

The Food and Nutrition Guidelines in Detail

Eat a variety of foods from each of the four major food groups each day.

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Vegetables and Fruits

Vegetables and fruits provide a wide range of vitamins and minerals. They are high in complex carbohydrates, fibre and water, and low in saturated fat and total fat. Eat fresh fruit when it is available, and canned fruit as an alternative when fruit is out of season.

Select at least *three* servings of vegetables, and *two* servings of fruit each day.

Vegetable Serving Sizes:

- 1 medium potato or similar-sized root vegetable (135g)
- half a cup cooked vegetables (50-80g)
- half a cup salad (60g)
- 1 tomato (80g)

Fruit Serving Sizes:

- 1 apple, pear, banana or orange (130g)
- 2 small apricots or plums (100g)
- half a cup fresh fruit salad (120g)
- half a cup stewed fruit (135g)
- 1 cup fruit juice (250ml)

Milk and Dairy Products

Milk and dairy products are valuable sources of protein and calcium. They can be a major source of saturated fat, but there is an increasing variety of low-fat and low-salt dairy foods available.

Select at least *two* servings each day, preferably low-fat.

Dairy Product Serving Sizes:

- 250 mL milk
- 1 pottle yoghurt (150g)
- 2 slices cheese (40g)
- 2 scoops ice cream (140g)

Breads and Cereals

Breads, breakfast cereals, pasta, rice, and other grain products provide complex carbohydrates, fibre and energy in addition to a variety of other nutrients. They are an important part of most meals and snacks. Wholegrain cereals provide additional fibre and B vitamins. Baked goods – including biscuits, cakes, and muffins – are made from cereals, but they also contain fats and should be eaten in moderation.

Select at least *six* servings each day, including some wholegrain.

Bread and Cereal Serving Sizes:

- 1 roll (50g) 1 muffin (80g)
- 1 medium slice of bread (26g)
- 1 cup cornflakes (30g)
- half a cup muesli (55g)
- half a cup cooked cereal (130g)
- 1 cup cooked pasta (150g)
- 1 cup cooked rice (150g)
- 2 plain sweet biscuits (14g)

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Healthy eating habits, however, that ensure you maintain a well-balanced diet may mean you are less likely to develop diet-related diseases such as high blood pressure or heart disease.

Nutrition is the study of nutrients and how your body uses them. **Nutrients** are the basic building blocks of foods. Your body needs nutrients to grow and keep healthy.

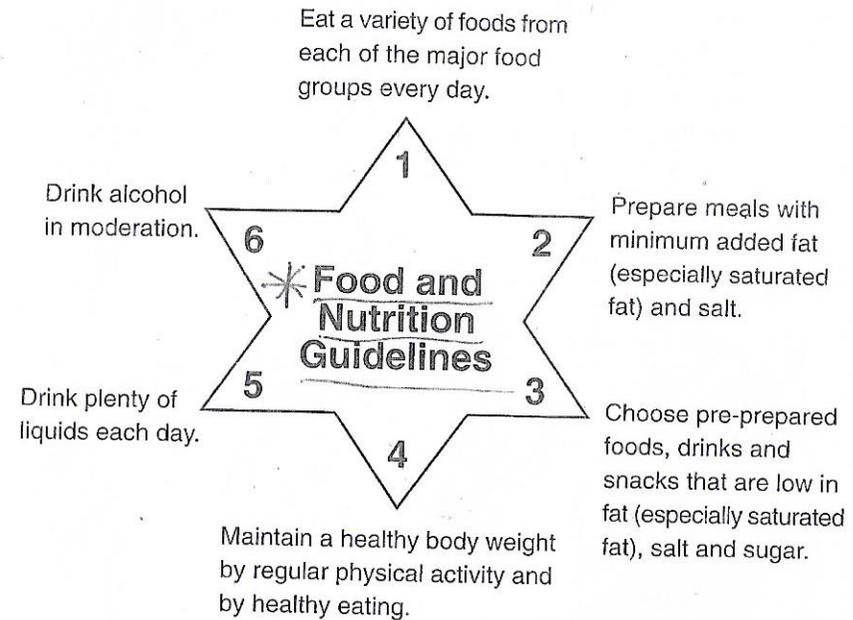
*substance
in food
needed*

Nutritional guidelines give advice on food to help you obtain the best balance of nutrients in your diet.

B. 3 food groups A. Healthy diet pyramid

These Food and Nutrition Guidelines have been developed to help you make wise choices of food which you will also enjoy eating.

Note: The following material on the Food and Nutrition Guidelines comes mainly from the brochure 'Food Fantastic', produced by the Public Health Commission in 1995. Peter, Jim and Susie's comments are entirely their own responsibility!



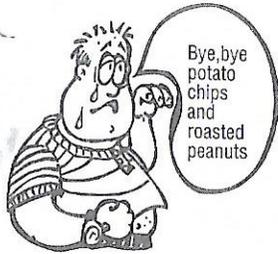
pg 1

Choose pre-prepared foods, drinks and snacks that are low in fat (especially saturated fat), salt, and sugar.

Pre-prepared foods include meals that are prepared outside of the home, such as restaurant meals and takeaway foods. It also includes foods that have been pre-prepared before purchase but still need to be cooked, heated or require more preparation before being eaten, eg a frozen pizza. When selecting and buying these foods, read the labels, ask for information, and choose those which are low in fat, salt, and sugar.

Fruits, vegetables and breads are all healthy snacks. Nuts are a snack food, but these should be eaten in moderation because they are high in energy. Choose nuts with little or no added salt.

Fruit juice, cordial and fizzy drinks are high in sugar and energy. Drink these in moderation and instead of sweet drinks choose water and drinks without added sugar.



4. Maintain a healthy body weight by regular physical activity and by healthy eating.

Food supplies energy. Excessive food intake, including a high intake of fatty or sugary foods, can lead to an over-supply of energy and contributes to obesity. To maintain body weight, energy intake must be balanced by the energy used. Healthy weight depends on how much of the weight is fat and where that fat is stored in the body.

While there is no exact healthy weight, being too thin or too fat increases the chance of developing health problems. To change body weight it is necessary to change both food intake and physical activity.

Lean Meats, Poultry, Fish

Eggs, nuts or pulses (such as dried beans, peas and lentils).

These foods are main sources of protein, vitamins and minerals, and most are important sources of iron and zinc.

Select at least *one* serving each day.

Serving Size Examples:

2 slices cooked meat (approx 100g)

1 egg (50g)

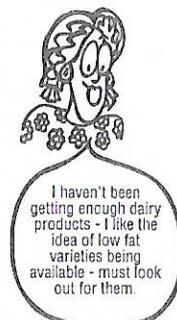
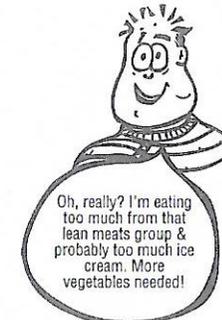
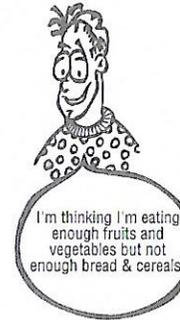
1 medium steak (120g)

2 drumsticks or 1 chicken leg (110g)

three quarter cup mince or casserole (195g)

1 medium fillet of fish – cooked (100g)

three quarter cup dried cooked beans (135g)

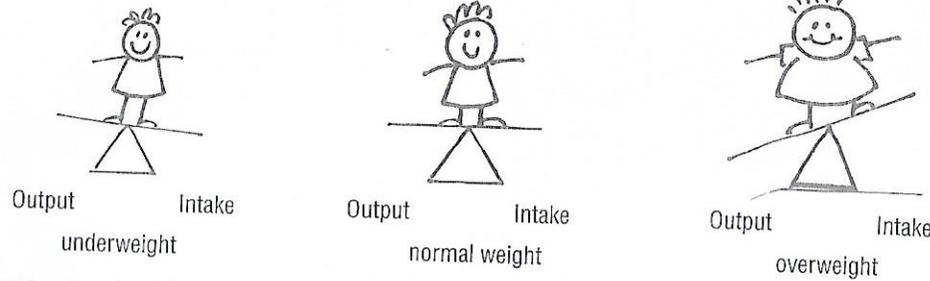


2. Prepare meals with minimum added fat (especially saturated fat) and salt.

To moderate the amount of fat eaten:

- Eat vegetables with little or no added butter, margarine, oil, or coconut cream. Replace these with low-fat dairy products such as yoghurt and cottage cheese.
- Use salad and vegetable dressings, and sauces sparingly (many of these are high in fat) or choose low-fat varieties.
- Add fats in small amounts to breads and cereals (eg, muffins or scones) or choose low-fat spreads and sauces instead. Butter and margarine have the same amount of fat; butter is higher in saturated fat. Reduced-fat spreads are available.
- When preparing meats, trim off as much fat as possible.
- Choose low-fat cooking methods, such as grilling, boiling or microwaving.
- Stand meat on a rack so that fat will drain off when grilling or roasting.
- When fat is used in food preparation, use monounsaturated fat such as canola or polyunsaturated fat such as sunflower oil instead of saturated fat such as butter.
- Eat poultry without the skin as most of the fat is found there.

