended as helpful guidance for healthy eating.

Problems with 'The eatwell plate'

Whilst The eatwell plate is a useful model and as a general concept is easy to understand and implement, it still has its drawbacks. These include:

- Foods do not necessarily fit into one group.
- Food such as pizza, pies and casseroles actually contain foods from all the different groups and therefore do not fit into one category.

Breakdown of the different food groups reported by Public Health England (2014)

Bread, cereals & potatoes

- These include foods such as pitta bread, scones, crispbread, chapattis, muffins, bread rolls, rice, breakfast cereals, potatoes and pasta.
- These foods should constitute one third of an individual's nutritional intake.

- The number of servings per day should be between 4 and 6, with 1 serving being 3 heaped tablespoons of cooked pasta, 2 egg sized potatoes, 2 tbsp of porridge, 3 tbsp of dry breakfast cereal, 1 small chapatti, 1 medium slice of bread, 3 crackers or crisp breads, 2 heaped tbsp of cooked rice, 1 mini pitta bread.
- The nutrients provided by these foods are fibre, particularly insoluble fibre, carbohydrates as well as calcium, iron and B vitamins.
- Carbohydrates are not necessarily fattening, they provide bulk without many calories, however their calorie content increases when fat is added. For example, calories can be added to potatoes by frying to make chips. Fat can be added to bread by using a high fat spread.
- Therefore the use of additional fat on carbohydrates should be discouraged. For example using a thicker piece of bread is advised in order to increase the carbohydrates intake without increasing the fat consumption.
- This food category can be used to increase fibre intake and satiety and alleviate constipation such as having wholemeal bread, brown rice and whole grain cereals.
- Cereals often are fortified with micronutrients such as iron and folate.
- With snacks becoming a regular part of daily routines, cereals can be a good snack.

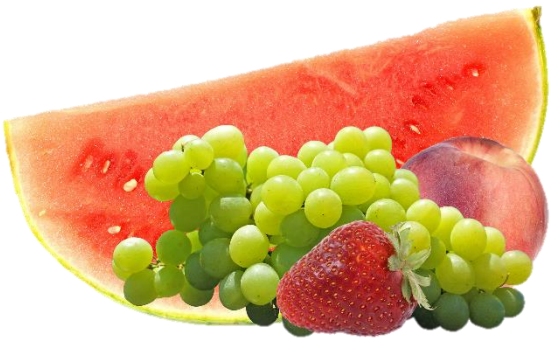
Fruits and vegetables

- This includes dried, canned, juices, frozen and of course fresh fruit and vegetables.
- It should constitute one third of food intake.
- It is from this group that we obtain essential minerals and vitamins such as beta-carotene, antioxidants, soluble fibre, folates, potassium and vitamin C. See the vitamins and minerals module for more details.

The recommended intake is five different portions of fruits and vegetables per day, with a portion being around 80g which is equivalent to:

- 1 medium sized piece of fruit
- 1 pear, apple or banana
- 2 satsuma, plums or 2 apricots
- 1 handful of berries or grapes
- Half a tablespoon of dried fruit such as raisins or dates (need to be careful of the high sugar content).
- 1 slice of large fruit like melon or pineapple.
- 150ml of pure juice not from concentrate.
- 2-3 heaped tablespoons of vegetables.
- Medium bowl of salad.
- 2-3 heaped tablespoons of beans and pulses.

In most situations, individuals tend not to be consuming enough fruit and vegetables and often eat less than 400g per day. Processed foods contain small amounts of fruits or vegetables such as fruit cake, vegetable soups or fruit flavoured soft drinks therefore it is important to check the label, however this is not considered to be a portion. Recently many juice companies have started to state that a glass of their juice would count as being one portion, however it is suggested that only one portion is from this source as it contains a high amount of NME sugars.



As different fruits and vegetables contain different nutrients, it is recommended a variety of fruit and vegetables are consumed. Similar to the previous section, the addition of fat should be avoided however it is possible to have fruit yoghurts dessert (which contain real fruit) as a way of increasing consumption. Furthermore with canned fruits and vegetables, it is recommended to choose a no added sugar or salt type, and to choose the fruits canned in their own juice rather than syrup in order to avoid high sugar consumption.

Milk and dairy

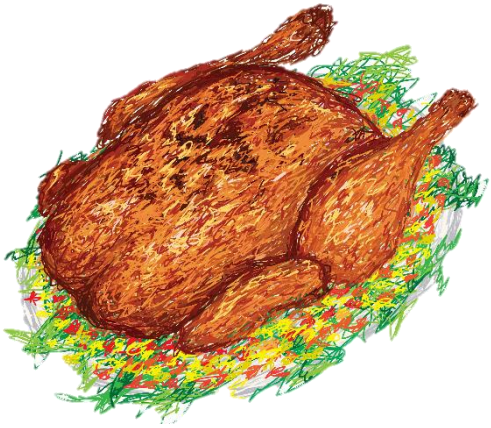
- This includes milk, cheese, yoghurts, fromage fraise and crème fresh.
- It should make up one sixth of the total intake by consuming 2-3 serving per day.
- A typical serving can include a 150g pot of yoghurt, 200ml milk (1/3 of pint), including milk substitutes, 40g

piece of cheese, 8g crème cheese or 200g cottage cheese

- This food group provides essential vitamins and minerals including calcium, protein, riboflavin (vitamin B2), vitamin A and D.
- However we should be aware foods in this group can be high in fat, therefore reduced low fat varieties should be selected, such as semi/skimmed milk.
- The reduced fat varieties contain the same amount of protein, calcium and riboflavin as their full fat equivalents but with much lower fat and calories. For children under the age of 2, these are not considered to be suitable as they are also low in energy density. This is due to the fact that they are also low in fat soluble vitamins such as Vitamin A and D. Skimmed milk is not suitable for those under the age of 5, however they can be given semi-skimmed milk as long as they are eating a diverse and adequate diet.
- Hard cheeses should be used sparingly due to high content of fat and calories.
- Butter and cream are classified as high fat foods and therefore they are not included in this group, but rather they sit in the high fat foods.

Meat, fish and alternatives

- This includes meat which is a good source of protein, vitamins and minerals, such as haem iron, zinc and B vitamins, poultry, offal, fish, meat and fish products, eggs, liver and kidney, pulses (beans and lentils) and nuts.
- It should make up one sixth of the total intake of the individual, with recommendation of an individual consuming two servings from this food group per day.
- A typical serving can include 3 slices of lean meat, 4 tbsp cooked lentils, 140g piece of fish, 2 eggs, 2-3 heaped tbsp beans and pulses, 2 tbsp of peanut butter, palm full of nuts/seeds



- This food group provides an essential source of protein, iron, B vitamins, zinc and magnesium.
- This is a very popular food group, however it should not dominate dietary intake and should be balanced against the other food groups.

Other types of meat, fish and alternatives:

Meat

This food group contains a high level of fat if the fat is not removed, however the muscle itself is low in fat, with half being monounsaturated. Therefore lean meat varieties should be consumed instead as it is classified as a rich source of protein and micronutrients. They are also particularly high in iron, similar to their full fat varieties of meat but again with much lower calories and fat.

Poultry

- Poultry tends to have less fat if the meat is white such as breast meat, eaten without the skin or any visible fat.
- If the poultry meat is taken from the leg, it is considered to be darker meat and is very high in fat and energy content. This type of meat should be eaten in moderation.

Offal (internal organs and entrails)

- It is relatively lower in fat in comparison to other meats and is known for its high content of iron. However, pregnant women should avoid liver or liver products due to their high levels of vitamin A; excess vitamin A is harmful to the foetus.
- Is also cheap but not always a popular choice and as result may not be as readily available.

Fish and eggs

- Considered low in fat unless fried and is a good source of selenium (antioxidant).

- Oily fish Includes Herring, Mackerel, Pilchard, Sardines, Salmon contain long chain Omega 3 fatty acids therefore considered as an essential food group in a cardio protective disease diet and should include at least 2 portions a week of which one should be oily fish.
- It is recommended for an adult individual to consume oily fish once or twice per week.
- Oily fish is considered as one of the dietary sources of Vitamin D.
- For eggs, if they are not consumed in large amounts each day, they are not considered to be of concern. This is because although they are known for high cholesterol, within the normal dietary intake, the dietary cholesterol has little impact on the body cholesterol.

Pulses, beans and lentils

- The main benefit is that they are low on the glycaemic index (see chapter on different diets for more details) and contain soluble fibre.
- Can substitute lean means due to their protein, mineral and trace elements content.
- Convenient form of pulses for many people.
- Pulses are good source of iron

Fat rich and sugar

- This includes butter, margarine and fat spreads, as well as cooking fats and oils.
- Includes sausage rolls, fried foods, savoury snacks, cream, rich sauces, gravy, mayonnaise and salad dressings.

Sugar and fat

- This includes cakes, biscuits, puddings, ice cream, chocolate, confectionary and fizzy drinks.
- This food group should only form a maximum 1/12th of total food intake.
- Although the intake should be minimal, some vitamins and essential fatty acids can be obtained from this food group, however the food group predominantly consists of excessive fat, sugar and salt.
- It is not realistic to avoid this food category completely as they provide palatability and convenience to the diet and if used sensibly it can form part of a healthy diet.
- However, the foods in this group are classified as high sources of fats, sugar and salts, therefore they need to provide the smallest proportion of the diet. As an alternative, a low/reduced calories, fat, sugar, as well as salt varieties should be chosen for a balanced diet.
- For example, butter and margarine (both soft and hard margarine) contain high levels of fat and hard margarine contains even more. Fat spreads such as sunflower spread contains about 70 % of fat.
- It is recommended that an individual should choose reduced or low fat spreads which contains about (40-60%) of fat and choose those rich in monounsaturated fatty acids such as those derived from olive oil. Additionally if butter milk is used in products this does not increase the fat content.
- The use of cooking fats should be kept to the minimum. In general vegetable oils should be preferred over animal fat such as lard or dripping. Such oils including olive oil are rich in monounsaturated fatty acids, and including sunflower, safflower and cornflower, are all high in Omega 6 with rapeseed and Soya containing Omega 3 fatty acids. In total all these fats should be minimised in the diet.

Aims of the section:

1) Understanding the definition of a vegetarian.
2) Understanding what motivates people to become vegetarians.
3) Understanding the seven different types of vegetarians.
4) Understanding what the benefits are of being a vegetarian.
5) An examination of the nutrients that a vegetarian or vegan may have missing in their diet and an exploration of alternative sources of these nutrients.
6) An explanation of the advice given to vegans and children who are vegetarians.
7) Outlining different cooking ideas for vegetarians.

Introduction

The Vegetarian Society states that a vegetarianism is defined as someone how lives on a diet of grains, pulses, nuts, seeds, vegetables and fruits with, or without, the use of dairy products and eggs. A vegetarian does not consuming red meat, poultry, seafood and flesh of any other animal. It also includes not consuming the by-products of any animal foods such as animal fat or gelatine.

What are the reasons for vegetarianism and veganism?

There are a number of reasons why people choose to live such a lifestyle which include:

- Religion
- Culture
- Moral and ethical beliefs
- Health, environmental and ecological

For many it is seen not just as a dietary choice, but as a philosophy that is informed by other closely held beliefs. These beliefs affect the whole life of an individual.

Variation in practice between individuals

There is a wide variation in individual's practice of vegetarianism therefore it is very important for the nutrition adviser not to make assumptions about the diet of a vegetarian as different individuals may have set themselves different criteria. Try to explore what foods have been excluded by the individual and explore the motivation for the individual which may include health, religious or just personal preference reasons.

The seven types of vegetarian

Many individuals are unaware that there are different types of vegetarian. This is important as it affects the content of the diet and can help the nutrition adviser make modifications to improve the individual's diet whilst staying in line with their beliefs. Also, knowing about these different types of diets will really help build up a health professional's relationship with the individual. There are at least six types of vegetarian diets that differ in the level of abstention from the consumption of meat, as well as from the by-products of animal slaughter:

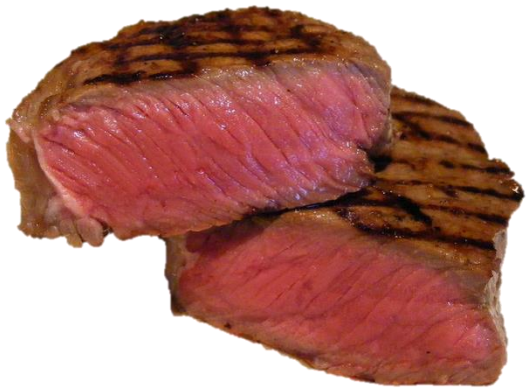
1. **Semi-vegetarian:** excludes red meat but will eat fish or poultry
2. **Pescetarian:** excludes red meat and poultry but will eat fish
3. **Lacto-ovo vegetarian:** does not eat any meat, poultry, fish, shellfish or ingredients derived e.g. gelatine and rennet. These vegetarians may also consume dairy products and eggs, but most likely only from free range origin.
4. **Ovo-vegetarians:** include eggs but avoid all other animal foods, including dairy.
5. **Vegans:** excludes all animal products including all derived additives and ingredients.
6. **Fruitarian:** is a vegan, who restricts their diet to only consists of raw fruit and vegetables, nuts, seeds, pulses and grains.
7. **Macrobiotic:** foods that contain both the ying and yang (based on the Chinese philosophy). With 7 levels that differ and increase in restriction with the lowest level being most varied includes fish but still excludes meat, eggs and dairy products. The highest level is based on only consuming brown rice.

Benefits of the vegetarian diet
The vegetarian diet tends to be lower in saturated fats and higher in starchy carbohydrates, fibre, fruits and vegetables than normal diets. Vegan diets tend to be even lower in saturated fats.

The vegetarian population is very heterogeneous, and the overall health status of a vegetarian and how healthy their diet is determined not just by their consumption but by how nutritionally balanced their overall diet is. However studies show that the overall mortality rates as well as risk factors for diseases in vegetarians and vegans seem to be lower. They have been associated with lower risks of heart disease, type 2 diabetes, obesity, certain types of cancer and lower blood cholesterol levels.

Risk factors relating to becoming a vegetarian
When cutting out animal products there are some specific nutrients that the vegetarian needs to consider. No matter what type of vegetarian a person is, it is important that the guidelines outlined by The eatwell plate are adhered to. Particularly, special attention needs to be paid to the following food groups:

Iron
The Scientific Advisory Committee on Nutrition reviewed a number of studies and found that dietary iron intakes of vegetarians are on average similar or sometimes higher, than those of non-vegetarians.



As has been discussed in the Vitamins and Minerals module, iron is an essential constituent of haemoglobin in blood and for non-vegetarians it can be obtained from red meat, being the richest and most easily absorbed source. For vegetarians, alternative sources of iron include:

- Wholemeal bread
- Dried fruit
- Fortified breakfast cereals
- Leafy green vegetables
- Nuts
- Beans and lentils
- Sesame seeds

Vitamin C
Vitamin C should be included in a meal to help with iron absorption which can be obtained from fruits and vegetables (especially citrus fruits, tomatoes, peppers, strawberries, and cantaloupe).

Protein
As previously discussed within the Protein module, protein is divided into two categories, Low Biological Value (LBV) and High Biological Value (HBV). Protein from animal sources tend to be HBV but few plants fit into this category. Quinoa, soya and hemp are the few plant foods containing all the essential amino acids. Other plants contain some, but not all so it is essential that a vegetarian eats a mixture of different plant proteins to ensure that they can meet their nutrition requirements.

A simple solution to this problem would be to consume more cheese, which would suit those vegetarians that can consume dairy. However this can cause other problems because cheese contains saturated fat which is not healthy in the long term. More suitable sources of protein for a vegetarian are:

- Seeds
- Nuts and nut butters (e.g. peanut butter)
- Soya and soya products e.g. soya dairy alternatives, tofu, soya nuts and soya mince
- Grains such as wheat (found in cereals, pasta and bread), rice and maize
- Beans, lentils and chickpeas

Other sources that some vegetarians may consume are:

- Mycoprotein such as Quorn (has added egg)
- Milk and dairy products (yoghurts and cheese) and eggs

Calcium
Calcium deficiencies may result in vegetarians who do not eat dairy foods. It is an essential mineral as it helps builds bones and teeth, promotes blood-clotting, contraction of muscles and nerve impulses. For vegetarians not consuming dairy products, other sources include:

- Dried fruit e.g. apricots and figs
- Calcium-fortified foods e.g. soya milk, yoghurts and puddings
- Sesame seeds and tahini
- Brown and white bread
- Tofu
- Green leafy vegetables, especially kale and pak-choi, but not spinach.
- Nuts

Selenium
This is an antioxidant that helps protect cells and tissues from damage. Fish and shellfish, meat and dairy products are good sources of selenium, therefore in their absence, whole-grain cereals and Brazil nuts are a good source.

Vitamin B12 and B2
Vitamin B12 is important as it helps build the genetic material of cells and produces blood cells. Several studies has suggested that low intakes of vitamin B12 have been recorded in the vegetarians and vegans diets Vitamin B2 metabolises carbohydrates, fats and proteins, produces hormones, and promotes eye and skin health. Different types of meat are excellent sources of these vitamins, however for a vegetarian who does not eat eggs and dairy foods, they should consume fortified foods containing Vitamin B12 and B2 (check the label) as well as:

- Breakfast cereals
- Yeast extract
- Certain brands of rice drinks and oat drinks
- Soya milk, yoghurts and desserts

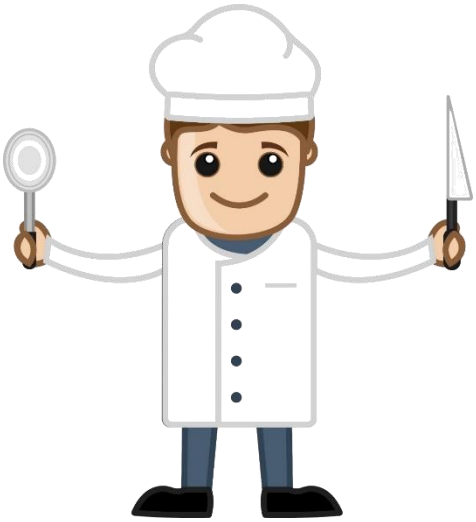
Omega-3
Omega-3 fats are important for good health and this has been discussed in detail in the module on fats and fatty acids. Current recommendations are to eat two portions of fish a week however if a vegetarian does not eat fish, they may wish to consider a supplement made from algae derived DHA.

Children following vegetarian diets
The main healthy eating guidelines are the same for everybody however if a child is being given a vegetarian diet or if a person decides to follow a vegetarian or vegan diet then it is very important to make sure that they are getting enough of the following nutrients, and to ensure that they are including a mixture of non-animal sources in their diet in order to maintain optimum health:

1) **Protein**
2) **Selenium**
3) **Iron**
4) **Omega 3**
5) **Calcium**

Vegans
As a vegan diet excludes all animal products, including milk and dairy foods, honey and eggs a multi vitamin and mineral deficiency is more likely to occur, hence the individual should ensure that they obtain a sufficient intake of vitamins and minerals.

Cooking ideas
Vegetarians often find the meat-centric nature of many common dishes challenging with regards to choice and variety, therefore it is important to be able to provide some alternative foods as well as strategies to help non-vegetarians cooking for vegetarians. These alternatives are mainly for vegetarians, however they can also act as excellent healthy alternatives to common dishes for non-vegetarians. These may include:



- Vegetables quiches.
- Vegetable stir-fry with corn strips and noodles or rice.
- Cook extra portions of a vegetarian dish, freeze the leftovers and then use at a later date when the family meal is not suitable.
- Remove a portion of sauce for bolognaise, casserole or curry before adding the meat.
- Add green and brown lentils to the food as it gives the appearance of red meat.
- Request or cook a portion of pizza meat free.
- Rice dishes such a vegetable risotto with grated cheese, beans, vegetable pilau can be a tasty alternative.
- Tinned beans to be used with pasta or jacket potato filling.
- Vegetable burgers are often readily available instead of meat.

Aims of the section:
An examination of the main types of diets currently being used:

High protein diets
1) Understanding what the high protein diet is.
2) Understanding who can follow the high protein diet.
3) Understanding why the high protein diet works.
4) Understanding the dangers and problems with the high protein diet.
5) Understanding ketosis including its side effects.
6) Understanding the long term effects of excessive intake of protein.
7) Understanding the importance of checking protein sources.
8) Understanding the good sources of protein and the best methods of cooking.
9) Understanding how to choose carbs wisely, the dangers of fat and the eat-well plate.

Glycaemic index (GI) diets
10) Understanding what the Gl diet is.
11) Understanding the relation of fat to this type of diet.
12) Understanding the importance of food preparation to this type of diet.
13) Understanding GI charts.
14) Understanding the recommendations for how to follow this diet.

Liquid diets
15) Understanding what a liquid diet is.
16) Understanding how liquid diets work.
17) Examination of whether liquid diets really work including understanding their safety.
18) Understanding the side effects of liquid diets.
19) Understanding where liquid diets can be used effectively.
20) Understanding the practical steps needed and what to look for in a product.
21) Understanding how to transit back to a normal diet after usage.

pH balance diets
22) Understanding what a pH balance diet.
23) Understanding how such a diet can prevent disease.
24) Understanding how an acid imbalance can affect our body.
25) Understanding how to address the pH imbalance.
26) Understanding the general guidelines of addressing an imbalance.
27) Understanding the role of the nutrition adviser in such an exercise.