Keep a healthy weight



What is a healthy weight? A quick measure is to see if you can 'pinch an inch' of flesh between your thumb and first finger just about your waistline. There are charts which give information on a suitable weight for your height, but these apply to people over 18 years. Teenagers are usually growing quickly and using energy in greater amounts than adults, so weight-height charts are not reliable for them. Someone who is a healthy weight will have enough reserves of energy to use if they become ill and yet not so much weight that they put a strain on their heart or increase their blood pressure.

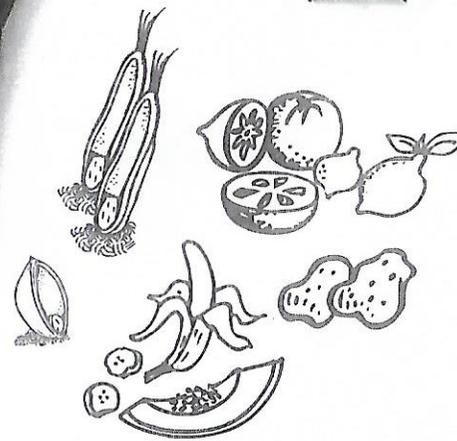
Underweight

If a person is not eating enough food, or using more energy than they are eating, then they will become underweight. They will have little energy and, if severely under-nourished, their body may have to use the protein in their body structures to provide energy. This is seen in famine victims. In New Zealand, underweight is sometimes seen in families with little money or in people who develop **anorexia nervosa** – a psychological illness seen mainly in teenage girls who exercise excessively as well as eating strict reducing diets because they are convinced they are overweight. It is a good idea to get someone else's opinion about whether you are a healthy weight. Your own opinion may be biased!

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Overweight

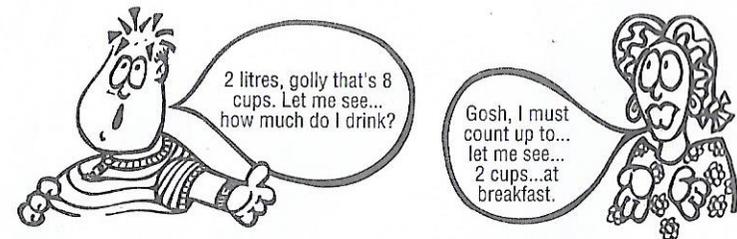
It is not clear yet why obesity seems to run in some families. However, it is clear that obesity is due to consuming more energy, particularly energy gained from fat, than the body uses up. While it may seem to obese people that they do not eat much, usually obese people do not report all that they have eaten. It takes honesty and courage sometimes to face up to the amount of food being eaten when there is a weight problem. Reducing weight means choosing low-fat, low-kilojoule foods as well as increasing exercise levels. The two approaches need to be used together. Reducing energy intake alone can mean that the body starts to work more slowly,



conserving energy. Also very strict reducing diets may not provide enough of the many other nutrients needed by the body. Exercise tones the muscles and gives the person a feeling of well-being, as well as being a valuable way of reducing stress. Plenty of fruits and vegetables in the diet give a feeling of fullness in the stomach so more food, but less energy overall, is eaten. Foods high in fat, sugar and alcohol are high in energy. It is easy to overeat these sorts of foods because they do not fill the stomach as quickly as the fruits, vegetables or wholegrain cereals. The Guidelines suggest keeping fat and sugar levels low for these reasons.

5. Drink plenty of liquids each day

The body loses at least 1–1.5 litres of water each day; this fluid needs to be replaced. Some of it is replaced from the food eaten, but people still need to drink at least one to two litres of liquid each day, and more in hot environments or when doing physical labour or exercise. This can either be as tap water or as beverages such as tea, coffee and fruit juices.



6. If drinking alcohol, do so in moderation

Alcoholic drinks supply energy but little or no nutrients. Alcohol intake should be limited by choosing low-alcohol drinks and increasing the proportion of mixers with spirits.

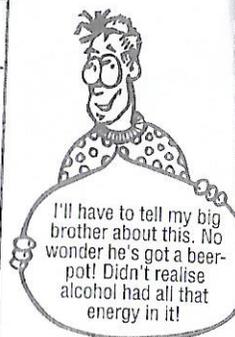
Alcohol intake should be limited to, or less than:

- 20 grams of alcohol per day for women
- 30 grams of alcohol per day for men

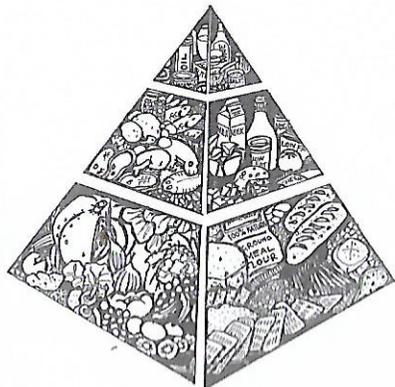
Levels above this may be harmful to the health.

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| | | Volume (mL) | Alcohol (g) | Energy (kJ) |
|------------------|---------|-------------|-------------|-------------|
| Beer | 1 can | 355 | 12 | 470 |
| | 1 jug | 1000 | 33 | 1320 |
| Low-alcohol beer | 1 glass | 250 | 8 | 330 |
| | 1 can | 355 | 4 | 370 |
| Sherry | 1 glass | 60 | 8 | 290 |
| Spirits | 1 glass | 45 | 15 | 380 |
| Liqueur | 1 glass | 20 | 7 | 250 |
| Red wine | 1 glass | 140 | 12 | 550 |
| Dry white wine | 1 glass | 140 | 12 | 410 |
| Sweet white wine | 1 glass | 140 | 12 | 590 |



The Healthy Food Pyramid/Shell/Baskets



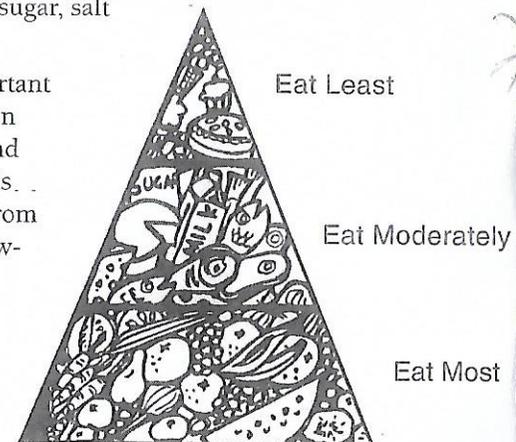
These diagrams have been developed by the National Heart Foundation to show the balance of foods that will help New Zealanders keep to the Nutrition Guidelines.



Eat least: foods which are high in fat, sugar, salt and alcohol.

Eat moderately: foods which are important for their protein content, but which can have high fat levels (eg whole milk) and are often cooked in fat. Foods from this group may need to have fat removed from them before eating (trim meat cuts, low-fat milk, cheese and yoghurt).

Eat most: foods which are fruits, vegetables and cereals, and so are high in fibre and low in fat and sugar. A large proportion of these foods in the diet will help control weight and reduce fat levels in the blood.



Foods need to be chosen from all three levels in the proportions shown to make sure there is a good variety of foods in the diet.

Factors Influencing the Choice of Food

There are many reasons why people choose food. The reasons may change throughout the day. Sometimes whether the food is good for your body may be the last reason you would think of.

| Comment | Factor |
|---|---------------------|
| "Gosh, is that the time? I'll just have to grab a banana and some toast for breakfast!" | - Time |
| "No, I've never eaten okra. We don't get it often here, you see." | - Geography |
| "What's in this salad? Oh, lettuce and beansprouts, cucumber, tomatoes and peppers. Yum, I've had those before, they're great." | - Familiarity |
| "At home we have lots of coconut milk - in all our recipes." | - Culture/Tradition |
| "I love the summer - all that fruit around to eat". | - Season |
| "Let me see ... I've only \$1.50 left so I can only afford to have ..." | - Money |
| "I'm so hungry, and all that's left is some crackers ... better than nothing I suppose." | - Hunger |

"Hey, Va, let's sit together for lunch, we can swap sandwiches again."

- Companionship

"I remember why this seems familiar! It was the pudding we always had for birthdays!"

- Early experience

"I've got to buy one of those ... you know, the ones on T.V."

- Advertising

"I enjoy eating bananas, they make me feel good."

- Emotions

"I love eating baked potatoes and salad. It tastes good and I know it's good for me."

- Food Value

"Wow! That looks great! I wasn't going to eat anything more, but can I have some?"