The low carbohydrate/high protein diet
High protein/low carbohydrate diets are very popular with many different versions of this diet being promoted. However there is a large amount of difference between the levels of carbohydrates, protein and other foods in these diets, some promoting meals with very high levels of protein and others not including any carbohydrates as well as fruit. In between each of these are diets

with different combinations of protein and carbohydrates. This variety has led to a lot of confusion as to what is a healthy balanced diet.

Studies have shown that for some people this can be a very effective way of losing weight and can kick start their weight loss if they are overweight or obese. However this diet is not suitable for everyone and is not a proven way of losing weight.

Studies have shown that including protein in your diet has been shown to increase the secretion of the PYY hormone which signals to the brain that you are full. Therefore brain receives less hunger stimulating hormone resulting in a reduced appetite as well as reduced food intake.

However it is important to note that initial weight loss on a low carbohydrate diet may be due to water loss, which can be caused by a high protein intake. When people follow such a diet, many people may lose weight just because they have reduced their calorie intake, due to the fact that they have eliminated their carbohydrate intake. This is because rather than replacing the carbohydrates that have been eliminated, they will just skip them all together. Removing foods that are high in carbohydrates can make a big difference because foods such as pasta, potatoes and rice are often eaten in large portion sizes.

Carbohydrates have an important function in our body, hence removing them completely or reducing them to dangerously low levels can have unhelpful consequences. They are an important source of energy for the body and fruit which are carbohydrate dense, such as bananas can provide essential fuel that is required by the body and will allow an individual to increase the intensity of their workout. Carbohydrates also provide nutrients such as B vitamins, particular the wholegrain variety, so those eliminating carbs altogether may risk deficiencies.

If you suddenly and drastically cut carbs, you may experience a variety of temporary health effects, including:

- Headache
- Bad breath
- Weakness
- Fatigue
- Constipation

Ketosis can occur if the diet becomes so unbalanced that less than 20g of carbs are consumed per day. In this situation, the body is breaking down the body's stored fat because it does not have enough sugar (glucose) for energy and thus ketones build up in the body. This can lead to headaches, mental fatigue, bad breath and nausea.

Obtain protein from healthy sources

Another aspect of the protein diet is the source of protein that is used. The sources of protein should be healthy as some protein diets actually promote the consumption of protein that is high in saturated fat. Saturated fat can have a very negative effect on our body and thus needs

to be avoided. These risks include high blood pressure, an elevated risk of developing diabetes or heart disease and of course they also lead to weight gain.

Healthy proteins should therefore be selected to be part of this diet, which are low in saturated fat and include:

- Legumes and beans such as lentils, kidney beans, peas and soy beans
- Soy products such as tofu and soy milk
- Nuts, for example almonds, walnuts, cashews and peanuts
- Seeds such as pumpkin, sunflower and flax
- Lean red meat
- Eggs
- Fish
- Chicken but not the skin
- Low fat dairy such as milk, yogurt and cottage cheese

When cooking this protein, extra fat should be limited or avoided if possible to help keep the protein healthy. Good methods of achieving this include dry frying, steaming, poaching, roasting with a little olive oil and grilling.

Ensure the diet is balanced
The following foods must be included in a balanced diet:

Fruit and vegetables
Part of a healthy high protein diet is to eat plenty of fruit and vegetables. They are low in calories and ensure that the diet is balanced, hence they should be included in most meals whilst on a high protein diet.

Choose carbs wisely
Although there are benefits to eating carbohydrates, it is important that the most appropriate types are chosen by making them as nutritious as possible. Whole-wheat pasta and brown rice should be chosen for maximum fibre and nutrients; these are examples of wholemeal carbohydrates, which can also help to ensure that sufficient fibre is included in the diet. Also highly refined carbohydrates and sugar, other than fruit should be avoided. Carbohydrates such as sweet foods, cakes, and white bread should all be avoided or chosen less frequently.

Fat
Even whilst on a diet, some fats are essential in the diet, however these should be polyunsaturated and monounsaturated fatty acids. Fish, (particularly oily ones such as sardines), seeds and nuts are both excellent sources of both protein and healthy fats as they help to protect against heart disease and other lifestyle diseases. These types of foods will improve the nutritional value of the diet.

In summary, follow 'The eatwell plate'
If a person decides to follow such a diet they need to ensure that they have enough fruit and vegetables, fibre, lean sources of protein, low intake of saturated fat but high intake of monounsaturated and polyunsaturated fats. The high protein diet can be healthy if the

individual is still having an adequate intake of carbohydrates and obtaining the correct nutrients to remain healthy.

Glycaemic Index (GI) Diets

This refers to a measurement of carbohydrates in food. In simple terms, the GI index tells us whether a food raises blood sugar levels dramatically, moderately or by just a small amount. The Glycaemic Index uses sugar as the reference point set at 100 and runs down to zero depending on the effect that an item of food has on the blood sugar levels of an individual. Those that have a slow and small effect will have a low GI, while those that cause a rapid and large increase in blood sugar will have a high GI value.

The theory is that when sugar is released slowly into the body, it provides a steady supply of energy and the body will be satisfied for longer without need to snack. However if there is a rapid rise in blood sugar, the body will very quickly return to feeling hungry and will therefore want to snack. This will lead to constant overeating. The GI diet focuses on foods which are low on the GI index and avoids those high on the index.

What to be aware of with this diet

The issue with this diet is that sometimes foods can be high in fat but low on the GI index, which helps explain why chocolate is low on the GI index, despite being high in fat. Also jacket potatoes are higher on the GI chart than high-fat crisps, whilst whole milk is low on the GI index as it contains a high level of proteins and fat.

The GI index does not take into account cooking and the amount of processing that has taken place. For fruits, it does not consider how ripeness which also affects its GI. The structure of the carbohydrate also has an effect because when instant oatmeal is processed, the starch is more easily exposed to the digestive enzymes, meaning that it will breakdown and enter the blood more quickly than traditional rolled oats.

High fibre foods are deemed to have a low GI value because the fibre acts as a physical barrier to the absorption of sugar into the blood. Therefore the combination of wholegrain foods with a low GI value and are low in fat and saturated fat are the best choices.

GI Charts

These are used to identify whether foods are low or high on the GI index and the effect that they have on blood sugar. However when a mixtures of foods is eaten in a meal, the GI value will change, however if the meal contains low GI value foods, the meal will be of low GI value.

The difficultly in identifying where foods are on the GI chart make the process of preparing a meal much more time consuming. Also as has been mentioned above, low GI value foods may be high in fat and may also be high in salt with few other nutrients. The example of chocolates and crisps have been given above which contain very few vitamins and minerals; a pack of 50g salted peanuts contains 5g salt which is most the maximum amount recommended to consume per day!

If an individual decides to follow such a diet the following should be considered:

1. The mixture of foods and overall GI of the food.
2. Avoiding foods that have no nutritional value.
3. Following "The eatwell plate" to ensure a balanced and varied diet.

GI diets do come with advice on how to reduce the consumption of fat. As an example they recommend skimmed over semi-skimmed milk. Also, most foods low down on GI tend to be healthier, nutrient rich, less processed and high in fibre, which when paired with protein can be very filling.

Liquid diets

Liquid diets work by controlling calorie intake through the restriction of what is eaten by consuming liquids only. The precise method varies from product to product with some having fluids only or replacing all meals with fruit and vegetables, which are consumed 3-4 times a day. The method can either be self-directed by buying the products over the counter or a medically supervised process, monitored by a doctor or dietitian.

Other liquid diets replace just 1 or 2 meals and then incorporate a healthy balanced dinner as part of the process. These diets may also include snack bars or soups or shakes, which can be eaten instead of a meal or as snacks in between meals.

Do liquid diets work?

Liquid diets work on the basis of significantly reducing the number of calories consumed. If you eat fewer calories than you burn, you will lose weight, however this weight loss may be short lived as the body's metabolism will slow down to conserve energy. So unless the individual changes their eating habits, they will regain the weight as soon as they return to their normal diet.

Research has shown that combining liquid diets with real healthy food can result in individuals controlling their intake. This can result in excellent weight loss results, showing that liquid diets work better over the long term than other diets.

Safety

Liquid diets should contain a balance of nutrients that are needed throughout the day, however often this is not always the case. If the diet is very low in calories with just 400-800 calories being consumed per day, it is likely to be lacking in essential nutrients. Such diets should only be done under medical supervision. This is because missing out these nutrients can lead to:

- Dizziness
- Gallstones
- Hair loss
- Electrolyte imbalance
- Fatigue
- Heart damage
- Intolerances

Additionally, a lack of fibre in the diet from not eating whole fruit and vegetables, can lead to constipation and other digestive problems. Furthermore, lean body mass can be lost if the individual does not obtain sufficient protein from their diet.

Uses of liquid diets

Some liquid diets are used for medical purposes. Individuals who are about to undergo surgical procedures such as colonoscopy require little or no food in the intestines and they might need to go on a liquid diet to help them achieve this target a few days before medical input. Sometimes patients are put on liquid diets a few days after surgery until their digestive tract is fully functioning once again and they can digest food normally. Liquid diets often include clear liquids such as soup and fruit juices.

Furthermore, those who require weight loss surgery may go down to a safer weight using liquid diets before the procedure is carried out. This type of liquid diet is supervised by medical professionals.

Practical advice to be given

Those individuals considering going on a liquid diet should first be advised to talk to their doctor about whether a liquid diet is appropriate for them. Certain people, including namely pregnant women should avoid liquid diets completely. Those who are diabetic or have a strenuous work or exercise routine should seek medical advice before use. Nursing women and people with insulin dependent diabetes, should skip liquid diets entirely.

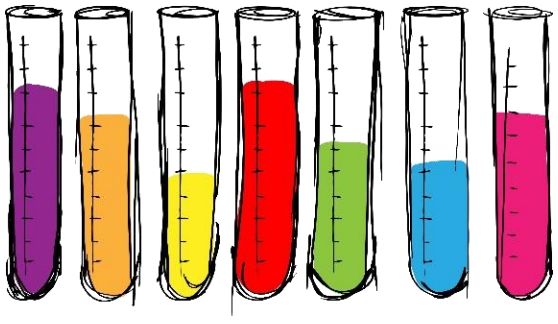
Once a diet has been approved by a doctor, a dietitian can play an essential role in ensuring that sufficient calories and nutrients are still being consumed. The dietitian may decide to recommend a vitamin supplement for optimal health whilst on this diet.

No liquid diet should be commenced before the individual is clear on what they are consuming. Even if the diet is a well-known commercial diet, they must first check the nutrition facts to ensure all required vitamins and minerals are being consumed.

Also, to avoid weight regain once the transition is made back to solid food, a diet not too low in calories should be considered to achieve gradual weight loss. Liquid diets including a meal or two per day, or that teach healthier eating habits, will be more likely to help keep the weight off over the long term.

pH balance diets

The pH balance diets describes a group of loosely related diets, based on the belief that foods affect the acidity of bodily fluids, including urine or blood, and can therefore be used to prevent or treat diseases. The acidity, measured by acidity of the fluid can range from 0 to 14 with a low pH corresponding to acidity and a high pH corresponding to alkaline and pH 7 being neutral.

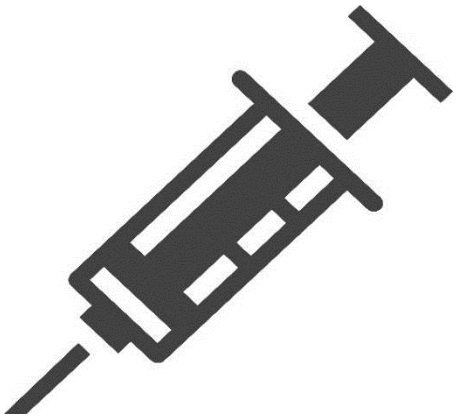


How does the pH balance relate to the food?

When we eat, some of the food we eat leave alkaline by-products (alkaline-forming foods), whilst other leave acidic by-products in the body (acid-forming foods). Hence any food can affect our pH. Those more acidic tend to be foods like fish, meat, eggs, most legumes (beans and peas, except lentils, which are alkaline-forming). Sugar, coffee, alcohol, and most grains are also acid-forming. Alkaline-forming foods include nearly all vegetables and fruits, many nuts and seeds, and spices.

Western diets
Research has shown that western diets have become more acid producing as we favour meat, sugars, grains, low-mineral processed foods, and other acid-forming foods and get far too few alkaline-forming vegetables, fruits, nuts, and seeds.

Link to disease
When we eat so much of the acid forming foods, the net result is that our eating patterns create a condition known as 'chronic low-grade metabolic acidosis'. Our body may occasionally be able to hand an acid load, in the long term this will exhaust our available alkalizing reserves.



Our blood is slightly alkaline with a normal pH level of between 7.35 and 7.45, our diet should reflect this pH and be slightly alkaline. High intake of acid producing food disrupts this balance and promotes loss of essential minerals such as potassium, magnesium, calcium and sodium as the body tries to restore the equilibrium. This imbalance makes people more prone to illnesses such as osteoporosis.

The solution
The solution to this problem is to follow an alkaline based diet which includes more fruit and vegetables, more seeds and nuts and to cut back on processed foods and sweets. The way to assess this is to understand how far the diet has shifted towards acidity. To assess this, the following symptoms can be spotted which include:

- Fatigue, feeling of being 'run down'
- Nonspecific aches and pains, especially in the bones and joints
- Weight gain
- Muscle weakness and loss of muscle
- Acid reflux or heartburn
- Kidney stones
- Urinary tract problems
- Poor digestion, irritable bowel, intestinal cramping
- Skin problems
- Receding gums
- Bone loss

The overall advice from this diet is to eat 80% of food from alkaline-forming foods and 20% from high protein foods and acid-forming foods. If symptoms improve or the pH balance improves following a urine or saliva test, the alkaline-forming part of the diet can be reduced to around 65%

The general advice for this diet is to focus on eating foods that are whole foods, particularly vegetables, root crops, and to a lesser degree, fruits, nuts, seeds, spices, whole grains, and beans (especially lentils). Processed and artificial foods, caffeine, white sugar, and white flour should be eliminated completely. However alkalizing beverages such as spring water and ginger root or green tea, and smaller amounts of essential fats, meat, fish, eggs, and dairy (if tolerated) should be included.

Aims of the section:

1) A background to understanding why religious diets are important
2) Understanding the Christian diet and its main restrictions
3) Understanding the Mormon diet and its main restrictions
4) Understanding the Hindu diet and its main restrictions
5) Understanding the Muslim diet and its main restrictions
6) Understanding the Buddhist diet and its main restrictions
7) Understanding the Jewish diet and its main restrictions
8) Understanding the Rastafarian diet and its main restrictions
9) Understanding the Seventh day Adventists diet and its main restrictions
10) Understanding the Sikh diet and its main restrictions

Introduction

Religious laws affect the eating habits of many people as they choose to eat or avoid food because of religion. Therefore it is important to understand these laws to know what dietary differences should be considered when planning a diet for a religious person.

However, not all religions have specific guidance of what should be consumed and here we will be focussing on the major world religions and discussing how they may impact an individual's diet based on information from.

Christianity

The religious requirements of Christians differ between denominations. Some Christians have no restrictions and others such as Catholics and Orthodox Christians have specific requirements such as fasting days on Good Friday or during Lent.

In earlier centuries meat and dairy products may have been avoided at certain times in the year, however now this may be limited to just eating fish on a Friday. For some Christians, consuming bread and wine is symbolic of the body and blood of Jesus Christ and depends on denomination. Therefore for many Christians, eating habits are not affected, however some may be vegetarians for moral reasons or not eat meat on a Friday.

Mormons

Mormons have additional restrictions such as not drinking tea, coffee or alcohol and an emphasis on maintaining wholesome eating.

Hinduism

Hinduism is one of most ancient religions and for Hindus, vegetarianism is applied as a way to respect life. As a result, Hindus avoid the killing of any animals and ensure that those preparing the food are cleansed in line with religious practices and the symbolism of certain foods.

In particular the cow is held in high regard as symbol of abundance and therefore Hindus do not eat cow's meat, however milk, butter and yoghurt may be eaten.

Prohibited for Hindus
Hindus therefore prohibit the following food:

- All meat except lamb, chicken or fish
- Strict Hindus are vegetarian
- Some do not eat domestic fowl, salted pork, milk, ghee, onions, garlic, eggs and coconut

Therefore for Hindus it is important to check the ingredients of certain products such as bread, biscuits, cheese and jam. Some Hindus also observe fasting out of respect or out of penance.

Many are vegetarians
Many Hindus are vegetarian, and therefore they need to check for meat, poultry, fish and eggs as well as checking for beef and beef products. Strict Hindus also exclude animal sources of fat and may also avoid onion, garlic, mushrooms, tea and coffee.

Islam
Islam has specific ritual slaughter procedures for animals of consumption and those animals which are not slaughtered according to the 'halal' procedures are forbidden for consumption. Other specific guidelines exist around fasting in Ramadan, the avoidance of pork and the forbidding of the consumption of alcohol. The two terms that are used to govern food are:

- Halal, which refers to foods that can be consumed.
- Haram, which are foods that should be avoided.

These terms of halal and haram are not just used for food and can be used for other practices as well.

Most foods are halal
Haram foods include pork, alcohol, also any animal meat or animal product e.g. animal fat, gelatines and margarine derived from animals not slaughtered using the halal slaughtering procedure. Additionally, bread and bread products fermented by yeast may contain alcohol may also be haram. Other than these foods, the majority of foods are halal and moderation in all things including eating and dietary habits is encouraged by Islam.

Summary of Islam
The following rules can be summarised as follows:

- The prohibited animal food is pork.
- Quran outlines what is eaten, the term halal refers to what is forbidden and those foods forbidden are referred to as haram.
- Beef, lamb and chicken are only eaten if the slaughtered through the halal method.
- The method is through slaughtering the animal and the blood drained from body. The primary goal is to perform what incurs least pain for the animal.
- Haram are foods forbidden.
- Pork, blood, alcohol and meat sacrificed to idols are also forbidden.

Ramadan
Within the Islamic calendar, one of the key periods is Ramadan which is the month where Muslims need to refrain from eating, drinking and smoking from sunrise to sunset. Ramadan is the 9th month of Islamic calendar.

Buddhism

Living beings are sacred and hence Buddhist translate this into vegetarianism and veganism. Buddhists believe that violence to animals is considered to translate into human aggression. Hence Buddhists maintain the principle of 'Ahimsa' that is harmlessness and to avoid all foods where harm was done. Some Buddhists also avoid meat and dairy products, with others only avoiding meat. There are also those that avoid alcohol and monks of the religion may fast during the day. During this time, they rely on donations as they are not allowed to cultivate, store or cook food.

Summary for what is prohibited

Buddhists should not be responsible for the death of any organism and are often strict vegetarian or vegan. Buddhists should also not consume alcohol.

Judaism

For Jews, foods are divided into kosher (allowed) and tereifa (forbidden). The characteristics of kosher foods are those that have completely split hoof and include cows, goats and sheep. For fish they must have fins and scales and all plant foods are kosher. For animals, specific slaughtering process must be followed for kosher meat and meat and dairy products should not be eaten, prepared or stored together.

For Jews, certain fasting days are also observed, including Yom Kippur. For the Passover, food helps to tell the story of how the children of Israel were led out of Egypt by over 3,000 years ago.

Summary of food laws for Judaism

A summary of the food forbidden to Jews include:

- The prohibited foods are pork, non-kosher lamb, beef and chicken.
- Torah outlines what is kosher and tereifa.
- Animals with split hoof and chew cud are considered kosher.
- Horses and pigs are also not kosher.
- Fish must have fins and scales. No shellfish or eels.
- All plant food is kosher unless damaged by rot or insects.
- When slaughtering animals, preparation must include the use of a single knife to kill the animal with all the blood must be drained. Meat is soaked in water and the salt is used to remove blood.
- Meat and dairy should not be consumed together.
- No food is prepared on the Sabbath, which commences at sundown on Friday to sundown on Saturday. The other period of fasting includes the Passover.

Rastafarians

Rastafarians are generally vegetarian or vegan and the food that is not allowed for consumption is referred to as ital. These foods are characterised by having no artificial colours, flavours or preservatives hence they are considered to be pure and natural. Also Rastafarians avoid alcohol, tea, coffee and other caffeinated drinks as they confuse the soul.

Seventh day Adventists

No pork, beef or lamb is consumed by Seventh Day Adventists. Many are Lacto-ovo vegetarians which mean that they also do not consume an animal flesh but may consume dairy or egg products. They also do not consume tea, coffee or alcohol.

Sikhism

Sikhs do not have many strict rules regarding food but many are vegetarians. Sikhs generally do consume alcohol and do not eat pork, beef, halal or kosher meat as they are not meant to take part in the religious rituals of other religions. Some older Sikhs fast when there is a full moon or special holidays, however most are discouraged from fasting.

Final word

Individuals make their food selections for different reasons and religion is one of the strongest principles on which diets are based. Regardless of an individual's views, one must follow a balanced diet and the nutrition adviser must help influence changes to the diet, whilst being sensitive to any religious views that an individual may have.