- Aesthetic

It is important that people providing food make sure that healthy food can be made quickly (*time*), is available (*geography, season*), suits people's backgrounds (*culture, tradition, early experience*), looks good (*aesthetic*), is not too expensive (*money*), makes them feel good (*emotions*), fills them up (*hunger*). Then for whatever reasons people choose to eat food, it will always be food that is good for them.

Food choices gone wrong

Food choices sometimes go awry when people have emotional or psychological problems. Food may be refused (anorexia nervosa) or overused (**bulimia**) for emotional or psychological reasons, sometimes because of family relationships. Bulimic behaviour is hard to detect because the person often maintains a normal weight. Bulimics eat a lot of food, often 'bingeing' in secret. They then 'lose' the food by vomiting or purging their bowels with laxatives.

Both illnesses are serious and need expert treatment. They can be fatal if not treated. Doctors, public health nurses or counsellors can all help people suffering from anorexia or bulimia.

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Activities 1B

1. List the six Food and Nutrition Guidelines.
2. For each Guideline, explain, using only two or three sentences, why it is important for New Zealanders to follow the Guidelines.
3. Explain why pyramid, shell and basket shapes were used for an image of the Food and Nutrition Guidelines.
4. Explain why milk and milk products are in the 'eat moderately' section of the pyramid.
5. Name five snack foods and drinks which could be placed in the 'eat least' category.
6. Name the factor that influenced food choice in each of these situations:
 - (a) "I ate it because it looked so yummy!"
 - (b) "I would have had avocados, but they are so expensive here."
 - (c) "I had fish and chips because everyone else was."
 - (d) "We never have puddings now that we're all watching our weight."
 - (e) "Popcorn made me sick when I was six years old. I never eat it now."

Nutrients in Food

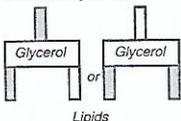
Knowing what nutrients do in the body and what foods they are in helps in choosing balanced meals and thus a healthy diet. There are six main nutrient groups:

The Nutrient Team

Protein, Fat, Carbohydrate, Vitamins, Minerals and Water.

The nutrients could be thought of as a sports team. They have different roles in the body, but all work together to keep the body healthy and functioning. Here is a list of the 'team'. The arrows show their role in the body. Where the arrows are larger, that is their more important role. You will see that some nutrients are important for both growth and energy, just like in some sports teams players are important for both defending the goal and for attacking.

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| Nutrient | What is it Like? (Structure) | What Does it Do? (Function in Body) | Where is it Found? (Food Source) |
|----------|--|--|---|
| Lipid | <p>Simplest form are triglycerides, where three fatty acids are joined to a glycerol molecule. The fatty acids can be saturated or unsaturated but are mostly a mixture.</p>  | <p>Needed in small quantities for cell membranes. Forms part of oils on skin and hair. Needed to transport fat-soluble vitamins. Broken down in the cells to release energy. Excess lipid is stored around organs, eg heart and kidneys, or under the skin as fat, especially in the hips, abdomen and thighs.</p> | <p>Butter, margarine, oil, fatty foods, eg cheese, whole milk, bacon, pastry, chocolate, fried foods.</p> |

Activities 1C

1. What are the main functions of protein, carbohydrate and lipid?
2. Describe the differences between the structures of sugars, starch and fibre.
3. What foods are the best sources of fibre?
4. What foods are the best sources of protein?
5. What are essential amino acids?
6. What is the function of fibre in the body?

Vitamins

can be classified into two groups

Vitamins are needed in very small amounts by the body. They usually form part of other compounds in the body. Often their role is as part of an enzyme in the chemical reactions that take place in the cells. There are two groups of vitamins:

Refer to pg 49 (Food & Nutrition)
 a) those that can be dissolved in fat

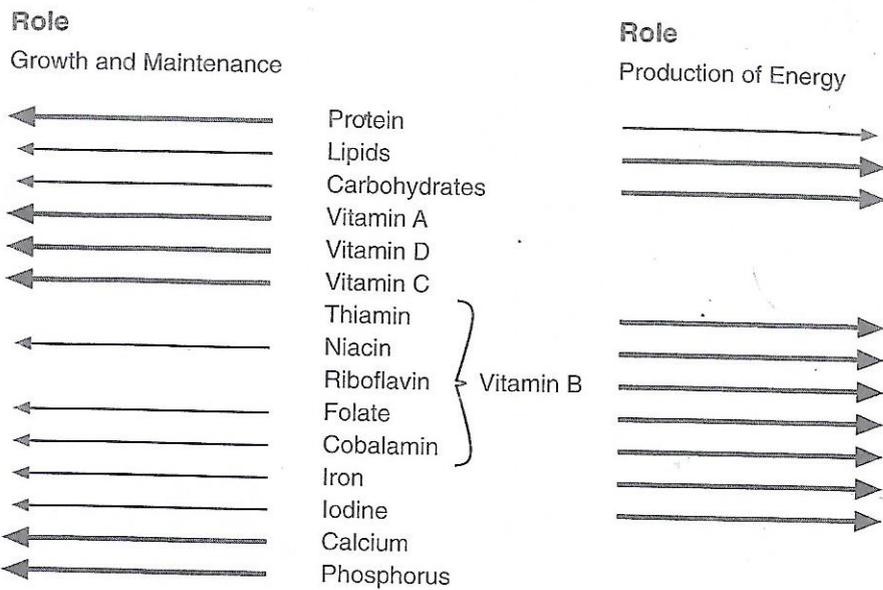
Fat-soluble: A, D, E and K₂ These can be stored in the body, usually in the liver, so an excess intake of them can be toxic.

Water-soluble: The B group vitamins and vitamin C. These need to be eaten frequently as excess intake of some is excreted daily in the urine. They are also easily lost in food preparation because they dissolve in water. An exception is vitamin B₁₂ which is stored in the body.

b) those that can be dissolved in water

Refer to pg 49 (Food & Nutrition).

The Team



Those nutrients mainly involved in growth and maintenance can be divided into the soft tissue team and the hard tissue team. You will see that some nutrients are both teams:

| Soft Tissue Team | Hard Tissue Team |
|-------------------------------|---|
| Protein, Vitamin A, Vitamin C | Protein, Vitamins D and C, Calcium and Phosphorus |



Nutrient Dense Foods

The more 'team players' in a food, the more nutrients are present. A food which contains at least one form of all the six nutrient groups (protein, fat, carbohydrate, vitamins, minerals and water) is described as a nutrient dense food. Wholemeal bread, avocados, milk and vegetable soup all contain one form of each of these six nutrients.

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Nutrients (table)

Activities 1E

- Which minerals are mainly concerned with energy production or regulation?
- What are the compounds in the body of which iron and iodine become part?
- Why is salt iodised in New Zealand?
- Calcium's connection with bones is well known. What other functions does calcium have in the body?
- Why are milk, milk products and yoghurt the best sources of calcium?
- Why are liver, kidney and meats the best sources of iron?
- Why are folate and iron important during pregnancy?

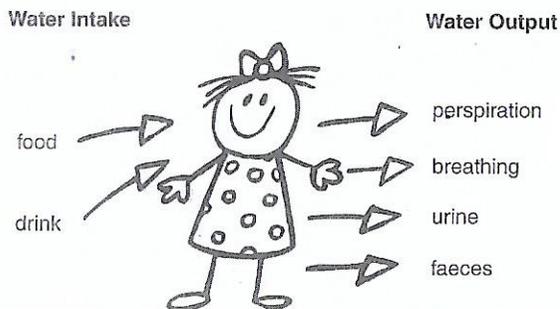
Water

Water is the sixth nutrient is water, often taken for granted. While people can survive for a time without food, without water they can only live for a few days. Our bodies are about 60% water.

Water is a part of all the fluids in the body as well as the cells, tissues and organs. Chemical reactions that take place in the cells can only do so when water is present. The fluids in the body, blood and plasma carry food and oxygen to the cells and transport waste out of the body. Water in the body helps in keeping a constant temperature.

About half the water we need is present in our food. The rest comes from what we drink. Eight cups of fluid per day is recommended. This can be taken in many forms – juice, tea, coffee, etc. As the caffeine contained in drinks such as coffee may irritate the kidneys to lose as much water as we drink, caffeine-free drinks are more suitable.

Water is lost from the body through *urine, faeces, perspiration* and in our *breath*. More water is lost from the body when the weather is hot, during physical activity, when the body has a fever, and when the person has **diarrhoea** or vomiting. One of the dangers of food poisoning, especially in small children, is the increased loss of water. If fluids are not given the person can quickly become **dehydrated**, and chemical processes cannot work efficiently.



Fibre

Fibre is present in plant foods. It is sometimes called **dietary fibre**. An older term is **roughage**. It is that part of the food which is not digested in the small intestine and passes through into the large intestine. Fibre is found in the outer walls of all plant cells. Different fibres come from different foods, but often several types are present in one food. The word 'fibre' includes *cellulose* and *hemicellulose*, *lignin* (the woody part of plants), *pectin* (from the soft tissues of fruits and vegetables), *gums* and some types of *starch*. Only lignin cannot be digested by the bacteria in the **colon** (large intestine). The others are digested to varying degrees – the soluble gums and pectin are digested more easily.