Aims of the section:

1) Understanding the food regulations requirements.
2) Understanding the requirements regarding the product name.
3) Understanding the requirements regarding the ingredient list.
4) Understanding the requirements regarding the stated quantity on the product.
5) Understanding what the main information included on packaging refers to.
6) Understanding how to know if a product is high in a particular category.
7) Understanding how to interpret the front of food packaging.
8) Understanding what reference intakes and the percentages on packaging mean.
9) Understanding the colour coding system.
10) Practical shopping tips relating to food labelling.

Introduction

In this section we will be talking in detail about food labelling, covering the terms, the conditions and what food labelling involves as well as what different food labels actually mean. We will demonstrate how to guide an individual through the different food labels so that they can effectively and independently understand what each food label contains.

Background to food labelling regulations

In 2011 a new Food Information for Consumers Regulation No 1160/2011(FIR) was published. The food regulations require that all food supplied either to the consumer or a catering establishment, must be labelled with:

- The name of the food.
- A list of the ingredients.
- An indication of durability, either through a best before or used by label.
- Any special storage conditions or conditions of use.
- The name and address of the manufacturer

In certain circumstances it may also be necessary to provide:

- Particulars of the place of origin of the food.
- Instructions for the food if it is difficult to make appropriate usage of the food in the absence of such instructions.

The product name

Having a clear and unambiguous name is essential to avoid confusing the consumer. For example Pilchards in tomato soup is both clear and unambiguous. Sometimes a non-descriptive brand is used such as with Marmite, however in this case some indication of the nature of the product must still be given, such as yeast extracts. Any processing that has been performed must also be clearly stated, such as ultra-heat treatment (UHT) on milk or smoked mackerel.

The rules also state that the name must not be misleading such as having a product that is called raspberry yoghurt but only putting raspberry flavouring and not real raspberries. The exception here is where the name is considered to be customary such as the example of cream crackers, where it is known that these do not actual contain cream and are therefore not considered misleading. Other products have strict rules for their usage such as margarine needing to contain 80% fat. If it contains less than 80%, it needs to be called a spread.

Ingredients list
Most pre-packed food products have a list of ingredients on the packaging or on an attached label. The ingredients list can help the consumer work out how healthy the product is. Ingredients are listed in descending order of content and weight so the main ingredients in the packaged food always come first. That means that if the first few ingredients are high-fat ingredients, such as cream, butter or oil, then the food in question is a high-fat food. If water is the first listed, then water is the largest in quantity

In 2000, the EC requirements for Quantitative Ingredients Declaration (QUID) strengthened that most foods products now have to state the quantity of ingredients if:

1. If a food appears in the name of the product and it is usually linked with the product by the consumer.
2. If there is a graphic, picture or word used and emphasised on the label.
3. If the item is essential to characterise it, so that it is distinguished from other products and not confused because of its appearance or its name.

Also the consumer should be able to compare the quality of similar foods. This is achieved if a product has a name such as 'beef and mushroom pizza' or 'Quorn sausages' where a declaration needs to be made regarding how much different foods are made from 'Quorn' or 'Beef'. This declaration needs to be next to the name of the food on the ingredient list and it should appear as a percentage, based on the amount of ingredient used.

Previously items considered to be allergens that made up less than 25% of the finished product did not need to be itemised separately. Milk, wheat or gluten could therefore appear in an ingredient list if it was below this level, which would make trying to avoid such ingredients difficult to achieve and problematic for individuals trying to avoid such substances. However a new EU directive came in to force in 2005 which meant that this 25% rule was abolished, to ensure that all allergenic ingredients are included in the ingredient list. There are 14 allergenic ingredients which must now be included on packaging:

- Celery.
- Cereals containing gluten.
- Crustaceans.
- Eggs.
- Fish.
- Lupin.
- Milk (including lactose).
- Mustard.
- Nuts (from trees).
- Peanuts.
- Sesame seeds.
- Soyabeans.
- Sulphur dioxide >10 ppm.

However, if an ingredient is derived from these allergens, but is processed such it does not contain allergenic proteins, they do not need to be explicitly stated in this way.

European legislation also specifically deals with foods which contain gluten for those who are intolerant to it. Specific levels of gluten are outlined which must confirm to the following criteria:

- Gluten free: if a food item is making this claim, the gluten must not be greater than 20 parts per million.
- Very low gluten: in this situation, the food making this claim must not exceed 100 parts per million. In practice, only cereal ingredients where there are special processes to remove the gluten, can make this claim.

How are nutrition labels read?
Nutrition labels are essential when assessing the level of fat, salt and added sugars in food and can be used to help consumers compare between different products. There is usually a nutrition label on the side or back of packaging for most pre-packed foods.

The calorie content of a food product is often what is viewed first on food packaging and this is included on food labels both as kilojoules (kJ) or kilocalories (kcal). Other nutritional information shown includes protein, carbohydrates and fat. Additional information may also be provided on fat, sodium, sugars, salt and fibre. This information is presented per 100g to allow for easy comparison but it is sometimes also presented per portion of food.

On the front of the packaging, supermarkets now have to highlight the energy, sugars, salt, fat and saturated fat content of the food and place them alongside the reference intake for each item (see below for further discussion). Using these nutrition labels, an individual can make their diet more balanced by:

1. Reducing their sugar, salt and fat, especially saturated fat intake.
2. Base meals around foods such as pasta, bread, potatoes, rice or any other starchy foods and to use wholegrain where possible.
3. Consume high quantities of fruit and vegetables with a variety of least five portions consumed per day.
4. To include some high protein foods such as fish, pulses, milk, dairy and also meat.

How do I know if a food is high in fat, saturated fat, sugar or salt?
It is important to know what makes a product high in sugar, salt, fat or saturated fat to ensure that these foods are consumed sparingly. For this the following guidelines should be followed:

Total fat
High: an item with more than 17.5g of fat per 100g
Low: an item with 3g of fat or less per 100g

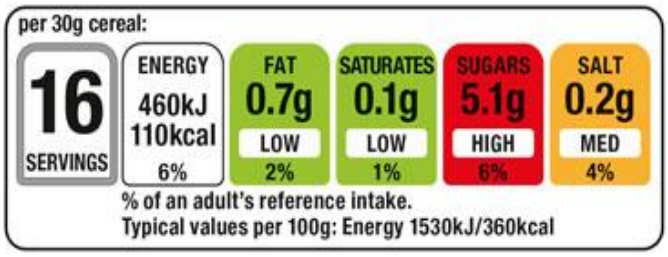
Saturated fat
High: an item with more than 5g of saturated fat per 100g
Low: an item with 1.5g of saturated fat or less per 100g

Sugars
High: an item with more than 22.5g of total sugars per 100g
Low: an item with 5g of total sugars or less per 100g

Salt
High: an item with more than 1.5g of salt per 100g (or 0.6g sodium)
Low: an item with 0.3g of salt or less per 100g (or 0.1g sodium)

As an example, an individual should try and limit their saturated fat intake to less than 5g per 100g if they are looking to cut down on saturated fat.

Nutrition labels on the front of packaging
As has been mentioned above, supermarkets place key nutritional information on the front of pre-packaged food and an example of this has been shown below:



The front-of-pack label shown above is an excellent quick guide for:

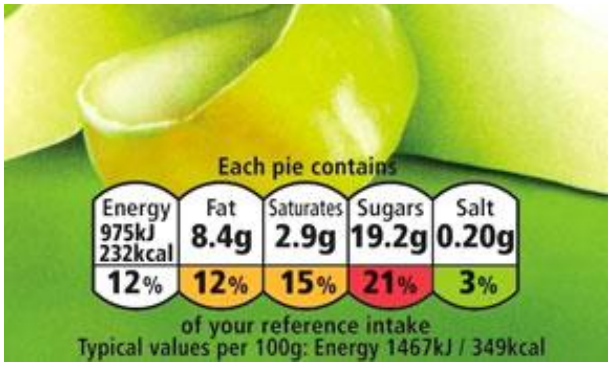
- Energy
- Fat content
- Saturated fat content
- Sugar content
- Salt content

As has been mentioned, these may be presented as a portion of food rather than per 100g. The example above has used 30g as its portion size, however it is important to note that the portion size of the manufacturer may actually be significantly different to the portion size of the consumer. Therefore when comparing foods, the nutritional information per 100g would be far more appropriate.

Reference intake (RI)
Nutrition labels can also provide information on how a particular food or drink product fits into your daily diet. Reference intakes are guidelines about the approximate amount of particular nutrients and energy required for a healthy diet.

RIs are not set as targets but rather they are useful indicators of how a quantity of energy or a particular nutrient can fit into an individual's diet. This is because everybody is an individual and thus will have different energy and nutrient requirements.

Previously the term 'guideline daily amounts' was being used and you may find that individuals still refer to these values using this name. However this has now been replaced with 'reference intakes' however the underlying principles have not changed.



A food label example from a pie

As an example, this pie contains 21% of an individual's daily sugar allowance, that is just over one fifth, as it contains 19.2g of sugar.

As a general rule, the percentages are measured against the RI's of an average sized woman who does an average amount of physical activity. This simplifies that labelling process and is also erring on the side of cause to avoid the risk of those with low energy requirements eating too much. Currently, these reference intake values are:

Energy:	8,400kJ/2,000kcal
Total fat:	70g
Saturates:	20g
Sugars:	90g
Salt:	6g

Red, amber and green colour-coding
The labels shown above also make use of the green, amber and red coding system. This is not used by all food manufacturers.

This can be very useful because it is designed to show you in an instance whether the product is deemed to be high, medium or low in terms of fat, saturated fat, sugars and salt. This makes it much easier for the consumer to decide on the spot whether the product is healthy or not. The labelling is split as follows:

- Red means high
- Amber means medium
- Green means low

In short, the more green(s) on the label, the healthier the choice. The labelling system is therefore quite easy to use. If a product has mostly green on the label then it is a healthy choice, but if it is amber, although the food may not be considered to be very healthy, you should be able to consume these most of the time. Products that are mostly red need to be avoided or at least reduced as it means that they are high in fat, saturated fat, salt or sugars and these are the foods we should cut down on. Try to eat these foods less often and in small amounts.

Food shopping tips
A general tip, if you are shopping and you are in a hurry, but you are still looking to make a healthy choice, make sure to at least check the label at the front of the pack. Be sure to pay particular attention to how much sugar, salt, fat and saturated fat can be found in the product.

If the product is colour coded, try and go for products that have more greens and amber in them if you are aiming to make healthier choices. Also remember that if the item you are purchasing is a ready meal, it is likely to be higher than a homemade meal in terms of energy and fat. Therefore it would be a more helpful choice to cook the meal at home, as you can still enjoy your favourite meal but can also make this meal healthier.

Aims of the section:

1) Understanding the terminology 'used by' and 'best before'
2) Understanding the storage instructions on packaging
3) Understanding when it is advisable to throw food away
4) Understanding display until and sell by
5) Understanding health claims such as 'low in energy'
6) Understanding the term 'low in fat', 'low in sugar', 'low in saturated fat' and 'low in sodium
7) Understanding the term 'light' or 'lite'
8) Understanding the term 'free'
9) Understanding how to determine if a food is a source of a nutrient
10) Understanding if a food is high or rich in a nutrient
11) Understanding the term 'no added sugar'
12) Understanding the term 'unsweetened'

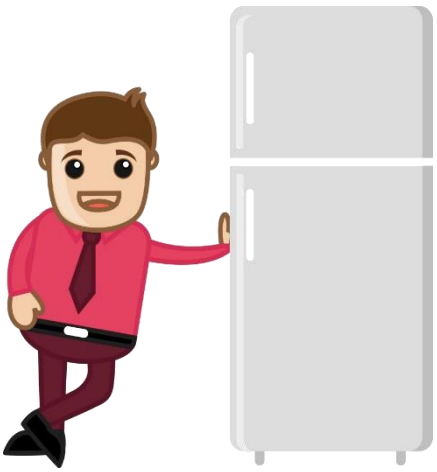
Introduction

We often see claims on products such as 'diet', 'light' or 'no added sugar', but what do these actually mean? In this section we will be reviewing the most common food labelling terms as health claims by understanding what they mean and how they are used in practice.

To be able to make healthy choices for our diet, we need to make sure that our food is safe to eat and the labels on the food should help us to achieve this. Understanding all of the information on the labels is essential and knowing the rules that govern what manufacturers can place on products will help us make more informed choices. There are clear guidelines that must be followed by manufacturers to ensure no false or misleading claims are made and clear rules for what labels on packets can and cannot show.

Use by date

'Use by' and 'best before' are used to indicate the durability of the product. There is an important difference between two terms. If an item of food goes off quickly, it will have a 'use by'. This includes food such as meat products, smoked fish and ready-prepared salads. It means that the product must be used by this date and after this date it should be assumed that the food is no longer safe to eat.



After the 'use by' date, the food may look or smell fine, however we should not use the food after this date, because doing so would be a health risk. Coupled with the 'use by' date are the storage instructions which need to be followed such as 'keep refrigerated'. Food poisoning may occur if the instructions are not followed as the food may spoil more quickly.

There may also be other instructions after opening an item of food with a used by date. For example it may say 'eat within three days of opening' however this will not apply if the 'use by' date is tomorrow. An item of food can be used beyond its 'use by' date if it is frozen, but the instructions on the food must still be followed such as 'cook from frozen' or 'defrost thoroughly before use and use within 24 hours'.

Best before date

Here the shelf life can last for years and can apply to various foods including tinned, dried and, canned foods, as well as breakfast cereals. After this date the food is not necessarily unsafe to eat, but there may be some deterioration in terms of the quality, texture and flavour of the food.

The core focus of 'best before' is quality and not safety and this will be noticed if the food is consumed beyond its best before date.

Eggs are an example of a product that can be eaten after its 'best before' as long as the egg is cooked thoroughly. This includes both the yolk and the white of the egg which both need solid and the same applies if they are included in a cake where they need to be cooked thoroughly.

This will ensure that all bacteria is killed, such as salmonella. As a more general point, the following at risk categories can eat eggs or foods with eggs in them as long as they have been cooked thoroughly:

- Toddlers and babies
- The elderly
- Pregnant women
- People who are already unwell

Awareness of what can be eaten and what needs to thrown away will help to reduce wastage as 7.2m tonnes of food and drink are thrown away each year, with the majority of this being edible. With the information above about the 'best before' date, we now know that much of our food does not need to be thrown away, as long as the storage instructions have been followed such as 'store in a cool dry place' or 'keep in the fridge once opened'.

Display until and sell by

Another date that is often found on foods is 'display until' or 'sell by' which is often placed next to or nearby the 'best before' or 'use by' date. These instructions are not for the consumer, but intended for the shop staff instead.

Health claims

Packaging often includes claims that the product helps to improve the health of an individual such as 'helps maintain a healthy heart', or 'helps aid digestion'.

In 2007, new rules were put in place to ensure that the nutritional claims were all based on science and to ensure that no misleading claims were given. Only specific claims approved by the European Commission can be used on food packaging.

It is not possible to make a general health claim such as 'healthy' or 'good for you' if there is not approved claim that accompanies it. There needs to be an explanation of why the food is healthy. Additionally, only licensed medicines can claim to prevent, treat or cure a disease or medical condition.

The main claims and what they mean

Here are some of the main health claims that are made on products (EU regulation (EC) 2006:

Reduced in a nutrient
If a product claims that it is reduced in a particular nutrient, it must be 25% less than a comparable product and may include; energy, fat, sugar or sodium.

Low in a nutrient
If a product claims to be low in nutrient than it must be less than a specified amount per 100g or serving of food. So for example, if a product is low in energy, than it must contain less than 40 calories per 100g or less than 20 calories per 100ml. However there is a separate criteria for low calorie soft drinks which must not contain more than 10kcal per 100g.

Low fat
To claim that a food is low in fat, the product must not contain any more than 3g of fat per 100g or 1.5g per 100ml for liquids. ~~100ml for liquids.~~

Low in sugar
This is if sugar is less than 5g per 100g or 2.5 g of sugars per 100ml.

Low in saturated fat
This is if saturated fat is less than 1.5g per 100g or 0.75g per 100ml and trans-fatty acids are less than 10% of total energy.

Low in sodium
This is if sodium is less than less than 0.12g per 100g or 100ml.

Light or diet
For a product to be considered to be 'light' or 'diet', one of components such as calories or fat needs to be at least 30% lower than a standard product. The label also needs to clearly show what it has been reduced by e.g. 'light: 30% less fat'.

However sometimes this can be used as a marketing trick where although a product is 30% lower in one typical value, the 'light' packet of crisps may still contain the same calories as the standard brand. Always check the label as tempting treats such as biscuits can have more calories than you think.

Free
If a product claims to be free of a nutrient, this means that it contains none of the particular nutrient per 100g. For each nutrient this means:

- Fat free less than 0.5g per 100g
- Saturated fat free 0.1g per 100g
- Sugar free less than 0.5g per
- Sodium free less than 5mg per 100g

Source of a nutrient
If a product claims to be a source of a particular nutrient, then it is claiming to have more than a specific amount of nutrient per 100g and serving. For different nutrients this would mean:

- Protein: more than 12% energy from protein and more than 12g.
- Vitamin: 15% of RDA (recommended daily allowance) of vitamin or mineral.
- Fibre: more than 3g per 100g of expected daily intake.

High or rich
If a product claims to be high or rich in a particular nutrient, which means that it has more than a specific amount in 100g or serving of the product. For example:

- If a product contains more than 20% from protein and more than 12g it is considered to be high or rich in protein.
- For vitamins or minerals, the food will provide 30% of RDA.
- For fibre, this means that the product contains more than 6g per 100g of expected daily intake.

Other common terms

No added sugar
This refers to the ingredients that are added to the food and does not mean that the product does not contain any sugar.

The ingredient list will tell the consumer what ingredients have been used and they may include types of sweetener and sugar. You can often find information about the sugar in the food on nutrition label.

So what does no added sugar actually mean? This usually means that the food has not had sugar added to it as an ingredient. A food that has 'no added sugar' might still taste sweet and can still contain sugar. This is because sugars occur naturally in food such as fruit and milk. But we don't need to cut down on these types of sugar, it is food containing added sugars that we should be cutting down on.

It is important to remember that 'no added sugar' may be used as a marketing trick, because the product may not actually be low in sugar. Remember that naturally occurring sugars such as the sugar in fruit e.g. fructose or the sugar in milk known as lactose may still be found within the product.

Unsweetened
This does not mean that the product does not contain naturally occurring sugar from fruit or milk. All it means is that no sugar or sweeteners has been added to the food to make it taste sweet.

Overall point
Regardless of what term is being used, to get the whole picture of the product being purchased and compare to similar foods, a closer look at the nutrition label will need to be considered. For comparisons the easiest method is to look at the amounts per 100g rather than per serving.

Aims of the section:

1) Understand the sensory reasons behind overeating
2) Understand the psychological reasons behind overeating
3) Understand the social reasons behind overeating
4) Understand the financial reasons behind overeating
5) Understand the habitual reasons behind overeating
6) Understanding other reasons for why they eat
7) Understanding how to give dietary advice with a detailed discussion of motivation
8) Understanding what to do if the individual suffers from a disease
9) Understanding how to explain the distant benefits and understanding readiness to change
10) Understanding how to build up knowledge and understanding and delivery methods
11) Understanding how to correct misinformation
12) Understanding how to increase acceptability of any advice given
13) Understanding how to increase achievability by the client
14) Understanding how to set targets for clients
15) Understanding how to provide support to the clients
16) Understanding the importance of communication

Why do people overeat?

Before giving any dietary advice, it is important to understand the reasons behind why people overeat. People tend to overeat because of six reasons:

1) **Physiological need:** people eat when they are hungry or because they do not feel satiated from an earlier meal. This is usually the case when people start snacking.
2) **Sensory appeal:** people also overeat for sensory reasons such as appearance, smell, taste, texture and other positive emotions associated with the food or the location.
3) **Psychological influences:** this may include boredom, depression, comfort eating, high levels of stress or feelings of rejection.
4) **Socials factors:** social norms play a big part in our motivations for eating whether these are religious festivals, holiday breaks or just peer pressure.
5) **Financial concerns:** it is less common in the Western countries to find not eating due to financial constraints, however it is more common to find those on a low income purchasing cheap very unhealthy food. Those on good levels of income may also excessively spend on food.
6) **Habitual reasons:** some people eat for habitual rather than physical hunger such as boredom and some may be unconsciously aware of their oral intake which can result in eating outside of physical hunger.

Giving nutritional advice

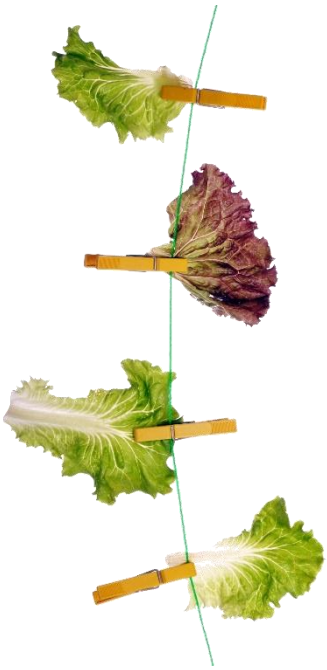
There is no purpose in giving advice to an individual that cannot be followed, no matter how sophisticated or appropriate this advice is. The advice must be tailored to the particular individual being addressed, for the advice to be followed.

Food is an integral part of life, hence asking an individual to change their food habits means that the individual must change their way of life which often is resisted due to the process being disruptive. Unlike taking medicine, eating is not an adjunct to life and hence the difficulties of achieving change should not be underestimated. Food habits evolve slowly over a long period of time and thus become deeply ingrained leading to change being resisted. If disruption can be kept to a minimum, change is more likely to occur.

If nutritional recommendations are to be implemented, the advice needs to be appropriate for the individual's needs and circumstances

Food habits are influenced by external factors and although people do eat to obtain the essential nutrients required for their survival and for healthy living, this is only a small aspect of their decision making process. For some people, this plays no part at all but instead some people choose a particular food because for them it is seen to be:

- Enjoyable
- Available
- Affordable
- Habit; what they have always chosen to eat
- Convenient
- Provides comfort
- Given to them



These particular choices are indeed influenced by a number of other factors such as:

- Cultural reasons
- Ethical or religious beliefs
- Personal taste preferences
- Income levels
- Lifestyle and occupation
- Health status
- Social norms
- Pressure from peers and family
- Influences from advertising
- Knowledge or beliefs about diet and food
- Familiarity and habit

So as to achieve effective change in an individual's dietary habits, which have evolved due to the above influences, the following conditions need to be met.

Motivation
Dietary changes can cause disruption therefore some may only consider to make such changes if they consider them to be justified. Therefore outlining the benefits of each proposed change and creating awareness of why change is necessary is essential for success.

If an individual is being asked to avert an event which may or may not occur in the distant future, such as cancer, cardiovascular disease or osteoporosis, it can be difficult to motivate such an individual. The key reason is that there is no real guarantee of ultimate benefit and hence nothing can promised, whilst at the same time, major changes to their lifestyle are being requested. The only thing that can be promised is that there is a reduced risk. Whilst the argument for such a change my be very strong, the individual may view them as poor in comparison to the practical change needed to make such changes. Therefore is it important that the individual is ready to change and hence an assessment is essential before providing any advice. This advice can be pointless or even counterproductive if the individual is not yet ready to change; they need to be in a position where they are receptive to such advice.

Knowledge and understanding

Once an individual is ready to make dietary changes, they can only do so if they know what changes they need to make. The individual needs to understand the guidance that they are being given by being in a language that they can understand and how this is done will differ in every situation. This involves using terms that can be understood by the person. Scientific jargon and nutrients may need to be avoided as the individual is more likely to be able to relate food choice and meal planning. Also the quantity of information has to be appropriate to the individual. Some individuals prefer to be given a large amount of detailed information whilst others can only process one or two very simple messages. The method of delivering the message is also important as some individuals prefer the use of audio-visual or interactive methods, others prefer one-to-one tuition and some prefer information to be written down. Also, some individuals feel more comfortable and less threatened in a group setting.

Other sources of information may have also had a great impact on the individual which need to be corrected. People are bombarded on a daily basis with information about nutrition from the television, newspapers, magazines, diet books, advertising and the opinions of family and friends. The additional problem is that this information is often confusing, conflicting and may even be wrong, but it can still have a great impact on the individual's dietary and lifestyle beliefs.

Acceptability

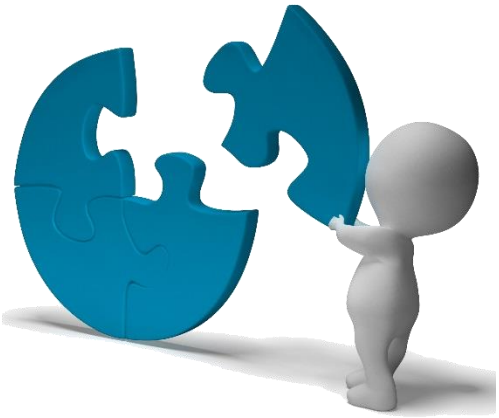
An individual may be motivated to make change and can have all the necessary knowledge to do so, however unless these dietary changes are

acceptable to the individual, they will not take place. For successful implementation, the following dietary advice will need to be taken into account:

- Preferences: if the individual or their family does not like to eat a particular food, they will not implement the dietary advice.
- Constraints: the food needs to be acceptable culturally, religiously and ethically to be implemented.
- Availability: if the food is not available for purchase, the dietary advice will not be implemented.
- Income: if the food is not affordable or the individual is on low income, they may be reluctant to experiment with unfamiliar foods.
- Practicality: the time, effort or complexity needed to prepare the food should not be an overburden.

The key to making dietary change is to make sure that the individual's current diet is understood. This will result in knowing the individuals problems, needs and customary eating habits which in turn will set the starting point for dietary change.

Achievability



A common mistake individuals make is to set their goals too high and thus make them unachievable. Habits are not changed overnight, hence dietary modification is a gradual process of adjustment.

The 'desired objectives' are not always the same as 'reasonable targets'. A long term goal could be to achieve a 50% dietary energy intake level from carbohydrates and less than 35% from fat, however this may unachievable for certain individuals, at least in the short term. In these situations, it may be more appropriate to perform a few simple dietary changes which help move in the right direction.

It is also important to start from where a person is and not where they would like to be. It is counterproductive to set unrealistic expectations that will discourage people because they are out of reach. In these situations people have become discouraged or in worst case, they may abandon their efforts all together. It is therefore important to make goals achievable and get the balance right between the dietary objective and judgement.

To make the goals achievable, the following steps should be considered:

1. Focus on the most significant objectives as it is far better to achieve two or three significant alternations than to fail with all the objectives set.
2. The goals should be realistic especially short-term goals, as long-term goals are much harder to achieve.
3. Adapt existing food habits rather than aiming to get rid of them completely. There will always be some changes which are compatible with existing food habits. The focus should be here rather than completely dismissing all existing habits.
4. The advice given should be positive and not just focus on what needs to be avoided. For example an emphasis should be given to 'suitable' foods and 'alternative' choices.
5. Be patient with the individual and do not expect too much, too quickly as change will take time.

Support

Constant support is required for individuals as change is unlikely to occur from just a single consultation. Dietary information may be very interesting to those attending a group session and may stimulate their interest however for significant change to take place, there needs to be further intervention. If advice is given on a one-to-one basis, this needs to be regularly followed up to help reinforce motivation, expand the knowledge base of the individual, assess the impact and take an overall view of progress.

It is not enough to just have food lists, good explanatory literature and other education tools. They may be helpful but insufficient on their own.

Sometimes questions come to mind after an individual leaves the consultation and motivation my dip, hence having regular support will provide a platform for these questions to be addressed and a chance to address problems and to reinforce the advice that has been given. It is essential to provide a contact point and regular follow up for further advice and support.

Communication

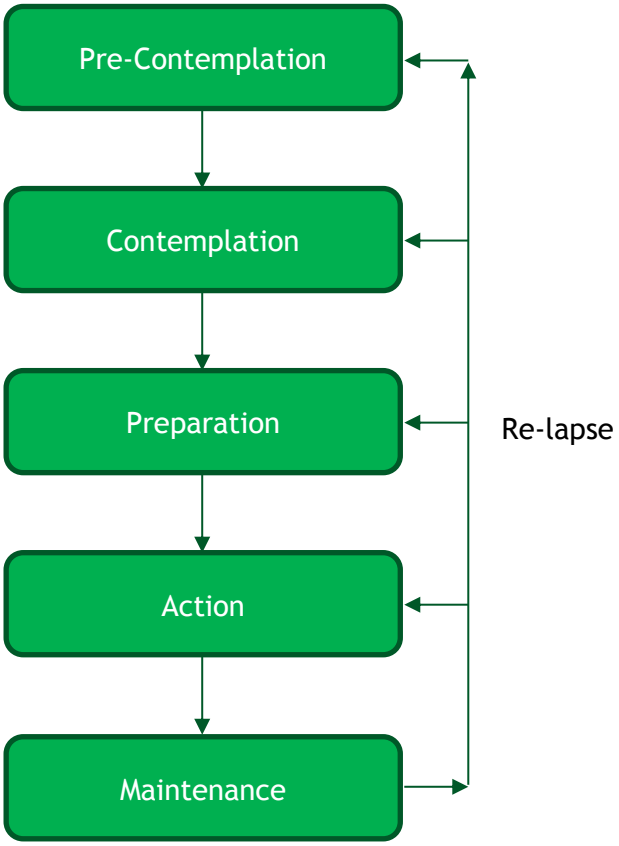
Different results are achieved based on how dietary advice is communicated. There needs to be a climate of disclosure, interactive dialogue and trust for the dietary advice to be implemented effectively and for the problems to be identified and overcome. To achieve this, the person should have good counselling skills and a strong understanding of human behaviour.

Aims of the section:

a) Understanding behavioural change strategies
b) Understanding the 6 stages of the behavioural change cycle
c) Understanding how to assess readiness to change
d) Understanding motivation and motivational interviewing
e) Understanding the pre-contemplation stage and the four key elements required
f) Understanding when a client becomes aware
g) Understanding what issues can block progress and how to implement various techniques
h) Understand what is required during the preparation stage
i) Understand what potential barriers could prevent change
j) Understand the process of changing and how to increase the success rate
k) Understanding how to set SMART goals
l) Understanding the action stage of the cycle
m) Understanding the stimulus control
n) Understanding self-monitoring and self-control
o) Understanding how to reward and reinforce behaviours
p) Understanding how to maintain the changes introduced
q) Understanding the risk of lapse and how to prevent re-lapse
r) Understanding how to change negative cognitions

Applying behavioural change strategies to clinical challenges

It is important to understand human behaviour and to do so, there are different behavioural change models that can be used to achieve this. These models provide a foundation for applying skills and a way of categorising reality from a certain viewpoint. However there is no perfect model and people are always varied. These models are therefore only guides to human reality and should not be seen as absolute. Interest in models of health behaviour has been increasing, however there is no one model that is considered thoroughly reliable. However of the most popular models currently being used is the Pro-chaska and DiClemente stages of change model. This model describes a series of six stages which people pass through when they are trying to make changes in their lives. See next page for diagram.



Prochaska and DiClemente found that these stages occur naturally without formal intervention in people who make successful changes and the educator's role is to facilitate a natural change process. A successful outcome can be defined as moving the individual around the cycle of change, which can be repeated several times before achieving a stable change. As different processes are at each stage, the nutrition adviser needs to employ different strategies depending on where clients are in the cycle of change. In order to ensure strategies are appropriately matched to the individual's stage of change, it is important to establish a client's readiness to change and location in the change process before proceeding with the intervention. This will help to avoid resistance, which can occur when inappropriate strategies for a particular stage of change are applied.

For example, attempting directly to persuade someone who is uninterested in change is likely to lead to some form of resistance and indeed can increase it. The "you really need to cut your fat intake down…" is likely to result in the counterproductive "yes, but…". Later we will discuss how to assess what the various stages at which an individual can be and how to adjust your advice accordingly.

The first challenge in the process of change is motivational; motivation can be understood as a person's present state of readiness for change. People often may not be highly motivated to change their dietary behaviour in the first place and, secondly, once they have started treatment they can stop midway. This has led to a growing interest in methods to motivate those who are reluctant to change. Motivational interviewing (MI) consists of a range of therapeutic strategies to motivate people to work through ambivalence about behaviour change, build commitment and reach a decision to change if appropriate. MI strategies are most appropriate in the pre-contemplation and

contemplation stages of change, although ambivalence often persists or re-emerges during the action stage. Certain strategies are therefore useful throughout the process, providing a motivational foundation for cognitive and behavioural strategies.

Cognitive and behavioural approaches offer key methods to help people to build confidence and make continued and sustained behaviour change. There have been effective nutritionally related self-help manuals developed based on these strategies in a range of areas, most notably for use with clients in obesity and eating disorders as well as treatment manuals for health professionals.

Pre-contemplation - Encouraging the possibility of change

Individuals who are not aware of the fact that they have a problem do not think seriously about changing their habits, even though others might recognise the need, and seldom present for treatment. For example an individual has been brought along by a family member to a healthy eating cooking class but the person has not made their own decision to attend it out of choice. The task at this stage is to create doubt or concern in the client about their health or their unhealthy behaviour. Motivation for change can only begin when a person perceives a discrepancy between where they are and where they would like to be. Clients in this stage of change need information and feedback to raise awareness of the problem and the possibility of change; launching into giving advice at this stage is likely to be met with resistance.

People will be motivated to change their lifestyle when they know what problems are caused by their behaviour and are concerned, whilst feeling positive about themselves and competent to make a change. A combination of four key elements is required:

1) Knowledge of the problems caused by their behaviour.
2) Concern about these problems.
3) Self-esteem; being confident about themselves.
4) Competence; self-efficacy.

When a person who is unaware of having a problem becomes more aware of it, this can be accompanied by a lowering of self-esteem as they realise that they have been doing something to themselves, which has endangered their health. Therefore, caution has to be taken to build self-esteem as awareness is increased.

Overall, an individual's progress may be blocked by various factors including a lack of awareness or concern regarding their issue or their problem, low self-esteem or their lack of faith in their ability to implement the required changes (low self-efficacy), and raising awareness in these domains will make change more likely. For example, those who are not concerned about their behaviour, and are unaware of its impact are unlikely to change. The application of these techniques provides the opportunity for the individual to develop all of these areas to an equilibrium and ultimately acquire the confidence in their ability to make successful changes.

Contemplation - Tipping the balance in favour of change

A person who is thinking about change may realise that there is a problem and that change is needed. However, although some thought may have been given to the potential gains and losses if change were made, the actual decision to change has not yet been made. This sort of ambivalence is a normal part of human behaviour. These individuals often express a desire to change which is not matched by their actions. In this situation, they may need support to weigh up the personal advantages and disadvantages of changing a specific behaviour against those of no change. This process helps to build motivation for change.

For example, an individual who likes to eat chips; the first thing to consider exploring would be what they like about it, for example taste or that it is enjoyable to eat. They then could consider what concerns them about continuing to eat chips such as weight gain or dyslipidaemia. They could consider the advantages such as weight loss, lower lipids and the disadvantages such as eating less of their favourite food. This process can be done verbally or on paper. A decision not to change is a viable option as it may be better not to start to make changes if they are not ready. Alternatively, if they have already tried and failed many times, a further half-hearted attempt and failure might reinforce an already low self-esteem.

As unhelpful eating behaviours are often underestimated, encouraging self-monitoring to start as soon as possible helps to demonstrate the extent of the problem and can thereby sometimes increase readiness for change.

Preparation - exploring options for change and choosing, the best course of action

A person, who is still weighing up the options for change, will eventually decide either to make active changes or not to go any further. The task for the educator at this stage is to recognise that a window of opportunity is open and that it is time for action. If a commitment to change has been made with the individual then it is helpful to explore the advantages and disadvantages of implementing a whole range of change options. The task is not so much to motivate change but to help determine a suitable course of action. Common perceived barriers include the lack of cooking skills, lack of food-storage or cooking facilities, low income, financial priorities other than food and health, food preferences, social and time constraints.

Making changes to eating habits usually means changing long-established habits related to shopping, cooking and eating. When changes to lifestyle are being planned, the key to success is thinking or planning beforehand. This can help by drawing attention to problems or difficulties that may be possible to sort out in advance, and it makes revising the plan easier if they know clearly what they are expecting of themselves. There are things, which can be done before trying to make changes to make it more likely that the change will be successful. From an early stage it is also helpful to consider alternatives to current unhelpful behaviour such as rewards for successful changes and strategies for maintaining changes.

It is important to address the difficulties and barriers related to change and to generate solutions to perceived barriers themselves. This helps to increase confidence, competence and

self-esteem and to emphasise that there is no single right option for change, rather it is a question of experimenting to find what works best for each individual.

Setting behavioural goals

Setting appropriate behavioural goals is key to achieving successful outcome. Setting an unrealistic goal can set up for failure and may lead to blame being attributed to personal shortcomings rather than the shortcomings of the treatment and lead to undervaluing achievement. It is important to encourage a discussion rather than telling an individual what to do with regards to change. There needs to be a focus on the small steps towards achieving any goal. Good goals can be defined by the acronym SMART:

Specific: 'for a goal of wanting to eat less fat, I will spread butter more thinly on my bread'.
Measurable: 'I'm going to eat five portions of fruit and vegetables each day'.
Achievable and realistic: setting realistic goals means aiming for something that can be achieved and then working up gradually to what might be desired. For example someone who eats two bars of chocolate each day could start by cutting down to one chocolate bar per day.
Relevant to the goal of treatment: if the aim of the treatment is to decrease fat intake, the focus would be to concentrate on eating foods which are low in fat.
Time specific: setting a goal to be achieved within an agreed time-frame, to include times where the goals are periodically reviewed.

For a goal to make a difference in the time set to be achievable, it needs to be as far-reaching as possible. For example, if the main goal is to reduce fat intake, the main dietary source of fat intake needs to be identified and reduced to a level that will make a difference. If fried foods are eaten daily, an appropriate weekly goal may be to use fat-free methods of cooking. This would have a bigger effect than a goal of, for instance, not eating doughnuts if these are only consumed once a fortnight. To ensure that it is realistic, only two or three specific, realistic and achievable goals should be given per sitting and may be further divided into a series of smaller steps towards the larger goal. Successful negotiation of each of the smaller steps gives a sense of achievement to keep motivated in the long term.

Action - helping people to make successful changes

This is the stage that is traditionally most heavily emphasised by health advisers who often assume that each person they treat is immediately ready for this active change process. In this stage, the individual takes action to bring about a particular change. Once they start to make changes, they tend to re-evaluate whether the change is worth the effort. At this point it becomes important to focus on how best to implement changes and develop strategies for coping with temptations to return to old behaviour. In this stage, help is required in the following four areas:

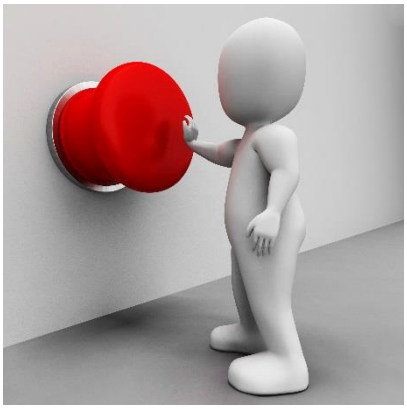
a) Stimulus control
b) Learned self-control
c) Self-monitoring

d) Rewarding and reinforcing desired behaviours

a) Stimulus control

Stimulus control consists of changing the environment to decrease exposure to triggers or stimuli, which make unhelpful behaviour likely to happen, or increase exposure to triggers/stimuli, which make the desired new behaviour likely to happen. A number of triggers both internal (e.g. feelings, thoughts, beliefs), and external (events and situations), can start a behaviour happening. Although, triggers causing unhelpful behaviours in any set of circumstances, may need to be identified and a strategy designed to influence behaviour in a positive direction.

b) Learned self-control



In the short term situations which lead to inappropriate eating, can be avoided by reducing exposure to these triggers. In the long term, it is important to have a plan to respond to triggers in a way that does not lead to a lapse in eating behaviour.

Over a period of time, those who overeat can be guided to expose themselves gradually for longer periods to foods which trigger an urge to overeat. They can learn to resist and tolerate the associated discomfort. Learning to resist the temptation can enhance self-confidence.

Learned self-control strategies include:

- Setting homework assignments over a period of weeks of gradual exposure to a trigger food, progressing through the least difficult foods to the most difficult foods.
- Practising relaxation strategies to manage emotional disturbances.

c) Self-monitoring

As individuals often have difficulty identifying what triggers their unhelpful eating behaviours, self-monitoring using a diary is a key part of both the assessment and treatment. It involves systematic observation and recording of target behaviours, i.e. the external (people, events, places) and internal (feelings, thoughts) conditions, which trigger lapses from the planned behaviour. Although there is a tendency to report dietary intake inaccurately, the prime purpose of self-monitoring is to increase self-awareness of their own behaviour and to highlight new problems. This forms an essential basis for planning and monitoring change. The self-monitoring process in itself has also been shown to be beneficial in changing food intake, albeit in the short term.

Self-monitoring can be used, for example, to identify:

- Time of eating
- Events happening prior to eating
- Place of eating
- With whom eating occurs
- Feelings or mood before and after eating i.e. bored, lonely, happy, sad etc.

Difficulty in keeping to the self-monitoring process suggests that unresolved motivational issues exist and need to be addressed before the more active phase of the treatment can be effective.

d) Rewarding and reinforcing desired behaviours

The frequency with which a positive behaviour occurs can be increased or decreased by what happens after it. For example, if a person has become very ill after eating a certain food, it is unlikely that they will want to eat that food again for some considerable time. In contrast, a positive experience, such as praise from a friend after eating a food on the dietary plan, makes it more likely an individual will repeat this behaviour at another time.

Once dietary goals have been established, the next step is to identify ways to reward on a regular basis when the desirable change has been achieved. Suitable rewards may be doing enjoyable leisure-time activities and hobbies, being with favourite people, buying small things, or doing an activity, which is relaxing or fun. Rewards help to reinforce the new behaviour thus making it more likely to happen again. It is helpful to focus on the achievement, however small, and personally congratulate for every small step taken. The importance of this cannot be underestimated as it is common to focus on their failures without acknowledging achievements especially after having a slip up or set back concerning dietary and lifestyle changes. If pleasurable and rewarding eating habits are those which are to be changed, new and pleasurable non-food rewards will need to be established. Care should also be taken that where eating changes are being made, they are as pleasurable as possible for them to be self-reinforcing. If eating chocolate and biscuits is a habit then it is important to find other enjoyable substitutes e.g. reading a book or phoning a friend. It may take time to adjust to these non-food related rewards.