The products of **digestion** include compounds which can be used by the bacteria and the colon wall for energy. They are also transported to the liver where they supply energy. Other by-products are gases (eg carbon dioxide, hydrogen and methane), which pass out through the anus. This is called 'breaking wind', 'gas', 'flatulence' or 'farting'.

Fibre not digested in the colon absorbs water, increasing the softness of the waste solids (**faeces**). The larger, softer faeces are more easily passed from the body, so constipation is prevented. The time the faeces spend in the intestine is also reduced.

It is thought that fibre in the gut binds some fats, preventing their reabsorption – this helps to prevent heart disease and cancer. A high fibre diet also seems to help prevent diabetes mellitus by slowing the rate of carbohydrate digestion.

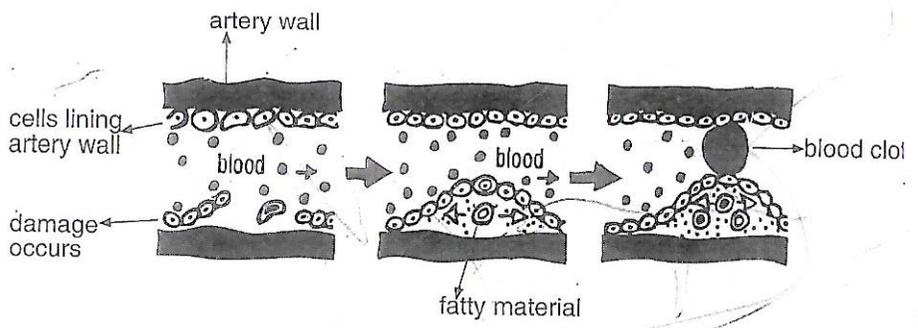
An adequate intake of fibre would be about 30-40g per day. A diet that includes wholegrain cereals and fresh fruits and vegetables gives a good variety of fibre types.

Cholesterol

Cholesterol is a white fatty substance which is present in all animal cells. This means it is present in human body cells as well as in foods of animal origin. Some cholesterol is essential for the body – as it is used in cell membranes and also as part of hormones, Vitamin D and bile acids.

Most of the cholesterol in the body is actually made there, in the liver. The amount of cholesterol eaten in the diet seems to have little effect on the level of cholesterol in the blood. The total amount of fat in the diet and the proportions of saturated and polyunsaturated fat seem to have more effect on blood levels of cholesterol.

Excess cholesterol may, over time, collect on the walls of arteries as a fatty deposit. This narrows and hardens the artery walls. This is called **atherosclerosis**. (This is a form of **arteriosclerosis**). The coronary arteries which supply the heart muscles with blood are especially small. If clots form, these narrowed arteries can be blocked completely. This stops the flow of blood to the heart muscle which stops contracting, causing a **heart attack (coronary thrombosis)**. If the blood supply to the brain is stopped in a similar way, a **stroke** occurs (**cerebral thrombosis**).



High levels of cholesterol in the blood seem to be a major factor in coronary heart disease. The best dietary response to this risk factor is to reduce the total amount of fat in the diet and to increase the proportion of polyunsaturated fats eaten. Keeping the diet high in vegetables, cereals and fruit also seems to be effective in reducing blood levels of cholesterol.

Activities 1F

1. You have a younger brother with diarrhoea and vomiting who isn't drinking enough fluids in a day. Write a paragraph explaining very simply why drinking enough water is important while he is sick.
2. Why is fibre important for our health?
3. When the term 'fibre' or 'dietary fibre' is used, what does it refer to?
4. Why might high cholesterol levels in the blood be a problem for some people?
5. Where is cholesterol needed in our bodies?
6. Where does the cholesterol in our bodies come from?

Digestion

Food is ground by the teeth and mixed with saliva. The enzyme **ptyalin** in saliva begins digestion of starch, splitting it into **maltose units**.

Food forms a **bolus** which is passed down the **oesophagus** by waves of contraction passing along the circular muscles of the oesophagus – this movement is called **peristalsis**.

The **cardiac sphincter**, a circular muscle at the top of the stomach, closes to hold food inside. The stomach further mixes the food as peristalsis moves over its surface. The food is mixed with protein-digesting enzymes such as **pepsin** in the acidic **gastric juice**.

substance that acts as a catalyst in living organisms regulating rate at which chemical reactions proceed without itself being altered in the process

15pg

When the stomach contents become less acidic, the **pyloric sphincter** relaxes to let the contents into the **duodenum**. The food is joined by **bile** from the gall bladder which emulsifies the fat particles.

Pancreatic juice contains several enzymes which digest carbohydrates, splitting maltose into single sugars.

In the small intestine fat is digested by **lipase** enzymes into fatty acids and monoglycerides. The peptides produced in the stomach by the action of pepsin on protein are further split by other **protease** enzymes into dipeptides.

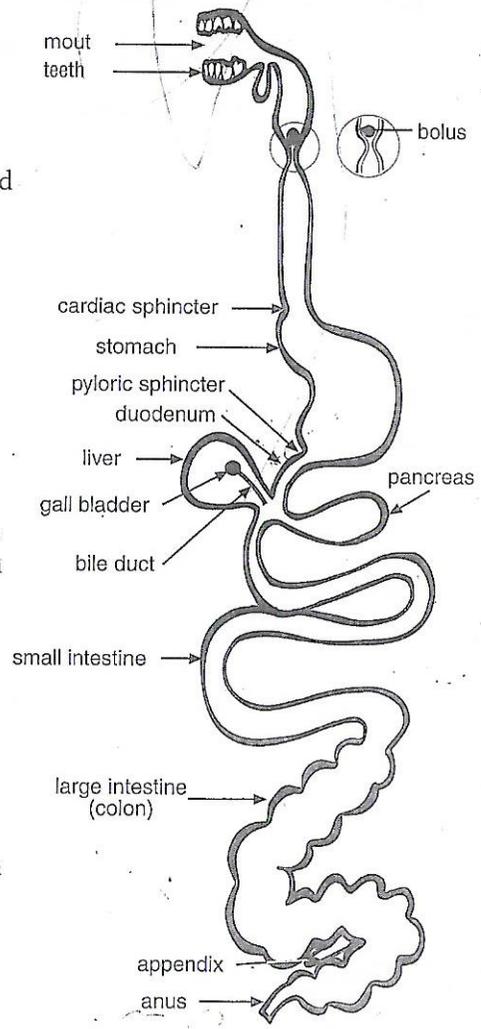
Towards the end of the small intestine the products of digestion, dipeptides, single sugars, fatty acids and monoglycerides, are absorbed through the wall of the intestine into the blood.

In the large intestine (colon) some water is reabsorbed into the blood. The remaining solid waste expelled through the **anus** consists mainly of water and bacteria, with some insoluble fibre.

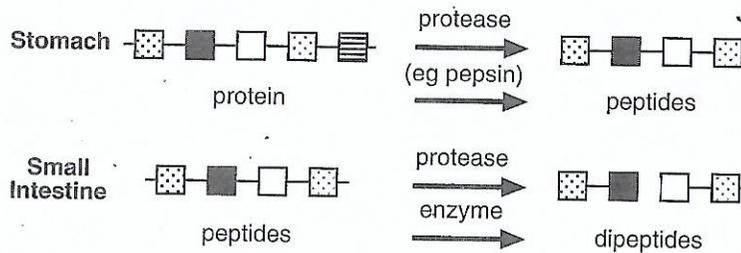
Enzymes in Digestion

During digestion, **enzymes** split proteins, carbohydrates (sugars and starch) and lipids (fats and oils) into smaller units. Enzymes are **catalysts**: they cause a reaction to happen, but are not used up themselves. The same enzyme can catalyse many reactions.

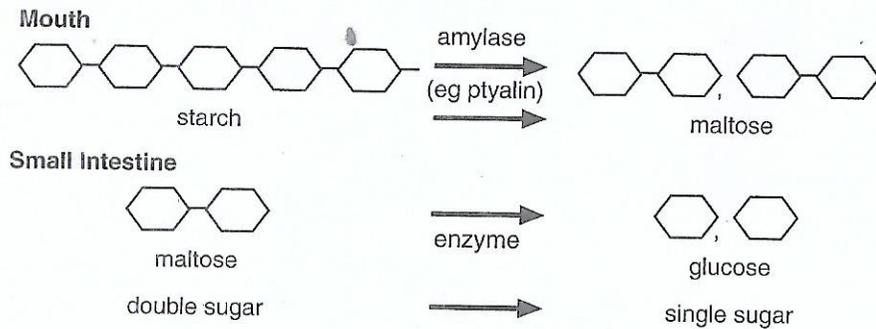
- (a) The group of enzymes which operate on *proteins* are called **proteases**. There are many different protease enzymes. One of them is pepsin which acts in the stomach. Pepsin is an enzyme which prefers to work in acid conditions, so the gastric juice produced by the cells in the stomach wall contains **hydrochloric acid**. Pepsin breaks the large protein molecule into **peptides** which are shorter chains of **amino acids**. Later in the small intestine other protease enzymes break the peptides into **dipeptides** which are small enough to go into the bloodstream. Refer to the table on page 28.



16pg

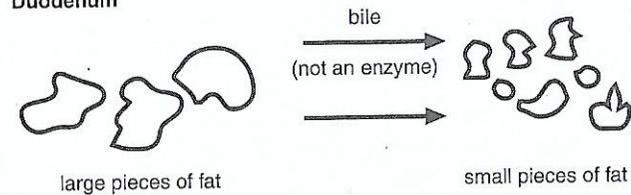


- (b) The group of enzymes which break down *starch* are called **amylases**. The first amylase in the digestive system is called **ptyalin**. It is in the **saliva** produced in the mouth. Ptyalin begins the digestion of carbohydrate by splitting the long **starch** molecule into the double sugar, **maltose**. If you hold a small piece of bread under your tongue for a few minutes you will feel it starting to dissolve as this digestion takes place. In the small intestine other enzymes break **double sugars** into **single sugars**.

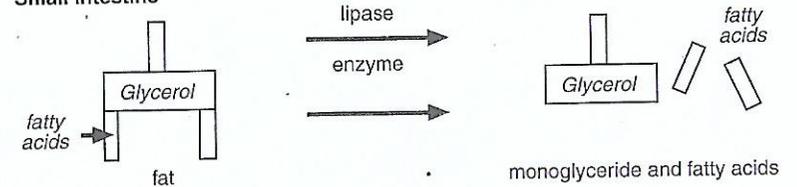


- (c) Lipids are first broken down by **bile** which is produced in the gall bladder and enters the small intestine through the bile duct. Bile does not contain any enzymes, but, like a dishwashing detergent, breaks up the larger pieces of fat into smaller ones. This is called **emulsification**. Once the fat is in smaller pieces, it is easier for the **lipase** enzymes to begin the chemical digestion of the lipids. The lipase enzymes do this by splitting the **fatty acids** away from the glycerol molecule to produce fatty acids and **monoglycerides**.

Duodenum



Small Intestine



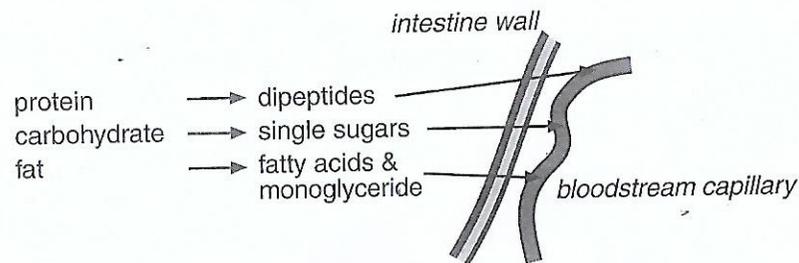
Activities 1G

1. What is the first place in the digestive system where digestion begins?
2. What is peristalsis?
3. Why is hydrochloric acid needed in the gastric juice?
4. Describe the differences between bile and lipases.
5. Describe the stages in carbohydrate digestion, explaining where each stage takes place.
6. Define and describe these terms: protease, protein, peptide, pepsin, amino acid.
7. Which nutrients do the following enzymes digest: protease, lipase, amylase?
8. Where in the digestive system are the products of digestion absorbed?
9. What happens to water and solid waste after the digestion process is complete?

Metabolism

The word '**metabolism**' refers to the chemical processes that take place in a living body.

Metabolism can also be used to describe the way a certain nutrient is used in a body, for example, we can refer to protein metabolism or the metabolism of fat in the body. This means we are talking about the way fat or protein is involved in the chemical processes in the body. In order for the body to begin the metabolism of any nutrient, food must first be digested into a form in which it can be absorbed through the wall of the intestine into the bloodstream.



Once the products of digestion have entered the blood they are transported to wherever they are needed in the body and metabolism begins.

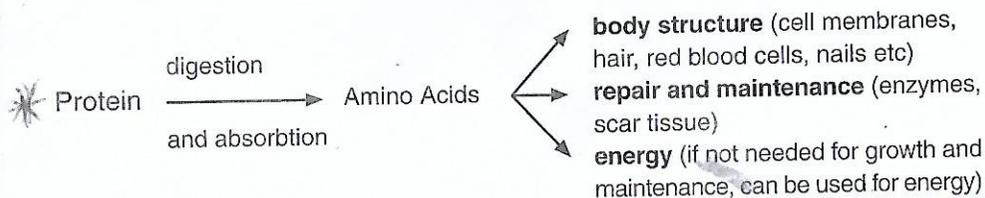
Metabolic reactions either:

- break the food we eat into *building blocks* which are then rebuilt in a different way to make the structures that are characteristic of our bodies – our hair, our fingernails, our skin
- or break the food down to release *energy* for use in the body.

* Protein Metabolism

metabolism

Amino acids are taken to every cell in the body. Different cells require different amino acids for the particular proteins they produce, eg hair follicles are constantly producing hair. The bone marrow always needs to produce red blood cells as these die after about 120 days in the bloodstream. The enzymes that digest food and carry out many other reactions in the body are proteins too.

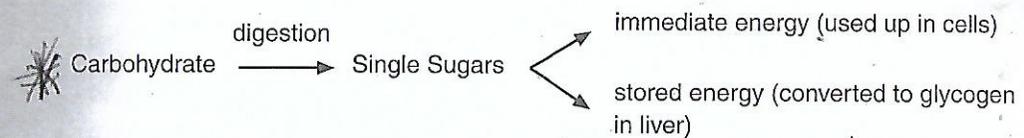


* Carbohydrate Metabolism

Carbohydrates enter the bloodstream as single sugars. These are transported to the parts of the body which need energy. The single sugar is broken down in the cells by a series of enzyme-controlled reactions so that energy is released from the sugar for the cells to use. Some of these enzymes have B vitamins as part of their structure.

Carbohydrate which is not needed immediately for energy is converted to glycogen, a polysaccharide which is a temporary store of carbohydrate in the liver. Glycogen is also present in muscles. This means the muscles can still contract even if there is little blood flow, eg during strenuous activity, such as sprinting.

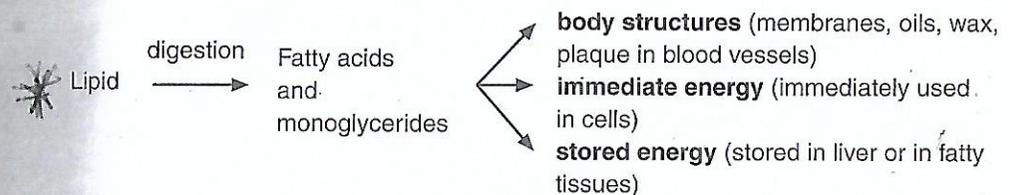
19 na



* Lipid Metabolism

Lipids enter the bloodstream as fatty acids and monoglycerides. Some lipids are needed for the membranes of new cells. Some are also needed in sweat and in the oils needed to lubricate the hair.

Lipids used for energy are sent to the cells which can break down fatty acids to release the energy the muscles need. Lipids not needed for immediate energy use are sent to the liver or to adipose (fatty) tissue where it is deposited as fat.



Metabolic Rate

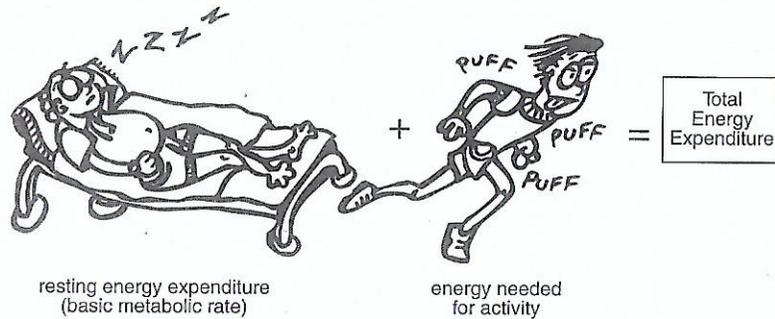
Metabolic processes happen at different rates in different bodies, and this is reflected in the amounts of food that are recommended for different types and ages of people. Men have a higher metabolic rate than women. The highest metabolic rates seem to occur in teenage boys who are growing quickly during their pubertal growth spurt.

The **basal metabolic rate** is measured when the person is doing as little as possible. Even when a person is lying down, completely at rest, some energy is still needed to keep the essential functions of the body going – building new cells, sending messages through the nervous system, keeping the cells working and for warmth. The energy needed for these basic activities is called the **resting energy expenditure** and is a measure of the basal metabolic rate of a person (BMR).