Maintenance - consolidating changes achieved

From the moment changes are actively started and desired outcomes are achieved, the challenge is maintenance. This requires another set of skills and a consolidation period of at least 6 months and addressing this vital element can often be neglected. Once preoccupation with a possible relapse disappears, this is considered as a step out of the cycle of change as the new behaviour becomes a permanently established feature of lifestyle. To maximize the chances of this being achieved, the therapeutic focus needs to be on preventing lapses as well as continuing to apply all of the relevant strategies developed in the planning and action stages of change.

The most likely outcome for anyone who tries to change their diet is relapse. A lapse can be defined as a one-off deviation from a new eating behaviour, a mistake or a slip; a relapse is often defined as a string of lapses that occur over a short period; a collapse is a complete return to previous eating behaviours.

Everybody who attempts to change their behaviour occasionally finds that they have eaten something which does not fit in with their plan. These one-off slip-ups, or lapses, often lead to feelings of guilt, which make a person more susceptible to other slips. This may result in relapse and can eventually lead to them abandoning their changes altogether, with a return to previous patterns. To avoid this, it is important to consider a new understanding as how they think about lapses will determine the outcome.

It is advised to identify what triggers lead to a lapse so that plans can be made in advance to prevent them, rather than just relying on willpower. A list of coping strategies can be established which can be accessed when necessary, similar to a first-aid plan.

This stage of change is an opportunity to review progress to date, with both its positive and negative effects. The aim is to increase confidence for coping with unavoidable lapses.

Relapse - preventing lapses from becoming relapses. Those who have relapsed or collapsed after a succession of lapses generally return to weighing up the advantages and disadvantages of change. At this stage, those who have been unsuccessful at coping with high-risk situations may view themselves as failures. To avoid this it is important to see the causes of the relapse as attributable to controllable external factors and renew commitment to, and confidence about, change. Otherwise, this can encourage return if and when felt ready.

Successful behaviour change includes careful management of lapses when they do occur. However, the way in which an individual copes once having lapsed can affect whether a lapse becomes a relapse or not.

Changing negative cognitions

The way in which a person thinks about a lapse often determines what they do next and whether lapse leads to relapse. Thoughts can both trigger and suppress behaviours. For example, thinking "I've slipped up and blown it completely, I may as well not bother any more" is likely to result in eating more and lead to relapse or even collapse. In contrast, thinking a more helpful thought, such as "It's a shame that I've slipped, I'll do some extra exercise to compensate, and think about ways to stop myself slipping again", gives a greater chance of returning to the eating plan and stopping the slip becoming a fall. Thoughts can be like traps: they can knock a person off their agreed course of action and they tend to make the situation worse, not better. It is helpful to identify negative thoughts which frequently arise in a situation and to decrease or replace these with helpful, coping thoughts. Where more pervasive unhelpful ways of looking at the self, the world or the future exist, then support from a wider team may be helpful such as psychological support.

Aims of the section:

1) Explaining some practical steps to facilitate behavioural change
2) Understanding the concept of stimulus control
3) Understanding how to implement various strategies to change
4) Understanding how to control internal triggers
5) Understanding how to control external triggers
6) Understand how to use plans and activities
7) Understanding how to deal with food servings, holidays and parties
8) Understanding how to perform self-monitoring
9) Understanding how to control eating behaviour
10) Understanding how to reward successful behaviour and how they should be delivered
11) Understanding how to deliver nutrition education
12) Understand how to incorporate physical activity into lifestyle changes
13) Understand what cognitive restructuring is
14) Understand how to manage relapses

Introduction

This section deals with practical tips for behavioural change and how they can be implemented into an individual's daily routine. Some of these tips are dietary tips, with others being behavioural and lifestyle issues. Overall, such an approach is essential as research shows that taking a wider view is essential, rather than just focussing on weight loss alone. It is generally agreed that the essential components for successful change are:

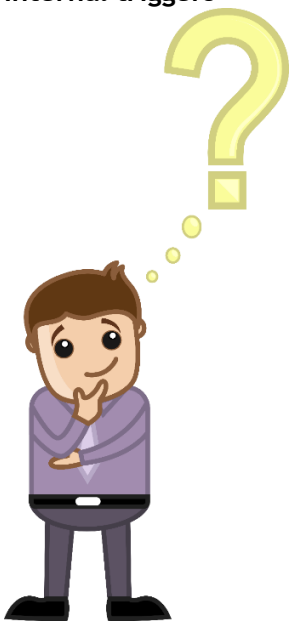
1) Dietary modification
2) Physical activity alterations
3) Behavioural techniques

1) Stimulus control

This was covered in the previous module and is defined as 'making changes to the environment so that exposure to stimuli which makes unhelpful behaviour less like and helpful behaviour more likely'. It is essential to understand what these triggers are and how you can adapt strategies to modify these triggers.

There are a number of different types of triggers, including internal triggers such as feelings, thoughts and beliefs as well as external triggers such events and situations. All of these triggers can lead to unhelpful behaviours, therefore the nutrition adviser should first identify what the unhelpful behaviour is and then a helpful strategy to influence the behaviour in a positive direction.

Internal triggers



There are methods to identify and manage internal triggers. For example, when a person experiences the 'urge to eat', they can ask themselves the question "Am I really hungry?". From this it is helpful for the individual to distinguish between such urges to eat and real genuine hunger. The former consists of psychological triggers to hunger with the latter being related to the real need to eat. Various strategies can be learnt to overcome psychological urges.

An analogy that can be used to describe urges and cravings is that of a moving wave. A moving wave will continue to build until it reaches a peak and then it will break down at the shore and will fade away, usually taking 15-20 minutes. To withstand this wave, the advice would be to do something that is incompatible with the urge to eat until the urge disappears. For example a suggestion would be to write a list of activities that would make acting on the urge impossible. These could include phoning a friend, walking, cleaning the car, running, a massage or bath, exercise, planning a holiday, painting, practising a relation exercise or reading a novel. These non-food related rewards can be used instead of the urge, until the urge to eat dies down.

Urges can also be due to other reasons such as worrying about work or a long-term illness; in some cases, after careful consideration, it may be helpful to ask for counselling or therapy for more support.

External triggers

The nutrition adviser should advise the patient to do the following to help reduce the effect of external triggers:

Shopping tips

The following tips should be advised:

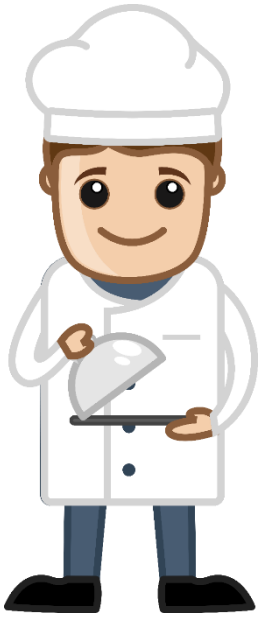
- Shop for food only on a full stomach.
- Shop from a list.
- Only buy appropriate foods.
- Avoid ready-to-eat foods.
- Only carry the amount of cash needed for the foods on the shopping list.
- Only occasionally buying calorie dense foods, such chocolates or crisps.
- Limit opportunities for seeing tempting foods, such as putting things away in cupboards.

Tips relating to making plans

- Plan to limit food intake.
- Pre-plan meals and snacks.
- Substitute exercise in the place of snacking.
- Eat meals and snacks at scheduled times.
- Do not accept food offered by others.
- Always make sure suitable foods are at home to avoid eating less suitable foods if hungry.
- Remove yourself from food when you are overeating.
- Distract oneself from the food by doing something incompatible with eating.

Incorporating activities to curb urges

- Use graphs, cartoons, pictures, etc. to remind yourself to eat properly.
- Make nutritionally acceptable foods as attractive as possible in preparation and presentation.
- Remove inappropriate foods from the house.
- Store unhelpful foods out of sight.
- Keep healthier foods visible.
- Eat all food in the same place.
- Remove food from inappropriate storage areas in the house.



Serving food

- Keep serving dishes off the table.
- Use smaller dishes and utensils.
- Avoid being the food server.
- Serve and eat one portion at a time.
- Leave the table immediately after eating.
- Save leftovers for another meal instead of finishing what is on your plate.

Holidays and parties

- Prepare in advance what you will do.
- Drink fewer alcoholic beverages.
- Plan eating habits before parties.
- Eat a low-calorie snack before parties.
- Practise polite ways to decline food.
- Do not be discouraged by an occasional setback.

2. Self-monitoring

This helps to understand what is being eaten and to keep the focus on being healthy and on the control of their urges. Keeping a dietary diary should also be encouraged which includes:

- Time and place of eating.
- Type and amount of food.
- Who else (if anyone) was present.
- How you felt before eating.
- Activities that you are doing at the same time.
- Calorie and / fat content of foods.
- Examining patterns in your eating.

3. Eating behaviour

This helps with the understanding of why certain foods are eaten in a particular way and how to slow the rate of eating. This can be achieved by:

- Taking one small bite at a time.
- Chewing food thoroughly before swallowing.
- Putting the fork down between mouthfuls.
- Pausing in the middle of the meal and assessing hunger.
- Doing nothing else while eating.
- Concentrating on the act of eating and enjoying the food.
- Eating all food in one place.
- Following an eating plan.

4. Rewards
This is very important and is often underestimated. People need support from as many people as possible including family members and friends who will help the individual achieve their desired change. An individual's environment can make it more or less likely for an individual to change.

Ideally family members should be included in discussions where possible, to help them participate in dietary and lifestyle changes. As an alternative, leaflets can be produced for family members, so that they understand how they can support the individual making change. For example if an individual is trying to pursue a cholesterol lowering diet:

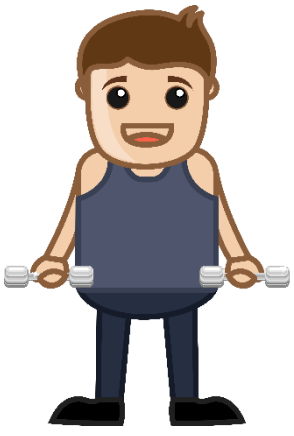
- Think of alternative gifts or treats
- Participate in the diet as well
- Do not tease or make fun of the person
- Re-enforce and encourage the person

How to deliver rewards
To deliver the rewards effectively, the family and friends should seek to:

- Solicit help from family and friends
- Ask family and friends to provide this help in the form of praise and material rewards.
- Clearly define behaviours to be rewarded.
- Use self-monitoring records as basis for rewards.
- Plan specific rewards for specific behaviours.
- Gradually make rewards more difficult to achieve.

5. Nutrition education
These include the following tips:

- Emphasise the use of a self-monitoring diary to identify problem areas.
- Make small changes that can be continued.
- Eat a well-balanced diet according to "The eatwell plate".
- Learn nutritional values of foods.
- Decrease fat intake and increase the complex carbohydrate intake.



6. Physical activity
This includes exercise and general activity levels:

- Starting a mild exercise programme.
- Keeping a record of daily exercise.
- Increasing the amount of exercise very gradually.
- Taking a route home that does not pass temptations.
- Increasing lifestyle activity.
- Increasing use of stairs.
- Walking where you would normally use a bus or car.
- Keep a record of frequency, intensity and duration of time walked each day.

7. Cognitive restructuring
This is where the mind-set towards weight loss and healthy eating is changed and a more positive attitude is adopted. To do so, the following should be considered:

- Developing realistic expectations for weight loss.
- Setting reasonable, realistic weight-loss and behaviour-change goals.
- Focusing on progress, not shortcomings.

- Avoiding imperatives such as 'always' or 'never'.
- Keeping a record of thoughts about self and weight.
- Challenging and countering self-defeating thoughts with positive thoughts.

8. Relapse management

Lapses are an inevitable part of the change process and should be dealt with effectively by understanding:

- Lapses have triggers and do not come out of the blue.
- They are a natural part of change.
- They may be slips ups and not personal failures.
- They are educational and provide important information.
- The difference between lapses and re-lapses and that it takes many lapses to cause a re-lapse.
- They are affected by internal and external triggers and hence successful change is achieved by understanding how to change the triggers.

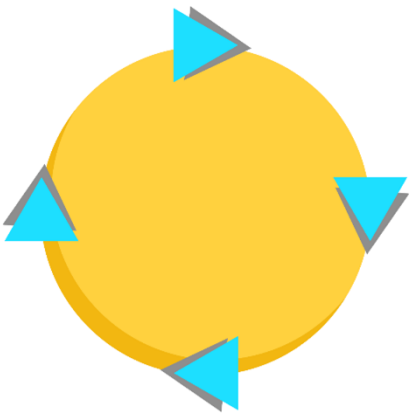
Once this is explained to the individual the following 6 steps can be used to help prevent the lapse from becoming a re-lapse:

1. Stop – stop the action and go away from where the action happened.
2. Say – not a big problem; a small error does not mean to throw everything out.
3. Learn – analyse situation and understand what was happening before the lapse.
4. Plan – for the future to avoid it happening again in the future.
5. Be positive – review goals and motivation.
6. Ask – what can be done to counter the slip up?

General advice about re-lapse management

Once the above advice has been given, the following general advice can also be provided:

- Learn to see lapses as opportunities to learn more about behaviour change
- Identify triggers for lapsing.
- Plan in advance how to prevent lapses.
- Generate a list of coping strategies in high-risk situations.
- Distinguish hunger from cravings.
- Make a list of activities to do which make it impossible to give in to cravings.
- Confront or ignore cravings.
- Outlast urges to eat.



It is important to remember change is an ongoing process and that each step is a move in the right direction. The goal is an ongoing journey rather than the outcome alone. Even a small change is a step in the right direction and it is helpful to stay positive throughout. It is necessary to identify which of the above strategies are most useful so that lifelong success can be achieved in an individual's life.

Aims of the section:

1) Understand how to perform a dietary assessment
2) Understand how to obtain a history of a client for a full week
3) Understand the seven purposes of an assessment
4) Understand the lifestyle perspective of the assessment
5) Understanding counselling skills and what to look out for
6) Understanding lifestyle factors
7) Understanding bowel movements
8) Understanding how to translate advice into reasonable steps
9) Understanding how to construct a goals achievement form
10) Understanding what to with the forms when motivation goes down

Introduction

This section deals with how to make dietary assessments in clinical practice and how to obtain the dietary information, what method to use, what to look for and how to obtain as much information as possible about an individual's diet, lifestyle and eating habits.

Dietary assessment in practice

Assessment of the current, recent or usual dietary intake of an individual is an essential component of assessing nutritional status or nutritional risk and as a basis for providing dietary guidance or nutritional support. The way in which this is done depends on the circumstances and the characteristics of the person being investigated e.g. age or ethnic background.

Information is often required immediately, and has to be obtained in a short timescale and with limited resources. In many instances this can be achieved by obtaining a 'diet history' whereby, by means of questioning, a picture of typical food intake is built up. An approach based on the 24-hour recall, 'What did you eat and drink yesterday?' can be a good starting point. However sometimes the 24-hour recall may sometimes not be sufficient, hence a full week is often requested to get a fuller picture of the diet. This diary should include all meals including:

- Breakfast
- Mid-morning snack
- Lunch
- Mid-afternoon snack
- Evening meal
- Extras, alcohol and desserts
- It is also useful to establish portion sizes

Interpreting the eating form

When trying to understand what the individual has eaten, it is useful to bear in mind the five purposes of the eating form, which are:

1. Meal patterns and how the overall balance of the diet

2. Determining the levels of consumption
3. Estimating energy intake quantitatively
4. Identifying whether there are nutritional deficiencies or surpluses
5. Understanding whether the advice given has been applied

Assessing the form from a lifestyle perspective

It is important to understand the lifestyle influences on an individual to understand whether there are external factors affecting the dietary decisions that a person makes. The following issues should be ascertained:

1. The degree of daily variation in both the quantity of food eaten and the type of food.
2. The differences between weekdays and weekends.
3. Influence of work pattern on eating habits, e.g. shift work, business entertaining, frequent travel.
4. Meals eaten out.
5. Social aspects, e.g. whether food is eaten as part of formal family meals, as a snack, on the move, or in front of the television.

Good counselling skills

Most people are sensitive about their food intake, especially if they are overweight and hence a non-judgemental approach is essential. Searching questions may need to be asked about consumption of items such as biscuits, confectionery and other snack foods, since people tend to assume 'disapproval' of a such items so are reluctant to admit to eating them. Conversely, there can be a temptation to exaggerate consumption of foods such as fruit or wholemeal bread to create a better impression. Indirect questions focusing on shopping habits, e.g. "how often do you buy...?" or "which brands of biscuits do you buy…?" can sometimes help to provide clues to actual consumption levels.

Individuals can be prompted to remember things that may be overlooked, such as between-meal snacks or drinks, but leading questions should be avoided. For example, asking someone "What did you eat for breakfast?" conveys the expectation that breakfast will have been eaten; the person may therefore be tempted to invent 'a slice of toast' to avoid seeming inadequate. The question 'What was the first thing you ate yesterday?' is more likely to reveal that this was a chocolate bar on the way to work. This information provides an overall picture of dietary balance and likely nutritional adequacy. Comparing the proportion of different food groups in the diet with that recommended in The eawell plate can quickly identify major imbalances e.g. lack of fruit and vegetables; over-representation of fat-rich foods. It also highlights the type of dietary changes that are likely to be needed in terms of food choice.

Depending on the individual and clinical circumstances, other influences on current food intake, and their impact and duration, may need to be considered. These may include:

- Appetite level

- Symptoms affecting food intake, e.g. nausea, vomiting, pain
- Difficulties with shopping or cooking
- Socioeconomic factors, e.g. low income, housing conditions
- Psychological factors, e.g. depression, anxiety, apathy or a recent bereavement

Other diet-related and lifestyle factors, which may need to be taken into account include:
- Physical activity levels
- Use of alcohol
- Use of tobacco

If these were not added to the eating form, you should ask these questions separately to obtain a full understanding of the individual's diet and lifestyle. From this you can draw an accurate conclusion as to what needs to be done to address the individual's dietary issues.

Bowel movements
This should supplement the eating form to get a general understanding of the individual's digestion of the food. This can be recorded as follows:
- Passing of urine – put a tick
- Passing of faeces – put a cross

The reason for the importance of this record is for three main reasons:
1. It will you assess whether the information you have provided the individual has been put into practice. For example if you have recommended that the individual drinks more water, you should see that they have more ticks on their form.
2. You can assess the impact of the food on the individual.
3. You can also get a good understand whether there are foods that speed or slow down the metabolism based on the food that has been consumed. The more ticks and crosses, the faster the metabolism.

Developing a plan of action
From these forms you can now assemble a plan of action and write an action plan for the individual. Some may be very resistant to change and do not like making too many changes at one time. If this is the case, one item of advice can be provided at a time and this can be gradually build up to two or three pieces of advice per week. This will give the individual time to adapt their practice and help them make full and lasting changes. Once these have become part of an individual's routine, then new advice can be provided. It is very important that this advice should be summarised and provided to the individual in writing, as verbal advice is likely to be quickly forgotten.

Goals achievement forms
This is a very important technique to help keep track of an individual's progress. From one side, this really helps with motivation as it shows the progress that an individual has made. It is also a good method to understand the adherence a person has had to the advice that has been given to the diet. However for this to be effective, four action steps are required in this situation:

1. Make the goals known e.g. tell a relative or suggest telling as many people as possible to allow for accountability to a wider number of people. This would be more effective than keeping it to themselves.
2. Recruit a friend or goal buddy to work together towards achieving the goal. Ideally if the individual shares the same problem with them, it can provide them with excellent moral support.
3. Break goals into manageable pieces. For example if the goal is to lose 20 pounds over 5 months, it is much easier to break this down into 4 pounds per month. Even if after 5 months the goal is not reached the goal they would still be in a better position than when they started off. Goals are always easier when they are broken down into manageable milestones
4. Develop a strong plan by knowing exactly what the goals are. The goals achievement form should use SMART objectives (see previous chapter for more details) such as 'aim to lose 20 pounds by July' is much better than 'the individual will lose weight'. Detail how each goal is going to be achieved and the daily actions required to reach these goals. Help adapting the advice to the individuals lifestyle and support them with developing a backup plan e.g. if the treadmill breaks down provide an alternative form of exercise.

Remember if motivation is lost, it can be useful to visualise what life will look like once all goals are achieved to keep motivated. Overall, an individual should be happier, life will be better and they will feel satisfied that they have made a change to their life.

In conclusion, if an individual puts the advice into action, takes it seriously and commits, they can achieve their goals. However for this to happen it requires effort and that if they do commit, they will achieve their goals and it will all be worth it in the end.

Aims of the section:

1) Understanding how to use weight as a body measurement
2) Understanding the importance of other body measurements
3) Understanding how to measure the bust
4) Understanding how to measure the chest
5) Understanding how to measure the waist
6) Understanding how to measure the hips
7) Understanding how to measure the thighs
8) Understanding how to measure the calves
9) Understanding how to measure the upper arm
10) Understanding how to measure the forearm
11) Understanding how to measure the neck
12) Understanding general tips for taking measurements
13) Understanding how to measure the waist
14) Understanding risk and the relation with coronary heart disease

Introduction

This section covers how to take body measurements and their importance. The usage of weight is a very good measure of progress however it is not a sufficient measurement on its own. Weight can be affected by various factors including some types of medication, menstruation cycle, illness or water retention. Therefore the scales will fluctuate over time and as a result body measurements are very useful. This section will cover various types of body measurements and how to taken them accurately. The first and most important point is to always measure from the same place and in the same setting.