Higher metabolic rates are found in young people who are in a growth spurt period, tall, thin people, those who are ill, men and pregnant women.

Metabolic rate tends to drop as people get older and is also very low when people fast or are suffering from malnutrition. This is why people on very low energy reducing diets often find it difficult to lose weight. The body drops the metabolic rate to cope with the low supply of food it is getting and so uses less energy. Our total energy expenditure at any one time is the total of our BMR and the energy needed for whatever we are doing.

The Total Energy Expenditure Equation



Activities 1H

1. Describe the two ways the word 'metabolism' can be used.
2. Describe the way protein is metabolised.
3. Describe the part of carbohydrate metabolism where carbohydrate is stored.
4. Describe the three ways lipid is metabolised in the body.
5. What is basal metabolic rate (BMR)? How does it differ between types of people?

Personal Food Habits

There is not much point in knowing a lot of information about food and nutrients if you do not apply it to your own food intake. It makes sense to develop healthy food habits now so that later in life you have a healthy, active body. Of course, eating healthily now also means you will feel better, your skin and hair will look clean and fresh and you will have enough energy for all that you want to do.



Daily Food Intake

The first step in looking at your food habits is to take note of what food you *actually* eat each day. There are several ways you can do this.

1. Think back over the last two days and add to them today's food.
2. Another way is to write down what you ate yesterday, today and will probably eat tomorrow.
3. A more reliable measure of your total food intake is to write down in a food diary everything you eat in a week. This will include the weekend, when most

You could head up a chart like the example below for each day you are going to record. Make sure you include the amounts eaten.

| Before School | | During the Morning | | Lunch | | During the Afternoon | | Evening Meal | | Before Bed | |
|---------------|--------|--------------------|--------|-------|--------|----------------------|--------|--------------|--------|------------|--------|
| Food | Amount | Food | Amount | Food | Amount | Food | Amount | Food | Amount | Food | Amount |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

You also need to draw a big Real Food Pyramid, with plenty of room to fit in all the foods that you will eat during the days you keep records.

The Real Food Pyramid

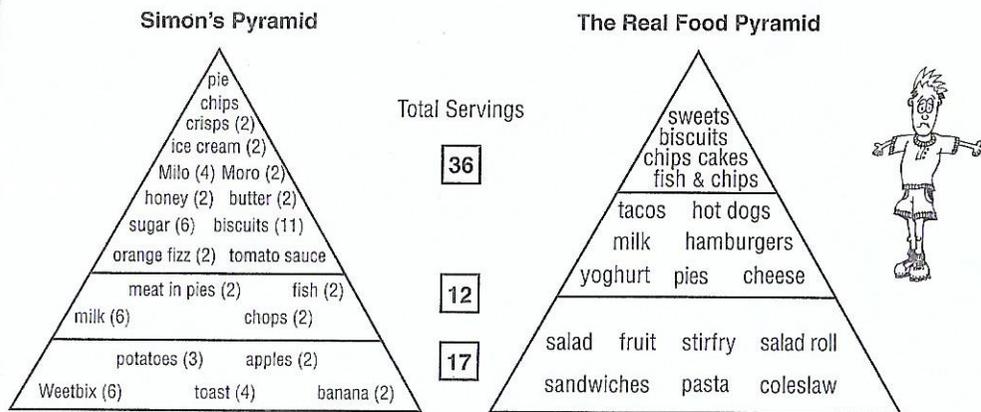
You are familiar with the *Healthy Food Pyramid*, it shows food in its raw state – chicken, fruits, vegetables etc. However, we actually eat food produced by manufacturers or in dishes prepared at home, or as takeaways. The National Heart Foundation has developed the Real Food Pyramid, so the foods we really eat are placed in the *Eat Least*, *Eat Moderately* and *Eat Most* categories. 'Real Food' is identified for the pyramid as ready-prepared food; ready-to-eat food; fast food; convenience food; or 'what-we-have-at-home' food. In Simon's case, it will include what he eats at home and what he buys to eat at the school café.

Analysis of Food Records

This is what Simon found when he looked at what he had eaten for two days.

| Before School | During the Morning | Lunch | During the Afternoon | Evening Meal | Before Bed |
|--|--------------------|-------------------------------------|---|---|--------------------------------------|
| Milo with milk & sugar 3 weetbix, milk, sugar | Moro bar | pie potato crisps orange fizz | 2 apples 4 chocolate biscuits 2 toast with butter & honey | 2 chops 3 potatoes 1 ice cream | Milo with milk & sugar 3 biscuits |
| Milo with milk & sugar 3 weetbix, milk, sugar | Moro bar | pie potato crisps orange fizz | banana 2 toast with butter & honey | 2 fish & chips tomato sauce 1 ice cream | Milo with milk & sugar 4 biscuits |

When Simon put his food for two days into the Healthy Food Pyramid, this is what he found.



Simon did not need any nutritionist to tell him that something was wrong! He looked carefully at the pyramid and came to the following conclusions:

1. He needed to increase the amount of food he was eating from the 'eat most' section of the pyramid.
2. He needed to cut down on the amount he was eating from the 'eat least' part of the pyramid.

Simon also thought carefully about what he liked most about the food he was already eating (see p. 33). Here are some of his notes:



1. I like the warmth of the pie at lunchtime.
2. I like the crispness of the crisps, but I also like apples, and they're crisp too.
3. I don't mind what I drink, so maybe I could change the type of drink I have at lunchtime.
4. The only vegetables I like are potatoes and coleslaw.
5. I like bananas and they are almost as filling and good to eat as Moro bars and biscuits.

So Simon decided on the following changes:

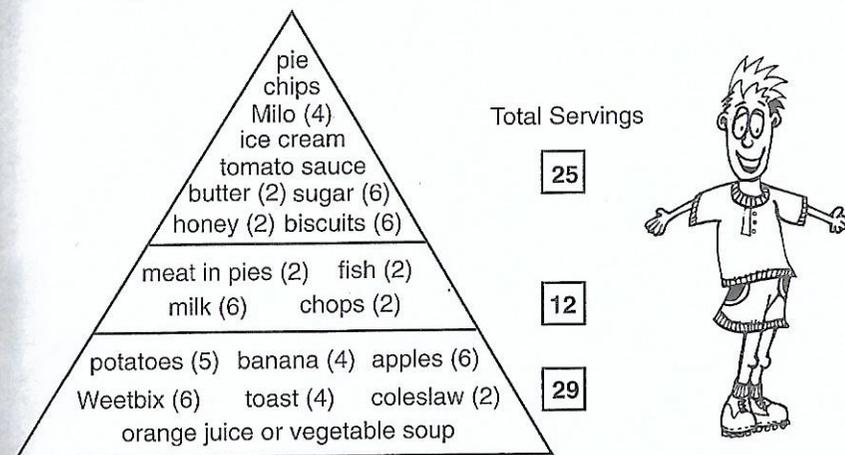


1. Bananas instead of Moro bars.
2. A potato-top pie – still warm but with more vegetable content, less fat because of less pastry.
3. Orange juice instead of fizz – or vegetable soup in winter.
4. Apples for lunch instead of crisps.
5. Coleslaw for the evening meal (offer to make it myself, I like chopping up all the vegetables).

Simon's meals for two days now looked like this:

| Before School | During the Morning | Lunch | During the Afternoon | Evening Meal | Before Bed |
|--|--------------------|--|--|---|--------------------------------------|
| Milo with milk & sugar 3 weetbix, milk, sugar | banana | potato-top pie apples orange juice | 2 apples toast, butter & honey banana | 2 chops 3 potatoes coleslaw | Milo with milk & sugar 3 biscuits |
| Milo with milk & sugar 3 weetbix, milk, sugar | banana | potato-top pie apples vegetable soup | apple toast with butter & honey banana | 2 fish & chips tomato sauce coleslaw ice cream | Milo with milk & sugar 3 biscuits |

With the changes his food pyramid looks like this for meals over two days:



Simon realises that there are yet more changes that he needs to make. He is pleased, however, that with only a few changes, he has cut down on the 'eat least' foods and increased the 'eat most' foods.

He has looked at what he could change easily first and has done those things. Because he knows he already likes coleslaw, apples and bananas, he has used them instead of the 'eat least' foods.

Simon knows there are other things that he can do – like replacing the ice cream for dessert with fruit desserts like apple crumble (easy in the microwave) or baked apples or maybe rice pudding. He might try these next time.

Simon is an active, growing teenage boy. He does not need to lose weight. He needs, however, to learn to get his energy needs from the 'eat most' part of the pyramid rather than from the 'eat least' part of the pyramid so he is not eating a lot of fat, salt and sugar. He may even need to eat more 'eat most' foods than an adult.

Changing food habits works best when small changes are made at a time. Simon has replaced high sugar/fat foods with fruit and has increased his vegetable intake in the evening meal. If he can keep this up for six weeks, he will know that he has started a new habit. Then he can look at what he can change next.

The way forward

You can follow these steps to healthy eating habits:

1. Record your daily food intake (for a week, if you can).
2. Analyse your daily food intake using the Real Food Pyramid.
3. Decide why you eat the food you do.
4. Substitute food you like from the 'eat most' and 'eat moderately' part of the pyramid that will give the same effect (eg apples are as crisp as potato crisps).
5. Make small changes at first.
6. Once six weeks are up and you have established a new habit, decide what further changes are needed and make those your new goal.

Activities II

1. Look at Simon's situation now, since he has made some changes in his diet. Look carefully at the second chart of meals for two days on p. 35 and the pyramid below it.
 - (a) Decide what changes he needs to make.
 - (b) Use your own food preferences to decide on four more actions Simon could take to make his Food Pyramid healthier.
 - (c) Write out a two-day menu and Food Pyramid based on these changes.
 - (d) Compare your changes with a friend.

TOPIC — FOOD and THE CONSUMER.

A Food Labelling

When buying processed foods, it is important to know exactly *what* you are buying.

* A good food label has:

- The name of the product.
- The manufacturer's name and address.
- A list of ingredients (in descending order of quantity).
- The net weight of the goods (the weight of the food without the container).

Some foods also give information about the nutritional value of the food and its 'use by' date — the date up until which the customer can be reasonably sure the food is in good condition.

25pg

The Ingredient List

This lists the ingredients in decreasing order of quantity. The ingredient which is present in the largest amount is listed first, followed by the ingredient in the next largest amount etc.

This label from a packet of leek and potato soup powder shows that skim milk is the ingredient present in the largest amount.

Ingredients:
Skimmed milk, potato puree, leeks, wheat flour, salt, flavour enhancer (621), flavour (spice extracts), beverage whitener, animal fat, sugar, vegetable gum (413), spice.

2. Additives

→ things that we add to the food to make it attractive, to improve natural quality

A numbering system exists for additives in processed foods. It was first devised in Europe. These numbers had the letter 'E' in front of them. The same numbers without the letter 'E' have been in use in Australia since 1987. Some products on New Zealand supermarket shelves have additive numbers because they are imported from Europe or Australia. New Zealand law has required all products to have the code number or specific name on the label since January 1995.

In the leek and potato soup powder above, two numbers were used — a flavour enhancer (612) and a vegetable gum (412) — a substance used as a thickener. The Australian Department of Health has adapted a book called the *Additive Code Breaker* which lists the additives by number, and gives their origin, function and any adverse effects they may have. It also notes whether the additive is permitted in Australia. A Ministry of Health leaflet entitled '*Identifying Food Additives*' (June 1996) gives further details relevant to New Zealand.

The information in these booklets tells us that the flavour enhancer numbered 621 is **monosodium glutamate** and that vegetable gum 412 is **guar gum**.

eg. The main groups of additives are:

| | |
|----------------------------|------------------------------|
| Colours | 100-175 |
| Preservatives | 200-283 |
| Antioxidants | 300-321 |
| Emulsifiers and Thickeners | some numbers between 170-579 |
| Sweeteners | 950-957 |
| Modified Starches | 1400-1450 |

This list of ingredients comes from a low-joule jelly.

| | |
|-----------------------|---------------------|
| Gelatine | 80% |
| Citric Acid | 10% |
| Artificial Sweeteners | |
| Cyclamate | 7% |
| Saccharin | 0.7% |
| Flavour | |
| Colour | (122), (132), (102) |
| Propylene Glycol | |

26pg

In this label the manufacturer describes the sweeteners which do not have numbers (cyclamate and saccharin) and uses numbers for the colours. Looking up the additive numbering system we find that the colours are:

122 – Azorubine (Carmoisine (red))

132 – Indigo Carmine (blue)

102 – Tartrazine (yellow)

Together these colours made a deep purple-coloured blackberry jelly.

The numbering system is useful to both manufacturers and consumers.

Manufacturers can fit all the names of the ingredients in their product onto a smaller space on their packet. If consumers want to avoid certain substances because they have a sensitivity, then they can memorise the numbers and look out for them. These include people for whom asthma or allergies may be a problem. The case connecting hyperactivity with additives is not conclusively proved. Some families, however, note changes in children's behaviour when some additives are excluded from the diet. Carefully controlled studies are needed in this area.

* **Preservatives** → substances added to foods to stop them decaying
As you will have noticed, the additives list included *preservatives*. These are additives which help to keep the food from decaying while it is on the supermarket shelves or in our cupboards. They include sorbic, benzoic and acetic acids and their compounds, sulphur dioxide and related compounds and sodium nitrite.

Antioxidants (refer 357)
Antioxidants also have a preserving effect on food by preventing oxygen reacting with foods. When oxygen reacts with fats or oils, for example, it makes them rancid. Antioxidants used in foods include **Ascorbic Acid** (Vitamin C) and Vitamin E (Tocopherol).

The other additives – colours, sweeteners, emulsifiers and thickeners – are added to food for consumer appeal.

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* Here are some labels from common processed foods.

eg 1. **Peanut butter**

Roasted peanuts, emulsifier (471), salt, hydrogenated vegetable oil

Bran and sultana breakfast cereal

Whole wheat, sultanas, bran, malt, sugar, salt

Muesli bars

Cereals (rolled oats, rice bubbles, whole grain oats, kibbled wheat, wheat germ, oat bran), sugars (glucose, brown sugar, honey, raw sugar, malt), compounded chocolate chips, vegetable oil, coconut, non-fat milk powder, stabiliser (glycerine, sorbitol), sesame seeds, emulsifier (lecithin), salt, flavours.

Cooking chocolate

Full cream milk, sugar, cocoa mass, cocoa butter, skim milk powder, emulsifiers (322, 476), malt extract, flavour.

2. **Breakfast cereal**

Whole wheat, sugar, salt, malt extract

A 'Lite' version of the same breakfast cereal

Wheat

Lasagna noodles

Durum wheat, wholemeal flour, water.

Tomato cup-a-soup

Ingredients when reconstituted: tomato, malto-dextrin, sugar, thickener (maize starch), salt, beverage whitener, vegetable fat, onion, flavour enhancer (621, 627, 631), hydrolysed vegetable protein, flavour, colour (161, 160), food acid (malic acid), herbs, spices.

Sometimes products also give *nutritional information*. In other words, they list the contents of the packet in nutrient form. This is an example from the low-joule jelly used on page 37. It is a low-joule product because it has no fat and very little carbohydrate.

100ml of ready to eat jelly contains: 1.49 g protein, 0.04 g carbohydrate, nil fat, 27.6 kJ (6.6 kcal)

Sometimes the ingredient lists and the nutritional information on products do not simply provide information, but become part of the manufacturer's advertising campaign. In recent years, the levels of salt, sugar, fat and fibre in foods have become selling points.

28pg

The New Zealand Heart Foundation have commented about some of these claims. "The following words commonly occur on food labels, and may lead to misunderstanding about products:

Low/No Cholesterol

This does not mean the food is low in fat, or that the cholesterol has been removed. Fat and cholesterol are separate food components. A food can contain 100% fat, yet be cholesterol-free. For example, vegetable oils are 100% fat, but because they are of vegetable origin they are cholesterol-free.

Only animal products contain significant levels of cholesterol. Some foods are advertised as having no cholesterol to promote sales, yet the products did not contain cholesterol in the first place. This is very misleading.

Low or Reduced Fat

Reduced fat may not mean low fat. The product may just be lower than usually found in this food. The best way to determine fat content is to compare brand labels.

Polyunsaturated

This refers to the type of fat in food and does not mean the food is low in fat. Margarines and vegetable oils are high in polyunsaturated fats and when used in moderate amounts may help to lower blood cholesterol levels. Animal fats, such as butter, lard and dripping, are high in saturated fats which may raise blood cholesterol levels. Select fats and oils with a high polyunsaturated (or monounsaturated) content and low saturated content.

No Added Sugar

A product can be labelled 'no added sugar' and may not have any extra added but can still be naturally high in sugar. Fruit juice is an example of this. Sugar can also appear under different names on a label, eg honey, glucose, fructose, corn syrup, treacle. A 'carbohydrate-modified food' has the sugar and sucrose removed and replaced by another sweetener called sorbitol. Sorbitol has the same calories as sugar so therefore the same calories as the unmodified food.

High Fibre

The claim of high fibre indicates the presence of fibre, but does not necessarily mean a certain recommended level. Again, compare similar types of products. *Remember to read the small print on food labels. This information will make your shopping easier and healthier.*

The Fair Trading Act (1986) restricts some of the above claims made by manufacturers. Under this law, manufacturers will have to show the nutritional composition of foods to back up nutritional claims. For example, if a bread claims to be 'low fat' it must have a fat content 20% lower than normal bread.