Common Body Measurements

Bust: place the measuring tape across the nipples and measure around the largest part of the chest. Be sure to keep the tape parallel to the floor.

Chest: place the measuring tape just under the breasts/pecks and measure around the torso while keeping the tape parallel to the floor.

Waist: first ensure that you have a measuring tape long enough for the waist circumference measurement. The way to perform the measurement is to measure midway between the lower border of the ribcage and the uppermost border of the iliac crest. When measuring the tape should be snug but should not compress the skin, however in practice it may be difficult to find these landmarks for very overweight individuals, therefore in these circumstances it is sufficient to use the belly button as the landmark.

Hips: place the measuring tape across the widest part of the hips/buttocks and measure all the way around while keeping the tape parallel to the floor.

Thigh: measure around the largest part of each thigh.

Calves: measure around the largest part of each calf.

Upper arm: measure around the largest part of each arm (above the elbow).

Forearm: measure around the largest part of each arm (below the elbow).

Neck: measure around the largest part of the neck.

Tips for Measuring
When taking measurements, ensure the individual is standing tall with relaxed muscles and feet together. When measuring, apply constant pressure to the tape (so it doesn't sag) without pinching the skin. Use a flexible measuring tape, such as plastic or cloth.

To aim for consistency measure under the same conditions each time, such as wearing the same clothes or none at all. The place to take some of these measurements will vary slightly from person to person and to ensure accuracy, take them in the same place on the body each time.

Special attention to waist circumference
The waist circumference has been shown to be an accurate indicator of central obesity and possesses a valuable prognostic value for health risks from adiposity as well. This measurement provides information about the distribution of fat, which is linked to risk level for coronary heart disease. It is now known that those who carry fat around their central cavity, are more likely to suffer the consequences of being overweight, hence the need to pay special attention to waist circumference as a measurement.

A standardised technique
A standardised method for measuring the waist was developed by the World Health Organisation in 1995 and referenced by the Scottish Intercollegiate Guidelines Network (SIGN) and the Manual of dietetic practice (2014). It requires the following:

- The measurement is taken whilst standing.
- Measured at a level midway between the lowest rib and the iliac crest
- The reading is taken at this midway point with the tape snug without compressing the skin
- Using a bony landmark is a real advantage here as there is little scope for error, particularly if the individual is partly undressed.
- Additionally it does not need to be adjusted for height as needs to be done for the Body Mass Index (BMI), which is weight in km divided by your height in m squared = kg / m^2.
- However in practice it may be very difficult to find these bony landmarks for individuals who are very overweight and therefore placing the tape at the level of the belly button is recommended.

As a technique, this measurement can help predict if a person has a BMI over 25. This would be the case if the measurement is over 94cm for men and 80cm for women.

In terms of risk relating to coronary heart disease, there is an increased risk if this measurement is over 94cm for men and an even greater risk if it is more than 102cm in men. For women there is increased risk if the measurement is over 80cm and a substantial risk is over 88cm. It is very important that these measurements are translated into practical advice for the individual.

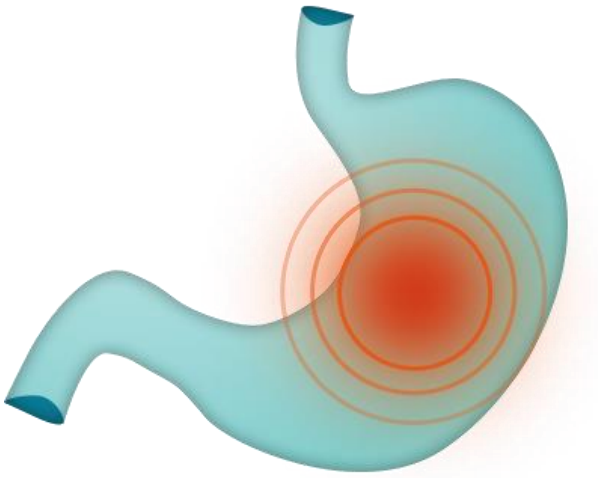
This section deals with those diseases that are known to be treatable by diet. These are some of the most common diseases in society today, however in most cases they require specialist medical advice to diagnose the disease and provide specialist medical treatment. You should not seek to treat these diseases yourself, instead if you encounter an individual with any of these problems, refer the individual to their GP.

Aims of the section:

1) Understanding indigestion, the contributory dietary factors and the treatment.
2) Understanding gastro-oesophageal (heartburn) and its causes.
3) Understanding the causes of reflux, the measures helpful to reflux.
4) Understanding Irritable Bowel Syndrome (IBS) including its description and how it is diagnosed.
5) Understanding the symptoms and how to assess the level of severity and causation.
6) Examining treatment methods of the symptoms as well as practical aspects of management.
7) Understanding constipation, hard stool, diarrhoea, bloating and wind.
8) How to spot if food intolerance is suspected and using food exclusion.

Indigestion

Also known as Dyspepsia is a general term covering non-specific symptoms in digestive tract. It's often described as a feeling of fullness, nausea, heartburn, gassy discomfort in the chest or abdomen. If the symptom of unusual fullness after eating persists, this may be a sign of inappropriate eating or it could be a sign of something much more serious. Hence it is important to consult with a doctor to understand the underlying cause, if any.



Dietary factors that could cause indigestion are:

- A long period of time not eating food, followed by a large meal or just general erratic eating habits.
- Hurried meals.
- Consumption of heavy, fat-rich meals often.
- Eating late at night.
- High levels of consumption of alcohol, tobacco, tea and coffee.
- A stressful lifestyle.

Treatment

Simple indigestion can nearly always be alleviated by diet and lifestyle changes, which result in regular meal patterns and healthy balance of foods

Gastro-oesophageal reflux (Heartburn)

This is a common accompaniment to indigestion and characterised by a sharp, burning pain either just below the breastbone or between the shoulder blades.

This pain can actually be so strong that it can be mistaken for angina. The symptoms usually occur during the night or after a meal and can be aggravated by straining, lifting, lying flat or bending.

What happens in this situation is that the contents of the stomach, containing acid and enzymes are refluxed back into the oesophagus and may reach the mouth or be felt at the back of the throat. NICE (2004) have reported that the mucosa is irritated as a result of the presence of this acid and the enzymes, which is what causes the pain. If this occurs repeatedly, it could result in damage and inflammation, known as esophagitis. This in turn increases the risk of adenocarcinoma (a type of cancerous tumour that can occur in several parts of the body), therefore it is very important to diagnose as soon as possible and to provide the appropriate treatment.

Reflux may occur in the following situations:

1. At the junction of the oesophagus and stomach there is a weakness of the sphincter.
2. Where the pressure within the stomach is high such as when a large amount of food or liquid has been consumed.
3. Where the pressure from the abdominal area is high such as during pregnancy.
4. With hiatus hernia (see below).

Heartburn is usually treated by diet and lifestyle chances, however it has been recognised that reduction of fatty foods, weight loss and stopping smoking have not been conclusively established as methods of treatment. Promoting health measures of general benefit my result in some relief in some individuals as well as being good for the purposes of health promotion. These general measures include:

- Making the meals consumed smaller and at regular intervals.
- Not eating late at night.
- Avoiding movements after meals which involved lying, bending or lifting.
- Weight loss especially if obese.
- Not excessively consuming alcohol, coffee and tea.
- Not consuming food foods that are considered to be irritant or exacerbate symptoms such as highly spicy foods.
- Not sleeping lying down, but rather sleeping in a semi-upright position or with the head of the bed raised a few inches. This helps to prevent symptoms of reflux that occur at night.

Irritable Bowel Syndrome

Irritable Bowel Syndrome (IBS) is a common disorder, which is thought to affect 9-25% of adult populations. It is a harmless condition but can affect an individual's daily routine. It also has similar symptoms to other diseases including coeliac disease therefore, it is important to get confirmation from the GP or specialist doctor. With dyspepsia they accounts for 40-60% of all referrals to the gastroenterology clinic.

The condition is defined as a functional bowel disorder, i.e. one that results in characteristic symptoms but with no obvious structural or biochemical cause. It usually presents as a combination of disordered defecation, constipation, diarrhoea or both, together with abdominal pain and distension.

IBS most commonly starts in people aged 20-30 years but can occur at any age. The prevalence in men and women is probably similar, but women are more likely to seek medical attention.

Diagnosis of irritable bowel syndrome
There is no single pathophysiological marker for IBS and diagnosis is based on symptoms and the exclusion of organic disease. The symptom criteria for IBS are:

• Abdominal pain relieved by defecation or associated with change in frequency or consistency of stools and an irregular pattern of defecation for at least 2 days including three or more of the following:
• Altered stool frequency (>3 times/day or <3 times/ week).
• Altered stool form (hard/loose).
• Altered stool passage (straining, urgency, sense of incomplete evacuation).
• Passage of mucus.
• Abdominal bloating or feeling of distension.

The severity of the symptoms varies from mild to severe and for some it can be debilitating while in others they are no more than a minor inconvenience. The condition may also spontaneously appear and then disappear.

Causation of irritable bowel syndrome
The cause of IBS is unknown, although some abnormalities of intestinal motility (intestinal movements) and visceral sensation (sensations that result from our internal organs) have been found in some individuals. Psychological influences on bowel function are also thought to be important and about half of those individuals seeking advice for IBS have clinical symptoms of anxiety and depression. However, it is also possible that signs of stress or emotional disturbance could be a consequence of having IBS, rather than being the cause of it. Therefore, a detailed assessment of the individual's eating habits and lifestyle is essential in order to understand if stress is the cause and if so, how high these stress levels may be.

Management of irritable bowel syndrome
Because IBS is poorly understood and in the past has often been misdiagnosed, there is no universally agreed approach to treatment. Current treatment tends to adopt a combination of two strategies:

Clinical management as overseen by a doctor or dietitian:
1) Treating the gastrointestinal symptoms:
   - Giving antidiarrheal drugs to reduce bowel movement frequency.
   - Giving smooth muscle relaxants for pain.
   - Increasing fibre intake of those with constipation.
   - Exploring other possible dietary triggers.

2) Treating psychological symptoms:
   - Providing reassurance that, although unpleasant, the condition is harmless.
   - Identifying psychological factors which may contribute to the symptoms.
   - Using psychological and behavioural strategies to help people to cope with stress and symptoms.
   - Using drug treatment to relieve depression and anxiety as appropriate.

Practical aspects of dietary management of irritable bowel syndrome

Because of the variability of the disorder, no single dietary treatment strategy is likely to be uniformly effective in the management of IBS. Nevertheless, dietary guidance which is symptom led, based on sound healthy-eating principles, monitored and modified as necessary can significantly improve the quality for many patients. For each of the steps below, advice should be first sought from a doctor or dietitian.

If symptoms of constipation, hard stools and urgency predominate consider:

- Increased consumption of dietary fibre, both insoluble and soluble, particularly if the habitual intake is low. However, additional fibre should be introduced gradually into the diet, to avoid triggering problems of bloating and wind.
- Adequate fluid consumption should also be considered.

If symptoms of diarrhoea predominate consider:

- Not increasing fibre consumption and in some cases may need to be reduced.
- Avoiding dried fruit, nuts, seeds, fruit and vegetable skins, and other irritant or spicy foods if food-related symptoms are more like to be apparent.
- Eliminating foods, which may cause intolerance such as lactose or wheat.

If symptoms of bloating and wind are a problem consider:

- Diagnosis of possible lactose intolerance.
- Reducing the consumption of peas, beans and legumes, onions and brassica vegetables such as cabbage and Brussels sprouts.

If food intolerance is suspected

Transfer to a dietitian to perform a food exclusion regiment in order to find the food intolerance.

Aims of the section:

1) Understanding the features of diabetes and how to recognise the symptoms
2) Knowing when diabetes is severe
3) Understanding type 1 diabetes
4) Understanding type 2 diabetes
5) Knowing how diabetes is diagnosed
6) Understanding the potential consequences of diabetes
7) Understanding diabetic retinopathy
8) Understanding diabetic nephropathy
9) Understanding diabetic neuropathy
10) Understanding the relationship with cardiovascular disease
11) Understanding the aims of management of diabetes
12) Understanding how dietary modification can prevent or treat a disease
13) Understanding how to adapt the eat well plate for diabetics
14) Understand how diabetes is treated by dietitians

Introduction

The full name of this disease is diabetes mellitus and is considered to be one of the most common diseases in the UK. This disease can have a major effects in terms of mortality and morbidity both from the direct acute effects and from the potential damage to microcirculation of the kidneys ie nephropathy, neuropathy (damage to the nerves), retinopathy (damage to the eyes), and peripheral vascular disease (limbs) as well as the increased risk of cardiovascular disease. Consequently, it is a major contributor to renal failure, blindness, stroke, heart disease and even amputations.

Features of diabetes

The glucose in our bodies needs to be transferred from our blood to our tissues and this is done by the hormone insulin. Diabetes is where there is a lack of insulin which may be the result of a lack of insulin production or a resistance to the action of the insulin being produced. As a result of this, the amount of sugar in the blood becomes very high which results in a condition known as hyperglycaemia. If this is higher than the renal threshold, excess glucose will pass into the urine which is known as glycosuria. This increased amount of urine is known as polyuria.

Additionally, the lack of glucose for energy in the cells means that both fat cells and if required the muscle tissue will need to be used. The combination of these three problems is what leads to diabetes being identified in individuals:

- Increased levels of urine
- Thirst
- Weight loss that cannot be explained

If there a very high shortage of insulin, the fat stores may be used excessively leading to a state referred to as ketoacidosis, where there are a large number of ketones being produced. If this isn't treated, it could lead to the individual falling into a coma and eventually death.

Types of diabetes
There are two distinct forms of the disease:

- Type 1: this is where the beta-cells in the pancreas completely or partially fail to produce insulin. This may be caused by genetic factors, autoimmune disease or certain viruses, however the exact causes are still poorly understood. It can develop at any age and it usually develops suddenly, accounting for 10-20% of cases. It is treated through lifestyle changes and insulation replacement by injection or pump therapy.
- Type 2: this is where the insulin is produced but in either insufficient or an ineffective form. It accounts for 80-90% of cases and is much more common than Type 1. The development of this type is much more closely linked within obesity and genetic factors and it tends to develop in middle age, although with higher levels of obesity it is now being seen in younger adults and children. Sometimes it is only discovered through routine checks, however just lifestyle changes can may be sufficient when they included reduced energy intake and more exercise. However most individuals tend to require hypoglycaemic medication which increases insulin production or enhances its effectiveness. In some cases insulin injections are required.

The terms 'insulin dependent' and 'non-insulin dependent' diabetes are no longer used, partly because some of the latter group of patients are now treated with insulin, but also because classification based on pathogenesis (the mechanism that causes the disease), rather than treatment method, as it more accurately reflects the metabolic differences and implications of the two forms of the disease.

Consequences of diabetes
At all ages, mortality rates are higher in people with diabetes than in their non-diabetic counterparts. Although some deaths still occur from the acute effects of diabetes (mainly ketoacidosis), most will result from the chronic complications associated with disease. Macro-vascular complications are common and often lead to devastating consequences including:

Diabetic retinopathy
This is strongly linked to duration of the disease in both type 1 and type 2. It is a very specific vascular complication where small haemorrhages in the retinal blood supply can eventually result in blood vessel proliferation and retinal deposits. If these are not treated early on they can cause blindness. Most individuals with type 1 diabetes and over 50% with type 2 diabetes will experience some level of retinopathy, making it the most common cause of blindness in the West.

Diabetic nephropathy
This is the damage to the microcirculation of the kidneys and is a major cause of premature death, largely from uraemia and associated cardiovascular disease. This can occur 10-20 years after the development of type 1 diabetes, where it affects around 30% of sufferers. In type 2 diabetes, it takes much less time to develop and occurs in around 50% of cases where the ethnic background is Asian or African-Caribbean and 25% in Europeans.

Diabetic neuropathy
This is known as a polymorphic complication, which is one that appears in many different forms and is associated with the nerves. However it is less well understood. Symptoms include pins and needles, neuritic pain in the limbs and impotence as a result of sensory deficit and autonomic dysfunction. This disease along with a restriction in the blood supply to tissues known as ischemia and infections can lead to breakdowns in areas of the body such as the foot which may need to be amputated due to gangrene. This disease is also very much associated with the duration on diabetes.

Cardiovascular disease
Diabetes greatly increases the risk of premature death from cardiovascular disease, particularly in women. Those with diabetes are at least twice as likely to develop heart disease as the non-diabetic population. Pre-menopausal women are four times more likely to develop the disease as their non-diabetic counterparts because the usual protection against heart disease in this age group is lost. Individuals with diabetes also have a two to three fold increase in the risk of stroke. The outcome from myocardial infarction (a heart attack) and stroke is also detrimental in someone with diabetes.

Hypertension (see later chapter) is particularly strongly associated with cardiovascular risk in this group, and long-term tight blood pressure control in hypertensive type 2 diabetic patients has been shown to result in a significant fall in the incidence of cardiovascular complications and stroke. As in the non-diabetic population, preventing cardiovascular disease therefore requires multiple risk-factor reduction, particularly from influences such as smoking, hypertension, dyslipidaemia, obesity and physical inactivity.

Dietary modification – prevention or treatment
As the nutritional objectives for those with diabetes are very similar to those advocated for the entire population, dietary guidance should be based on a framework of healthy eating principles on which the specific aspects relevant to the diabetes, in terms of food choice and meal timing, are superimposed. It should be noted that this does not mean that dietary advice is simply a matter of healthy eating guidance; many other issues have to be considered.

Meal pattern
In most people, carbohydrate intake will need to be fairly evenly distributed throughout the day. Individuals with totally erratic eating habits or those who go for long periods without food will need to adopt a more regular meal pattern to ensure a better, and more constant, balance between supply and usage.

For many people, a meal pattern of three evenly sized meals and three smaller snacks per day is ideal, but this will vary between individuals according to the demands of medication, lifestyle and individual preference. The important aspect is that an appropriate meal pattern, whatever that is for a particular person, remains relatively constant from day to day.

How the eatwell plate is adapted for those with diabetes by a dietitian

Bread, cereal foods and potatoes These are an essential basis for every meal	• Quantity and timing: These need to remain fairly constant from day to day. • Good food choices: pasta, rice, bread, chapattis, potatoes, breakfast cereals (especially oat-based). • Reduce the amount of fat added to these foods: including fat spread on bread, chapattis or used in pasta sauces should all be kept to a minimum. • Wholemeal/wholegrain bread and cereals are high in fibre and have advantages in terms of satiety and preventing constipation.
Fruit and vegetables A variety of 5 servings a day	• These foods have major health benefits for people with diabetes. • 1-2 servings of vegetables (excluding potatoes) should be eaten with main meals. • Fresh fruit can be chosen as a snack or dessert • Frozen or canned fruits and vegetables are useful alternatives to fresh varieties. • Fruit juice should be regarded as a sugar-containing drink and not consumed only with meals. • Have salad or vegetables with manufactured convenience foods or ready meals.
Milk and dairy products 2-3 serving a day	• Low/reduced-fat varieties of milk, yoghurt, fromage frais, etc. should be chosen. • Full-fat cheese should be used in moderation especially by those who are overweight. It is more helpful to use it as a main meal component rather than a snack. • Cream should only be used as an occasional treat.
Meat, fish, pulses and alternatives 2 servings a day	• Greater use should be made of pulses (peas, beans and lentils), either as an alternative to meat or as a way of making a smaller quantities of meat go further. Fresh, canned or dried pulses are all suitable. • Ideally at least two portions of fish should be consumed every week, one of which should be oily fish. • Fat avoidance is important, e.g. meat should be lean; visible fat should be trimmed or drained off after cooking. • Consumption of meat products e.g. burgers, pies, sausage rolls or high-fat meat mixtures (mince) should be kept to a minimum. • Poultry is a low source of fat if the skin is removed and fat, which appears during cooking, is discarded.
Fat-rich and sugar-rich foods These should be kept to a minimum	**Sugar-rich foods:** • The diet does not have to be sugar free, but sugar-rich confectionary and drinks will impair glycaemic control if consumed at inappropriate times or in addition to meals. • Low-calorie 'diet' soft drinks are good alternatives to their

	higher sugar counterparts. • Ordinary jam, marmalade or reduced-sugar varieties can be used in small amounts on bread. • Small amounts of sugar-containing biscuits or cakes can be eaten as scheduled snacks, but higher fibre, lower sugar choices are best, e.g. tea breads, fruit cake, English muffins, plain cakes and biscuits. Those who are overweight should be encouraged to make more use of fruit as snacks. • Intense artificial sweeteners should be used if sweet-tasting drinks are required. **Fat-rich foods:** • Source of fat should be avoided as much as possible. • Food should be boiled, baked, grilled, dry roasted or microwaved instead of fried. • Minimum amounts of fat should be spread on bread, added to food or used in cooking. • Reduced-fat monounsaturated spread and small amounts of monounsaturated oils (olive or rapeseed/canola) are the best choices. • High-fat snack foods such as crisps and biscuits should be eaten less often and replaced by healthier alternatives such as fruit, low-fat yoghurt or whole-wheat crispbread.