29 pg

5 'Use by' Dates

There are several forms in which date information can appear on food labels.

- Date of Packing:** The date the food was packaged. It can be written as packing date, packed on or pkd.
- Minimum durable life:** The period from the date of packing when the food can be expected to keep its normal quality. (This is provided the food is stored as suggested on the label.) The number of days, weeks, months or years is given in brackets.
- Use by date** means the date on which the minimum durable life of the food is finished. It can be written as 'use by' followed by the date. *Best before* is the same as use by.

Even if you buy an out-of-date product at a special price, you can still expect your legal rights of replace or refund because the shopkeeper has the responsibility to provide goods that are of good quality.

Activities 1J

- What information is found on a good food label?
- How are ingredients listed on a food label?
- Name two benefits of the additive numbering system. ✕
- What do preservatives and antioxidants do?
- From the text, what is the main ingredient in lasagna noodles?
- What is the difference between an ingredient list and nutritional information on a food label?
- Explain to your thirteen-year-old sister why she may need to be cautious about the following statements on food labels:

| | |
|-----------------|---------------------|
| (a) reduced fat | (b) polyunsaturated |
| (c) high fibre | (d) no added sugar |
- What is the 'minimum durable life' of a food?
- What does the 'use by' date mean on a food label?
- Janey bought some yoghurt which was marked down in price because it was out-of-date. She found when she opened it that it had mould growing in it. What legal rights does she have?

30 pg

School Certificate Questions on Nutrition

A. Multiple-Choice Questions

1. Foods with a high nutrient density supply
 - A. a lot of chemical energy.
 - B. plenty of fat and sugar.
 - C. all the fibre needed by the body.
 - D. all six classes of nutrients.
2. Foods high in water and fibre are generally
 - A. soft texture foods.
 - B. low energy foods.
 - C. high cost foods.
 - D. energy dense foods.
3. Folic acid is involved in many biological functions including blood formation. Good sources of folic acid are
 - A. wheat germ.
 - B. green leafy vegetables.
 - C. dried fruits.
 - D. sesame seeds.
4. Food products which feature this symbol will be
 - A. low in fat, sugar and salt.
 - B. nutrient dense.
 - C. a good source of fibre.
 - D. low in fat and cholesterol.
5. To increase fibre in your diet you should eat more
 - A. refined cereals.
 - B. processed food.
 - C. meat and fish.
 - D. fruit and vegetables.
6. In which list are *all* the nutrients required for building hard tissue?
 - A. Calcium, phosphorus, vitamin D, fluoride, protein.
 - B. Lipids, vitamin C, carbohydrate, vitamin D, calcium.
 - C. Calcium, phosphorus, lipids, vitamin C, protein.
 - D. Thyroxine, calcium, fluoride, protein, fat.
7. Which vitamins are needed for energy production?
 - A. Iron, thyroxine.
 - B. Iron, iodine.
 - C. Iodine, niacin.
 - D. Niacin, thiamin.
8. Convenience foods can have a harmful effect on the environment because they
 - A. may contain additives such as artificial sweeteners.
 - B. may have lots of packaging which must be disposed of.
 - C. usually save time and use little energy for cooking.
 - D. may cost more because of the type of packaging used.



21 pg

9. In which list do *all* the factors influence the amount of food people need each day?
 - A. Likes, dislikes, season, texture.
 - B. Colour, energy, lifestyle, habits.
 - C. Money, activity, advertising, age.
 - D. Sex, size, age, activity.

Use the label to answer questions 10-13.

SC Nutty Muesli Bar

Ingredients:
apricots, coconut, peanuts, glucose,
modified starch, sesame seeds, lactose,
casein, lecithin

10. This muesli bar would *not* be a healthy food choice for someone on a reducing diet because it is high in
 - A. sugar and protein.
 - B. fat and sugar.
 - C. fibre and salt.
 - D. protein and fibre.
11. In which list are *all* the ingredients on the label carbohydrate?
 - A. Glucose, lactose, coconut.
 - B. Lecithin, glucose, modified food starch.
 - C. Glucose, modified food starch, lactose.
 - D. Lactose, casein, coconut.
12. Which ingredient is present in the largest amount?
 - A. Coconut.
 - B. Sesame seeds.
 - C. Peanuts.
 - D. Apricots.
13. In which list do all the ingredients on the label have fat in them?
 - A. Coconut, peanuts, sesame seeds.
 - B. Casein, lecithin, sesame seeds.
 - C. Glucose, lactose, modified food starch.
 - D. Peanuts, sesame seeds, apricots.
14. Kylie explained she didn't eat silverbeet because it "looked dead on the plate". This type of reason is
 - A. nutritional.
 - B. aesthetic.
 - C. social.
 - D. cultural.
15. Which of the following foods has the highest nutrient density?
 - A. Milk.
 - B. Cheese.
 - C. Lettuce.
 - D. Celery.

32 pg

16. Which of the following are both water-soluble vitamins?

- A. Ascorbic acid, thiamin. B. Retinol, niacin.
C. Sodium, iron. D. Nicotinic acid, potassium.

Use the table to answer questions 17-19.

| | Portion weight (g) | Kilojoules | Kilocalories | Fat (g) | Fibre (g) | Cholesterol | Sodium (mg) |
|------------------------|--------------------|------------|--------------|---------|-----------|-------------|-------------|
| 1 McDonald's Big Mac | 204 | 2311 | 553 | 32 | 1.6 | 45 | 906 |
| 1 piece of KFC chicken | 140 | 1936 | 462 | 30 | 0.3 | 90 | 805 |
| 1 piece battered fish | 146 | 1556 | 372 | 23 | 0.1 | 37 | 686 |
| 1 McDonald's apple pie | 80 | 801 | 191 | 9 | 1.4 | 11 | 125 |

17. The source of fibre in a burger, KFC chicken and battered fish is

- A. bread, flour. B. meat, fish, chicken.
C. fat, oil. D. seasonings.

18. Which food contains the most fat per 100g?

- A. Big Mac burger. B. Battered fish.
C. KFC chicken. D. Apple pie.

19. Kilojoules is a metric measure of

- A. carbohydrate. B. starch.
C. metabolism. D. energy.

B. Written Questions

A. Kate sometimes likes to eat fast foods. She finds that her three favourite fast foods are high in saturated fat and low in fibre.

| Fast Food | Portion Weight (g) | Kilojoules (kj) | Saturated Fat (g) | Fibre (mg) |
|--------------------|--------------------|-----------------|-------------------|------------|
| Cheese/bacon pizza | 206 | 1960 | 20 | 1.1 |
| Cheeseburger | 186 | 1986 | 24 | 1.8 |
| Mince Pie | 172 | 1649 | 24 | 0.9 |

1. Kate decides to make one of these products at home.

- (a) Select ONE of the fast foods above.
(b) Give TWO ways she could reduce the saturated fat content in this food.
(c) Give ONE way she could increase the amount of fibre in the fast food.

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B. Jess has homework to do when she gets home.

1. Use the following tables to answer the questions below.

| Product | Energy (kj) | Protein | Fat | Cellulose | Sugars | Starch |
|-----------------|-------------|---------|------|-----------|--------|--------|
| Bread white | 904 | 7.3 | 0.9 | 2.8 | 1.9 | 45.8 |
| Muesli | 1350 | 12.1 | 4.5 | 5.9 | 17.8 | 44.7 |
| Brown rice | 589 | 2.6 | 1.1 | 0.8 | 0.5 | 31.6 |
| Apples | 199 | 0.3 | 0.6 | 1.5 | 10.1 | 0.9 |
| Bananas | 331 | 1.1 | 0.3 | 1.5 | 16.2 | 3.0 |
| Kumara | 421 | 1.2 | 0.2 | 2.8 | 12.6 | 12.5 |
| Potatoes | 380 | 2.6 | 0.2 | 2.0 | 0.3 | 20.7 |
| Muffin | 1140 | 7.8 | 7.8 | 7.7 | 19.5 | 26.1 |
| Plain biscuit | 1870 | 6.3 | 16.3 | 2.2 | 13.6 | 55.0 |
| Cracker-biscuit | 1970 | 9.5 | 20.9 | 2.2 | 0.1 | 68.3 |

(a) Which food will supply the most carbohydrate?

(b) Which food will supply the least carbohydrate?

(c) How many grams of carbohydrate are supplied by 100g of potatoes?

(d) Which 100g of food will supply the most energy?

2. Match the terms in List One with the statements in List Two.

Write the correct number from List One in the box beside List Two.

List One

- Amylase
- Starch
- Glycerol
- Glucose
- Glycogen
- Cellulose

List Two

- A single sugar used by the body.
- Stored in the liver for later use.
- Enzymes which break down carbohydrate.
- Cannot be digested by humans.
- Broken down into single sugars and used for energy.

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