Other advice to prevent diabetes

1. Check food labels to check whether there is a high amount of sugar.
2. Do not miss breakfast and avoid high calorie lunches. Skipping breakfast will lead to the blood sugar going really low.
3. Keep hydrated and avoid alcohol intake.
4. Exercise 4-5 times per week, for a healthy weight and encourage good blood sugar levels.
5. Replace normal potatoes with sweet potatoes, which can be eaten with skin as this has a lower glycaemic index which means it prevents blood sugars rising as quickly and keep them stable for a longer period of time.
6. White bread with wholemeal bread or ideally with soda bread, crisp bread or rye bread.
7. Replace pasta with Quinoa, Spellt and Millet.

All of these have a much higher nutrient density, with much more vitamins and minerals and they will help maintain blood sugars.

Aims of the CHD section:

1) Understanding the background to the disease including important definitions.
2) Understanding the difference between angina, heart attacks and heart failure.
3) Understanding the key risks that could lead to CHD and understanding the modifiable risk.
4) Understanding what is directly causal and the different degrees of risk.
5) Understanding the role of physical activity, smoking and blood pressure
6) Understanding the relationship with diabetes
7) Understanding the main symptoms of CHD.
8) Understanding how the disease is managed and treated.
9) Understanding blood pressure and hypertension, as well as how it is managed.
10) The role of dietary fats including saturated, monounsaturated polyunsatured fats and cholesterol
11) Understanding saturated fat and atherosclerosis
12) Understanding the role of trans fats and diet recommendations, oily fish and omega-3
13) The role of fruits, vegetables, alcohol, salt, antioxidants, sterols and stanols
14) Understanding the role of weight management, exercise and stress

Coronary heart disease

Coronary heart disease (CHD) is the most common form of cardiovascular disease (British Heart Foundation, BHF). It is when the arteries supplying the heart with oxygen rich blood, become narrowed by the gradual build-up of fatty materials in their walls. This is called atherosclerosis and the fatty material is called atheroma.

How it is presented

CHD can present clinically in a number of different ways including angina. This is progressively caused by the arteries becoming so narrow that they cannot provide oxygen rich blood to the heart. The pain and discomfort caused as a result is called an angina attack.

If a piece of atheroma breaks off, it may cause a blood clot or blockage blocking off the coronary artery and cutting off the supply of oxygen rich blood to the heart, resulting in permanent damage, which is known as a heart attack.

Coronary heart disease also encompasses heart failure, which is the end stage of this disease. It is a major contributor to morbidity and mortality and is considered to be the most common cause of mortality in the UK.

Risk factor for someone getting the disease

These are both unmodifiable risk factors and modifiable risk factors.

Unmodifiable risk factors

The main unmodifiable risk factors for CHD include:

- Age: risk of developing CHD tends to increase with age.
- Gender: Men are more likely to develop CHD because they do not benefit from the protective effects of oestrogen. This applies particularly to premenopausal women and potentially post-menopausal women with hormone replacement therapy. Other than in certain circumstance, such as the coexistence of diabetes, women tend to have a lower prevalence of CHD than men of the same age.
- Family history: also referred to as genotype, this is where there is a family history of CHD. In these circumstances, there is a strongly linked increased risk of CHD, which may be partly due to the differences in that family with regards to lipid metabolism or somatotype (that is human body shape and physique type). This is also particularly the case where members of the family tend to have central or peripheral fat distribution.
- Ethic group: CHD risk is also enhanced in certain racial groups including South Asians; Indian, Bangladeshi, Pakistani or Sri Lankan are 50% more likely to die from CHD than the general population.

CHD risk is also particularly elevated where the following diseases exist:

- Diabetes mellitus
- Renal disease
- Stroke

Modifiable risk factors

Modifiable factors known to influence the development of CHD include:

- Smoking
- Diet
- Lack of physical activity
- Psychosocial stress: depression and social isolation or lack of quality support (SIGN, 2007a).
- Hypertension

Management of coronary heart disease

Dietary management is very much determined by how much the disease has progressed and the way it is being treated. More advanced cases will be managed by medical teams, however as part of disease prevention, it is possible to take steps to ensure that the diet is cardio protective and that the lifestyle being adopted reduces the risk of any problems:

Some of the measures include:

1) More physical activity

A good diet with physical activity as well as having a healthy weight reduces the chance of high blood pressure.

Regular exercise will make the heart and circulatory system more efficient, will lower the cholesterol level and also keep the blood pressure at a healthy level. It is recommended to exercise for 20 minutes, a minimum of 5 times per week, in order to prevent coronary heart disease risk and to prevent associated diseases such as diabetes or obesity.

2) Giving up smoking
This will reduce the risk of developing CHD as smoking is a major risk factor for developing atherosclerosis.

3) Keeping blood pressure under control
Eat a healthy diet which is low in saturated fats, exercising regularly and if required, taking the appropriate medication to keep the blood pressure low.

4) Keeping diabetes under control
If you are diabetic, you have a greater risk of developing CHD. Being physically active and controlling your weight and blood pressure will help you manage your blood sugar level.

Risk factors related to diet
To help reduce the risk of CHD, the following factors need to be considered:

Blood lipids (blood cholesterol)

The relationship between cardiovascular risk and blood cholesterol levels have been demonstrated from large studies, this relationship exists irrespective of whether an individual is a smoker or non-smoker, normotensive or hypertensive and is in the presence/or absence of vascular disease. For reference, total cholesterol is the sum of all cholesterol. Low Density Lipoprotein (LDL) cholesterol makes up 60 – 70% of total cholesterol and is classed as a powerful risk factor for CHD. High Density Lipoprotein (HDL) is involved in the removal of cholesterol esters.

Blood pressure and hypertension
The risk of CHD, stroke and heart failure rises with increasing blood pressure.

Dietary fats
Dietary fats play a role in the development of atherosclerosis and are classified based on their structure and the number of double bonds they contain – saturated (no double bonds), monounsaturated (one double bond) and polyunsaturated (two or more double bonds). In addition to fatty acids, cholesterol is present in animal foods.

Most food sources will have a combination of fats however if one fat dominates the food then it can be classed as rich in that source.

Saturated fat	Monounsaturated	Polyunsaturated	Cholesterol
Dairy products	Olive oil	Corn oil	Egg yolks
Beef	Rapeseed oil	Sunflower oil	Meats
Lamb	Avocado	Safflower oil	Dairy products
Pork	Olive margarine	Soya oil	
Poultry		Margarines from above	
		Oily fish	

Saturated fat increases the risk of atherosclerosis as it causes an increase in LDL cholesterol. This is likely due to saturated fat blocking LDL cholesterol receptors hence the clearance of LDL cholesterol is reduced. The LDL cholesterol is then available to be taken up by macrophages (type of white blood cell) into the blood vessel wall; the macrophages become loaded with cholesterol and then develop into a foam cell thus leading to an atherosclerotic plaque.

Dietary guidelines on saturated fat
Recommended that intake of saturated fat is limited to ≤10% of total energy requirement.

Advice to achieve these recommendations includes:

- Using lean cuts of meat.
- Reduce quantity of meat & poultry.
- Eat fish twice weekly.
- Avoid animal fats in cooking–butter, ghee and/or lard.
- Use vegetable based oil and/or spreads instead.
- Use low fat dairy products.
- Limit intake of cheese.
- Reduce intake of foods high in hidden fats – pastry, mayonnaise, biscuits etc.

Dietary cholesterol is present in foods of animal origin for example egg yolk, liver. As the atherosclerotic plaque is rich in cholesterol esters, it had been common to advise patients to reduce dietary cholesterol intake. However many foods high in cholesterol are also high in saturated fat and it is the latter that has more impact on plasma cholesterol levels.

The guidelines from SIGN (Scottish Intercollegiate Guidelines Network) give no specific advice for diet cholesterol intake although other guidelines recommend intakes of <300mg/day

Polyunsaturated and monounsaturated fats
Monounsaturated fats have been suggested as an alternative to saturated fat as they can reduce LDL cholesterol and slightly increase HDL cholesterol:

- Limit total fat to less than 30% of energy.
- May benefit from keeping polyunsaturated fat <10%.
- Use monounsaturated fat to make up the difference.

For example:

- Use olive or rapeseed oil in cooking.
- Use vegetable based (soft) spreads.
- Include other foods rich in monounsaturated fat – olives, avocado and nuts.
- Vegetable sources of n-3 fatty acids include soybean, flaxseed, rapeseed and walnut oils and nuts (walnuts, peanuts).

Trans fats
Trans fat are thought to behave like saturated fat and hence may result in an increase in LDL-cholesterol.

Diet recommendations:

- Limit intake of processed foods for example biscuits and cakes.
- Choose soft margarines low in trans fat.
- Avoid hard vegetable margarines.

Oily fish and Omega-3 fatty acids
It has been proposed that n-3 fatty acids act to protect from coronary heart disease due to a number of mechanisms that promote vasodilation (widening of blood vessels), reduce platelet (blood cells whose function is to stop bleeding) aggregation and increase HDL-cholesterol. The recommendation is to include oily fish once weekly into diet for example:

- Sardines
- Mackerel
- Salmon
- Fresh tuna.

However there is some evidence that those with recent MI (myocardial infarction, commonly known as a heart attack), may benefit from two to three portions of oily fish weekly.

Fruit and vegetables
Evidence from population studies show that increased intake of fruit and vegetables is associated with a reduced risk of coronary heart disease. Also diets rich in fruit and vegetables are often low in saturated fat. Minimum recommendation is five portions of fruit and vegetables per day.

Alcohol
The evidence suggests that alcohol can have a beneficial or harmful effect depending on the amount taken and drinking habits. A light or moderate intake can reduce the risk of coronary heart disease by up 20% and result in improved lipid profiles (NICE 2007). However excessive amounts and/or binge drinking is harmful to health as can negatively affect blood pressure and lipid profile.

Whether considering primary or secondary prevention, light to moderate alcohol can be protective. The recommendation is no more than 2-3 units per day for women and 3-4 units per day for men with two drink free days per week.

Salt
Research shows that a reduction in salt intake can reduce blood pressure in both normotensive (normal blood pressure) and hypertensive (high blood pressure) individuals (those with normal and high blood pressure), with greater reductions in the latter. However the benefit of reducing CHD is unclear though studies showed a 30% risk reduction in CVD. The difficulty is maintaining a low salt diet due to taste alterations and the amount of salt added to foods during manufacture.

The recommendation for the population is to eat less than 6 grams of salt (100mmol/2.4g sodium) per day. Those with hypertension should aim to reduce salt intake as much as possible.

Antioxidants
Oxidative stress is considered to be a factor in the development of CHD. Antioxidants are thought to have an important role as they reduce the oxidative stress by interacting with free radicals. A number of antioxidants exist including vitamins (Vitamin E, C and beta-carotene) and trace elements (selenium). A varied diet including fruit and vegetables, nuts, fish and appropriate oils will maximise dietary antioxidant intake.

Weight management
The risk of CHD is higher with increasing weight (BMI ≥25 overweight and ≥30 obese) and with central obesity (waist measurement ≥102cm in men, ≥88cm in women with ≥90cm in Asian men and ≥80cm Asian women). This is associated with atherogenic (tending to promote the formation of fatty deposits in the arteries) LDL cholesterol i.e. those that promote the formation of fatty deposits in the arteries, high blood pressure, insulin resistance and impaired glucose tolerance.

Evidence from trials show that weight reduction between 3 –9% can reduce blood pressure, as well as improving lipid profile and glucose control. Hence SIGN recommends overweight individuals at risk of CHD should aim to reduce and maintain weight loss.

A diet low in fat with a daily 600 calorie deficit does result in weight loss in individuals with CVD or associated risk factors.

Lifestyle changes

Physically active
Routine physical activity help to lower LDL cholesterol reduce blood pressure and promote weight loss. It also lowers the risk of developing diabetes and raises HDL cholesterol level, the good cholesterol, which helps prevent CHD. You can get health benefits from as little as 60 minutes of moderate aerobic exercise per week. The more active you are the more benefit it will have on overall health and wellbeing.

Maintain a healthy weight
This can lower the risk of CHD, by aiming for a BMI of less than 25. BMI measures the weight in terms of your height and gives an estimate of total body fat. A BMI between 25 and 29.9 is considered to be overweight, 30 or more is obese, with less than 25 being the goal for prevention and treatment of CHD.

Quit smoking
Smoking increases the risk of CHD and raises the other risk factors.

Manage stress
Research shows that the most common trigger is an emotionally upsetting event particularly one involving anger. Some ways of dealing with stress such as drinking alcohol, smoking or overeating are not helpful lifestyle choices. More beneficial ways to deal with stress include relaxing and coping with problems that help to manage emotional and physical health. Also having supportive people around support you with your concerns can also help relieve stress. Physical activity, medicine and relaxation therapy can all help to relieve stress.

Aims of the Dyslipidaemia section:

1) The definition and sub-groups of the disease
2) Understanding the difference between good and bad cholesterol
3) Understand the role of hyperglyceridemia including symptoms
4) How is it discovered and treated including dietary management
5) Practical tips and guidance on how to treat the disease
6) The role of fibre and whole grains and practical methods to increase consumption
7) Other specific tips to reduce the risk.

Remember

This module will give you a general understanding of dyslipidaemia, however you should not apply this advice to specific individuals, instead the refer the individual to their GP.

Dyslipidaemia

Previously known as hyperlipidaemia, this is where there is an excess of fatty substances called lipids, largely cholesterol, in the blood also called hyperlipoproteinemia because the substances travel in the blood attached to proteins. This is the only way they can remain dissolved whilst in circulation.

What is the description of dyslipidaemia?

The fat complexes in the blood are called lipoproteins. The best known are low density lipoproteins (LDL) and high density lipoproteins (HDL).

Excess LDL leads to the blockage of arteries eventually resulting in a heart attack; the higher the level of LDL the greater the risk of CHD. This is true in men and women in different ratios for ethnic groups and all adult age groups hence LDL is labelled the bad cholesterol.

The lower the level of HDL the greater the risk of CHD, therefore it is commonly referred to as the good cholesterol. Low levels of HDL are accompanied by an increase in blood triglyceride levels. Studies have shown that high triglyceride levels are associated with a high risk of CHD

Symptoms of dyslipidaemia

There are no noticeable symptoms and it tends to be discovered during routine examinations for atherosclerotic cardiovascular disease. Deposits of cholesterol form underneath the skin for those with high cholesterol in the blood. Those with hypertriglyceridemia may develop numerous pimple like lesions across their body and extremely high levels of triglyceride may also result in pancreatitis; severe inflammation of the pancreas that may be life threatening. Dyslipidaemia typically diagnosed based on medical history, physical examination and blood tests, to determine the levels of LDL, HDL and triglycerides.

Practical tips on how to manage blood cholesterol

The following dietary changes should be considered:

1. Read food labels and choose foods with low cholesterol and low saturated fat levels.
2. Limit the intake of red meat and eggs to reduce intake of saturated fat and cholesterol.
3. Choose semi skimmed or skimmed milk, as well as low fat and fat-free dairy products.
4. Limit fried food, and use healthy oils in cooking, such as vegetable oil.
5. Reduce total fat intake as well as saturated and trans fat intake. The remaining fat should come from monounsaturated and polyunsaturated fats such as unsalted nuts and seeds, oily fish including salmon, trout and herring at least twice per week, and vegetable oils.
6. Limit cholesterol intake to less than 300mg per day and for CHD cholesterol intake should be less than 200mg per day.
7. Increase the consumption of fibre as this can help lower cholesterol levels by as much as 10 percent.
8. Increase intake of grains including wheat, oats and rice. Some foods made from these grains use only the inside of the grain such as white rice and white pasta whereas whole-grain foods include the outside and the entire grain.

What makes whole grains so great?
Wholegrain foods are healthy because they contain fibre. A diet high in fibre can help reduce the risk of heart disease and diabetes. High fibre foods stay in your stomach for longer, so you feel fuller and your blood sugar doesn't go up as quickly after you eat. Whole grains, such as whole-wheat flour and brown rice, also have more fibre than refined white flour and white rice. Whole grains and other high-fibre foods are helpful for the following reasons:

- Control blood sugar and blood cholesterol
- Making you feel fuller for longer resulting in eating less
- Preventing constipation, or hard bowel movements

How to eat more fibre
To increase fibre intake consider the following suggestions:

Instead of ...	Try ...
White bread or "wheat" bread	'Whole-wheat' bread or rye bread
White rice	Brown rice or wild rice
Regular pasta	Whole-wheat or whole-grain pasta
Macaroni	Bulgur wheat
Corn flakes	Bran flakes or other bran cereal
Crispy rice cereals	Whole-grain cereals
Cream of wheat	Oatmeal
Flour tortillas	Whole-grain or corn tortillas (made without lard)

Maintain a healthy weight
Weight loss of 10% can reduce the risk of risk of dyslipidaemia. To promote weight loss it is necessary to burn more calories than consumed; every good weight loss plan has the same two parts, food and physical activity. Helpful food choices and increased physical activity can result in fewer calories consumed and burning off some of the calories consumed resulting in maintaining a healthy weight.

Keep portions smaller than your fist
It's easy to overeat when you have too much food on your plate therefore smaller portions help prevent overeating. Overeating can make health problems worse, especially with dietary related diseases like diabetes and a helpful way to control overeating is to reduce portion sizes. For most foods, a reasonable portion is ½ to 1 cup, approximately the size of a woman's fist. Even if the individual's fist is larger than that it is still a useful measuring tool.

The two most common exceptions for these portion sizes are:

- Meat, chicken and fish. For these foods, keep portions the size of a deck of cards, which is about half the size of your fist.
- Plain vegetables, including salads without dressing. You can have as much as you want because these foods are filling and low in calories.

Control your hunger with filling foods that are low in calories.
Foods such as soup, salad, fruit and vegetables digest slower and as a result satisfy hunger and help weight loss due to a fuller feeling on a smaller amount of food.
Keep track of what you eat
Studies have shown that keeping a track of what is consumed on a daily basis will result in being more likely to maintain dietary and lifestyle changes and, if necessary, promoting weight loss.

Enjoy more physical activity
Regular physical activity is important for keeping a healthy heart. By increasing physical activity this may help weight loss as well as strengthening the heart muscle at the same time.
Helpful tips to maintain a healthy weight:

Instead of ...	Try ...
Counting every calorie and fat gram	Keeping a food diary. Once you know what you are eating you may be able to reduce the amount without having to count every calorie. Try eating ½ portions.
Eating dessert after dinner	If you want a dessert, try only eating it after lunch, and choose a low-calorie dessert like fruit. The earlier in the day you eat high-calorie foods, the more time you have during the day to burn off those extra calories.
Skipping meals to lose weight	Eating 4-5 smaller meals during the day. Eating every 3-4 hours helps control hunger. Just make sure that your smaller meals do not exceed your daily total calorie goals.
Leaving long gaps between meals	Planning ahead and bringing healthy snacks with you wherever you go so you won't be tempted to pick up an unhelpful choice instead. Drink a tall glass of water to get you through a craving.
Tasting food while you cook	Resisting eating the food you are making until you are sitting at the table with a plate an appropriate portion size in front of you.
Stopping at the supermarket on the way home	Shopping after you eat. Aim to avoid food shopping whilst hungry and if you have to go to the shops before eating a meal make sure you have a healthy snack to eat before. This will help to curb the appetite and reduce the likelihood of binge-buying.
Weighing yourself every day	Weighing yourself once a week allows you to see more accurate weight loss rather than daily fluctuations and prevents an unhealthy obsession with the scales; a change in your body shape or meeting a dietary and lifestyle goal is just as successful as weight loss.

Aims of the section:

1) Understanding what the disease is and its definition
2) Understanding what happens when a person has hypertension
3) Understanding when the condition is clinically significant
4) Understanding other dietary influences
5) Understanding the role of obesity with the disease
6) Understanding the role of physical activity, alcohol, sodium, potassium
7) Understanding other dietary treatments for the disease

Introduction

Hypertension, also known as raised blood pressure, is a major risk factor for cardiovascular disease, coronary heart disease and strokes. There is also an increased risk for those with diabetes and it can be a secondary disease to renal disease, liver disease, cardiac failure and complications with pregnancy.

Definition measurements of hypertension

Hypertension is a chronic medical condition in which the blood pressure in the arteries is elevated. Blood pressure is summarised by two measurements, systolic and diastolic, which depend on whether the heart muscle is contracting (systole) or relaxed between beats (diastole). This equals the maximum and minimum pressure, respectively. Systemic pressure force is during contraction of heart ventricles, diastolic pressure is the measure of blood pressure during ventricle relaxation.

It is influenced by the force of the heart pumping blood, the diameter of blood vessels and the volume of circulating blood. Blood pressure varies during the day, so you will tend to need 2-3 readings. For young healthy adults 120mmHg mercury would be ideal, with 80mmHg mercury as a typical reading for women who have lower blood pressure.

Blood pressure increases with age and genetic factors may also come into play. It can also be affected by ethnic group, such as the Afro-Caribbean, where it tends to be higher as well as a higher prevalence in lower socio-economic groups.

Potential effects of hypertension

When the volume of blood is too high for the vessels, the raised blood pressure increases the workload on the heart, which damages the blood vessels. This increases the infiltration of blood components such as lipids in arterial wall, leading to an increase in cardiovascular risk.

Risk factors

The risk of hypertension increases as you get older and although there is not one factor which causes hypertension the following can increase the risk:

- Being overweight
- High blood pressure
- Excess consumption of salt
- Increased consumption of alcohol
- Aged over 65

When is this clinically significant?
Depending on the age of the individual and whether there is any cardiovascular risk the level at which active investigation would normally be considered is when the blood pressure is greater than 140mmHg / 90mmHg. There other dietary influences which include:

- Obesity
- Low level physical activity
- High alcohol intake
- High sodium intake
- Low potassium intake
- Dietary calcium and Omega 3 fatty acids which can lower blood pressure

There are several lifestyle modifications to prevent and management hypertension as shown below:

Effects of obesity
The risk is greater if fat is centrally distributed however if body weight is reduced by 3-9% it can decrease blood pressure by 3mmHg, and can also decrease the need for hypertensive medication.

Physical activity
Physical activity can decrease systolic and diastolic pressure, however it needs to be maintained as this can be reversed when physical activity decreases again. It is most effective if the exercise is aerobic and does not necessarily need to be of high intensity; regular and low intensity may be more effective than exercise of moderate intensity.

Alcohol
If intake is above 1-2 units, it can cause high pressure. Heavy consumption and binge drinking is linked to high blood pressure and those with hypertension should exclude alcohol from the diet.

Sodium
There is direct link between increased sodium and high blood pressure and with obesity and high sodium the mortality rate increases also. A reduction in sodium levels leads to the reduction in blood pressure in hypertensive and normal individuals, however the link with salt is smaller than that of alcohol and obesity. It has a greater impact in the elderly population and those with high blood pressure.

The reduction of the average intake of salt from 9g to 6g a day, has now been endorsed by the Scientific Advisory Committee on Nutrition. The effect of salt still needs to be more scientifically proven, however there are still good reasons to advocate the reduction as part of healthy lifestyle. In affluent societies, high salt intake is heavily due to processed foods.

Potassium
There is a positive impact on reducing blood pressure due to relationship with sodium and hence potassium is beneficial for those with hypertension. Individuals should increase potassium by increasing fruit and vegetable intake. Also those foods with antioxidants and soluble fibre also increase potassium intake.

Other tips on the prevention of hypertension

- Weight loss is of primary importance.
- Sodium intake should be reduced by adding less salt to cooking, eating fewer salty foods and less processed foods.
- Fruit and vegetables, which elevate potassium, should be increased by aiming for at least 5 portions of fruit and vegetables a day. These can be fresh, dried, frozen, juiced or canned, however for the canned vegetable variety, low salt should be selected.
- Alcohol should not exceed 1-2 units and binge drinking should be avoided.
- Regular physical activity is important to promote weight loss or maintain a healthy weight.
- The diet should be balanced and cardio protective with the inclusion of oily fish.
- Include at least 1-2 portions of oily fish especially dark-fleshed fish per week such as salmon, pilchards, sardines, mackerel, herring and trout. Fresh, frozen or canned are all good, but avoid fish canned in brine.
- Include 2-3 servings of low-fat dairy foods such as semi skimmed milk, low-fat yoghurts and low-fat cheese.
- Include 2-3 servings of wholegrain per day including breakfast cereals, bread and pasta.
- Also eliminate or at least reduce smoking.

Aims of the section:

1) Understanding the disease and the results of osteoporosis
2) Understanding bone structure and how to strengthen bone structure
3) Understanding what the main symptoms are
4) Understanding the non-avoidable risk factors
5) Understanding the avoidable risk factors
6) Understanding the main treatment of osteoporosis
7) Understanding the role of vitamins and minerals
8) Understanding the prevention of osteoporosis

Osteoporosis

Osteoporosis has been defined as a systemic skeletal disease characterised by low bone mass with a consequent increase in bone thinning and susceptibility to fracture. Osteoporosis related fractures cause a great deal of pain and can lead to a loss of independence by reducing mobility, especially in the elderly.

Thinning bones can cause chronic bone pain, especially back pain. Bones are composed of collagens minerals filled with calcium to create a hard structure and are constantly remodelled to suit our lifestyle. During childhood and early adulthood the bones develop their strength and from our 45-50 onward they start to lose structure slowly causing bone thinning.

The most effective mechanisms to reduce the risk of developing osteoporosis are to acquire optimal peak bone mass, maintain bone health in early adulthood and reduce the rate of bone loss in later life.

Risk factors

Non avoidable risk factors:

1. Gender: women more likely to develop osteoporosis than men
2. Age: the older, the higher the risk of osteoporosis
3. Family history: having a parent or sibling with osteoporosis increases the risk.
4. Frame size: those with a smaller body frame size tend to have a higher risk due to having less bone mass to draw from as they age.
5. Hormonal imbalance: low levels of oestrogen especially at menopause, increases the risk of developing osteoporosis at a later age.
6. Thyroid problem: too much can cause bone loss
7. Other glands: it has also been associated with an overactive parathyroid as well as adrenaline glands

Avoidable risk factors
These are factors, which we can have an impact on and include:

1. Body weight

Body weight is positively linked to bone mass and therefore a higher body weight is associated with a higher bone mass and reduced risk of osteoporotic fracture. Intentional weight loss results in an increased rate of bone loss in healthy premenopausal women and this is exacerbated if the weight loss is sufficient to cause low oestrogen levels, as in anorexia nervosa. Maintenance of a body mass index (BMI) within the normal range is advocated to help to achieve optimal bone health.

2. Physical activity

Appropriate physical activity can aid attainment of peak bone mass, reduce age-related bone loss and reduce the risk of fracture in postmenopausal women. However, excessive strenuous exercise can be detrimental to the bone health of young women if it results in loss of menstrual cycles and therefore reduced oestrogen levels. Weight-bearing exercise (running, dancing, climbing stairs and brisk walking) has been shown to have the most beneficial effect, but swimming and cycling and other non-weight bearing activities have a beneficial effect on muscle strength and can help to prevent falls and subsequent fracture.

3. Smoking

Smoking appears to have little effect as an independent factor on osteoporosis or the risk of hip fracture in pre-menopausal women, but significantly affects the risk of fracture in postmenopausal women and in men. Cigarette smoking has been implicated in the aetiology (causation of a disease or condition) of osteoporosis but reported bone changes could in part be due to other lifestyles factors closely associated with smoking, such as low body weight, alcohol consumption and low micronutrient intake.

4. **Calcium intake**

Calcium is important for maintaining strong bones and the recommended intake of calcium is at least 700mg a day (The British Dietetic Association, 2005).

5. **Eating disorders**

Eating disorders can lead to osteoporosis and loss of muscle strength, particularly in women and girls therefore the early intervention by a specialist team is essential.

6. **Excessive alcohol intake**

Limit alcohol intake to reduce the risk of osteoporosis; the recommended limit is 3 to 4 units for men and 2 to 3 units for women although it is important to also avoid binge drinking.

7. Vitamin D

It is important to help the body absorb calcium and can be found in eggs, milk and oily fish. Most Vitamin D is made in the skin in response to sunlight and short exposure to sunlight, without sunscreen (10 minutes twice a day), throughout the summer should provide enough vitamin D for the whole year. Certain groups of people may be at risk of not getting enough vitamin D including those housebound or particularly frail, people with a poor diet or who keep covered up in sunlight because they wear total sun block or adhere to a certain dress code, and women who are pregnant or breastfeeding.

Lifestyle

Since regular heavy consumption of alcohol and smoking are likely to have adverse effects on the bone health, guidance on sensible drinking limits and smoking cessation should be given when appropriate. Alcohol and smoking should be limited or eliminated.

Exercise

Regular weight bearing exercise and in older people, muscle strengthening exercises for fall prevention should be undertaken for at least three 20 minute sessions weekly. To be of benefit, these measures need to be sustained since it may take as long as 9 months for the effects to become apparent (National Osteoporosis Foundation, 2010).

Daily weight bearing exercise such as walking, running, standing or just shifting weight from one side to another should be included; swimming is not considered as a weight bearing exercise. Sedentary or bed ridden people will find it difficult to perform weight bearing exercises. They should therefore be encouraged to do as much as they can.

Prevention of osteoporosis

It is clear that in order to achieve and maintain optimal bone mass within genetic potential and thus reduce the risk of developing osteoporosis, appropriate eating habits must commence at an early age and continue throughout life. The British Dietetic Association recommend to ensure that calcium and vitamin D are adequate for bone health is to integrate requirements for these nutrients in the patterns for healthy living and eating set out in The eatwell plate. Such patterns will also help to ensure the appropriate intake of other nutrients implicated in bone health.

The concurrent maintenance of other healthy lifestyle behaviours such as taking sufficient physical activity, avoidance of smoking or excessive alcohol consumption, and keeping BMI within the normal range may be no less important preventive measures.

This shows that the prevention measures are very close to the treatment measures, therefore these measures work for those with osteoporosis or for those without the disease.

Aims of this section

1. Understanding the definition of food intolerances and the food allergies
2. Understanding non allergic food intolerances
3. Understanding psychology and causes of food allergies/intolerances
4. Understanding the four different types of allergic response
5. Understanding the immunologically mediated reactions
6. Understanding the dietary management of food allergies and where dietetic guidance is required
7.
8. Understanding the causes, signs and symptoms of food intolerance
9. Understanding the diagnostic exclusion diets, both single and multiple
10. Understanding food reintroduction and non-allergic food intolerances

Definition

According to the BDA (2014) a food allergy is an abnormal response to a food triggered by the body's immune system. When you are allergic to certain types of food, the suspect food triggers the immune system into releasing antibodies called immunoglobulin E (igE). These cause the body to start releasing histamines, and it is these that are responsible for all the unpleasant symptoms.

Difference between allergy and intolerance

Food allergy and food intolerance are both a type of food sensitivity. Food intolerance, also known as Non-allergic food hypersensitivity, doesn't involve the immune system, which are referred to as non-immunologically mediated reactions and they are generally not life-threatening. Very often, people mistake a food intolerance for a food allergy. Food intolerance is much more common, and is the less serious of the two conditions. Just because the body responds badly to a particular food, it doesn't automatically mean an allergy. Sometimes, another type of reaction to food called 'food intolerance' occurs.

Originally 'food intolerance', was suggested as an umbrella term to cover a wide range of physiologically mediated reactions to food. More recently it is used to describe intolerances that do not result in a true allergy, ie non-immunologically mediated reactions to food.

The symptoms of food intolerance may look and feel like those of a food allergy such as vomiting, stomachache and diarrhea. However; the immune system is inactive and it does not cause these symptoms. For example some fruit juices and natural sugars can cause rashes and diarrhea, but these aren't allergic reactions.

Food allergy

This is a specific reaction resulting from an abnormal immunological response to a food, which can be severe and life threatening. The symptoms may be of rapid onset but can also develop more slowly (e.g. coeliac disease).

Food intolerance

Such reaction may be due to a directly triggered histamine (compound involved in local immune responses) release, pharmacological effects, enzyme deficiencies, irritant and toxic effects. There may also be other factors whose influence is not yet fully understood. Due to their variable aetiology (meaning the cause of the condition), the effects are also diverse. They can be acute and severe but are more usually chronic and diffuse, and hence often difficult to diagnose. Unlike immunologically mediated reactions, relatively large amounts of a food may need to be ingested for adverse effects to occur.

No all responses to food necessarily need to be physical. Some responses may be emotional, which result from the thought of eating a certain piece of food. This is not termed as being food intolerance, but rather is referred to as 'food aversion'.

Food allergy causation

The immune system mistakenly treats proteins (antigens) found in food as a threat to the body, when they should be harmless. As a result, chemicals are released in defence and it is these chemicals, which cause the allergic reaction.

There are four basic types of allergic response (Gell and Coombs 1963), of which the acute type I and the delayed type IV reactions are the most common:

- Type I: This is the 'classic', and most common, form of allergy where reactions occur within minutes of exposure to the antigen (a molecule that induces an immune response) causing symptoms such as swelling in the mouth and throat, streaming eyes and nose (rhinitis), breathing difficulties or asthmatic attack, often followed by reactions in the skin or gastrointestinal tract. If untreated, these effects can result in asphyxiation (dying from a lack of oxygen) and circulatory collapse (anaphylaxis) and be fatal. The reactions result from the interaction of the allergen with specific IgE antibodies bound to receptors on mast cells, triggering the rapid release of mediators such as histamine into the circulation causing vasodilation, capillary leakage, hypotension, oedema and smooth muscle contraction. Type I allergic reactions are the most serious because of their speed of onset and potential severity, often in response to minute quantities of the triggering antigen.

- Type II or 'cytotoxic' reactions are also immediate but are confined to cell membranes. Interaction of the cell-bound antigen with IgG (antibodies with a long-term effect) causes membrane damage, and the subsequent activation of the complement system results in cell breakdown.

- Type III or 'immune complex reactions' occur some hours after exposure to antigen and are known as 'late' reactions. These result from the IgG antibodies and are most commonly responsible for allergic and intolerance reaction in children.

- Type IV or 'cell-mediated reactions' only appear 24-48 hours after exposure and are termed 'delayed' reactions. The T-lymphocyte (a type of lymphocyte that play a central role in cell-mediated immunity) recognizes antigens bound to foreign cells and causes breakdown. Type IV reactions are probably the second most common form of food-provoked allergic reaction after type I, and are probably responsible for the exacerbation of eczema in

children with cow's milk protein allergy, and some types of contact or urticarial dermatitis in adults.).

Foods known to cause immunologically mediated reactions include (NHS choices, 2014):

- Peanuts
- Tree nuts (e.g. Brazil nut, almond, hazelnut)
- Milk (cow's goat's, sheep's and others)
- Soya (and other legumes such as peas or lentils)
- Fish
- Shellfish
- Eggs
- Fruit (especially apples, peaches, plum, cherries, bananas, citrus fruit)
- Seeds (especially sesame and caraway)
- Herbs and spices (especially mustard, paprika and coriander)

Cow's milk, eggs, peanuts and soya are the foods commonly responsible for allergic and intolerance reactions in children.

Severe type I anaphylactic reactions are most likely to be provoked by peanuts, tree nuts, fish, shellfish, egg, soya and sesame seeds. Anaphylaxis can also be triggered by milk, cereals, fruit and many other foods.

How do dietitians management of food allergies

The core of managing food allergies is to first identify the allergen(s) and then to ensure that it is being avoided during food consumption. Complete exclusion is imperative because a reaction can occur to even trace amounts of allergenic protein and also because sensitivity to the allergen can increase on repeated exposure. A previously mild reaction could subsequently become a life-threatening one.

Specialist guidance from a dietitian is essential to ensure that:

- **All sources are avoided:** all potential sources of the allergen, both obvious and less obvious, are avoided. This may not be a simple procedure. If the food is a common component of manufactured foods (e.g. nuts, egg, and wheat), many foods may need to be avoided and, if the food allergen is often present in trace quantities its presence may be difficult to identify
- **Minimise effects of food exclusion:** the effects of the exclusion diet on the intake of other nutrients and overall dietary balance are minimised. This is especially important if the individual is an infant or child, as is often the case. If the excluded food is normally a major nutritional contributor to the diet (e.g. milk), alternative sources of nutrients will need to be provided.

In practical terms, clear written guidance is needed regarding:

1. Foods, or types of foods, which may need to be avoided and the extent to which this can be determined from ingredients lists on manufactured food. With some types of

foods exclusion, lists of manufactured foods free from specified components may be available.
2. Foods or type of foods, which can safely be eaten.
3. Dietary measures, which should be taken either to reduce the impact of dietary exclusions on normal life or to prevent potential nutritional inadequacies.

What are the causes of intolerance?
Reactions to food can result from a number of causes, none of which are mediated by the immune system. Such reaction may be due to directly triggered histamine release, pharmacological/chemical effects, enzyme deficiencies, irritant or toxic effects (Allergy UK, 2012).

First cause: enzyme deficiency
Enzymes are needed to digest food. If some of these are missing or insufficient, proper digestion may be undermined. For example, people who are lactose intolerant, lack lactase, which is an enzyme that breaks down milk sugar (lactose) into smaller molecules which the body can then absorb through the intestine. If lactose is not absorbed it can causes spasm, stomach ache, bloating, diarrhoea and gas.

Those with a milk protein allergy have also had similar symptoms to lactose intolerance, which is why some people are misdiagnosed as allergic. Nearly all foods require an enzyme for proper digestion therefore enzyme deficiency is a common cause of food intolerance.

Chemical causes
Certain chemicals in foods can cause intolerances including amines in cheeses and caffeine in coffee, tea and chocolate. Some people are more susceptible to these chemicals than others.

Food poisoning
Foods with naturally occurring chemicals can have a toxic effect on humans causing diarrhoea, nausea and vomiting. For example undercooked beans can cause aflatoxins, toxic metabolites produced by certain fungi in/on foods, possibly resulting in unpleasant problems, however fully cooked beans do not have this toxin.

Natural occurrence of histamine.
Fish not stored properly can have an accumulation of histamine as they rot. For some people this can lead to them developing skin rashes, abdominal cramp, diarrhoea, vomiting and nausea. Often the symptoms are very similar to anaphylaxis, which results from an allergic reaction.

Food additives
This is a very common cause of intolerance and has been a steadily growing problem, with more foods containing additives to enhance their flavours, increase appeal and lengthen shelf life. Examples of these additives include antioxidants, artificial colourings, artificial flavourings, emulsifiers, flavour enhances, preservatives and sweeteners. From the numerous additives used in the food industry, a small number are thought to cause problems including the following:

- Nitrates: which are known to cause itching and skin rashes. These are found in processed meats.
- MSG: Mono sodium glutamate used as a flavour enhancer. This is known to cause severe headaches.
- Sulphides: food enhancer or preserver, commonly used in wines.
- Colourings: carmine (red) and annatto (yellow), known to cause food intolerance reactions.

- Hot spices: irritant effects on the gastrointestinal tract can be induced by foods containing hot spices such as chilli or pepper.
- Other cause: there is growing evidence that the composition of growing micro flora, may contribute directly or indirectly to causing food intolerance.

Signs or symptoms
A symptoms is something a sufferer feels such as pain or discomfort, however a sign is something others can detect such as a rash.

It can be difficult to determine whether the individual has food intolerance or a food allergy, because often the signs and symptoms overlap. With an allergy, even small amount of the food result in symptoms such as peanuts. With food intolerances, tiny amounts will not usually have an effect, however for further investigation, medics can usually test for IgE antibodies.

Also, food intolerances take longer to emerge compared to a food allergy. Sometimes it may take several hours after ingesting food but the symptoms can persist for several days; in some cases symptoms may take 48 hours to emerge.

Some people may be intolerant to several groups of food, making it harder to determine whether it is a chronic illness or intolerance. Identifying the culprits can take long time.

Most common symptoms
- Bloating
- Migraines
- Headache
- Cough
- Runny nose
- Stomach ache
- Irritable bowl
- Hives

What is the treatment?
This is found in what is known as 'Diagnostic exclusion diets' where foods or food constituents which are suspected of causing intolerance are eliminated from the diet to see whether symptoms improve. These processes should be overseen by a dietitian, however they are mentioned below only for reference purposes:

1) Single exclusion diet

Here only a single source of food is removed from all aspects of a diet. This is where the individual suspects that it is this particular food that is causing the problem. Where this is the case, the following two points are noted:

a. They need to check whether all food that is still being consumed contains the particular item. Sometimes this may be less obvious and thus reading the label may be required.
b. If this diet means that certain staple foods are excluded such as milk, cereal of bread, substitutes or alternatives will need to be suggested.

2) Multiple food exclusion diet

This is used when a dietary link is suspected but cannot be identified, so those foods most commonly associated with the problem are excluded first. The most common examples are wheat, egg and milk. Also non-dietary sources may also need to be excluded such as wheat and yeast can be found in pharmaceutical products and colours or preservatives can be

encountered via toothpaste, medicines, vitamin and mineral preparations, paints, chalk, crayons and cosmetics, whilst.

Where fluctuations in the disease pattern occur this diet can be followed for up to 6 weeks, however the usual period for this type of diet is 2-3 weeks. Once the symptoms improve, the challenge is to reintroduce the food so that the ones provoking the symptoms are identified. If there is still no improvement, the dietitian will examine if the procedure was correctly followed and then decide whether or not exclude additional foods or to conclude whether or not a food intolerance is the cause of the problem.

3) More advanced methods

Where a single or multiple exclusion diet does not work, more advanced methods may be used involving very little or even an elemental protein diet. Both of these would be overseen be a medical team.

Food reintroduction by a dietitian

Dietary exclusion for diagnostic purposes needs to be followed by phased food reintroduction in order to identify or confirm the suspect foods.

Foods can be reintroduced within intervals of a few days, if it is for a non-allergic food intolerance. The return of symptoms may return immediately or it may take a week or more. How much food is reintroduced is debated as it a balance between consuming too much and consuming to little such that no symptoms are provoked. Also, the body may be much more sensitive after the food has been excluded, however as a general rule the reintroduction should be in similar quantities to the levels of consumption prior to starting the diet. With children, the reintroduction may be more gradual.

This can take up to 9 months, so motivation from a dietitian is very important for the individual. There also needs to be a balance between wanting to identify the problematic food and making the diet more palatable. However the individual should be encouraged to tolerate such a diet, because the potential rewards in terms of quality of life are high if the problematic food is correctly identified. Even if no such food is identified, the individual must be reassured that the investigation has not 'failed' but rather it has been established that the symptoms they are experiencing are not diet related.