Food Nutrition

Topic: Nutrition

Macronutrient vs Micronutrient

What is a micronutrient?

A micronutrient is a nutrient which you need in **SMALL** amounts. Any vitamin and mineral is a micronutrient, as we don't need them in large amounts. They are mainly found in fruit and vegetables.

Examples of vitamins are vitamin A, vitamin C. Examples of minerals are calcium and iron.

The amount of micronutrients a person needs is far less than a gram, it wouldn't show up if we placed it on a weighing scale. We measure vitamins and minerals in micrograms (mg). A microgram is 1/1000 of a gram.

Tiny.

What is a macronutrient?

We also need macronutrients. These you need in **LARGE** amounts. There are only 3 macronutrients and we need these in much larger quantities than micronutrients.

Protein

Carbohydrates

Fats

Carbohydrates

Carbohydrates are essentially sugars, but their chemical structure determines whether they are just a sugar, a starch or fibre. Carbohydrates are made in plants during photosynthesis. Glucose is a single unit of sugar. Glucose is what makes up carbohydrates!

THERE ARE 3 TYPES:

Sugars (and food with sugar added)

Starches (bread, rice, cereals, root vegetables)

Fibre (wholegrain foods and skins of fruit/veg)

	Function	Sources	Excess and deficiency
Carbohydrate	We need carbohydrates to provide us with **energy.** Carbohydrates are made in plants during a process called **photosynthesis**. They are also known as a **protein sparer**. This is because our body will use protein as **energy** if we have not got enough carbohydrates in our diets, but this stops protein carrying out its primary function of and repair.	There are 3 types of carbohydrate. They are **sugars, starches**, and **dietary fibre**.	Excess carbohydrates can cause **obesity** which can lead to health problems such as **diabetes**. Deficiency can cause **weight loss** and also means the body cannot grow and repair as well because **protein** will be used for energy. Lack of fibre can cause bowel cancers and constipation.

Monosaccharide, disaccharides, polysaccharides

The chemical names for carbohydrates depends on their structure.

Mono = one, di = two, poly = multiple.

Monosaccharides = have one unit of sugar

Glucose and fructose are monosaccharides.

Disaccharides = have two joined units of sugar

Lactose and sucrose are disaccharides.

Polysaccharides = are a chain of multiple sugars

Starches and wholegrain foods are polysaccharides

Simple and complex carbohydrates

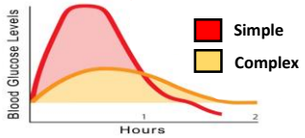
SIMPLE CARBOHYDRATES:

Digested quickly so cause a spike in blood sugar levels so energy levels spike and then drop quite soon after. Any monosaccharide or disaccharide is a simple carbohydrate are they are easy to digest. Examples of simple carbohydrates would be any carbohydrate which falls into the 'sugars' category.

COMPLEX CARBOHYDRATES:

Need to be broken down into single glucose molecules first so digested slowly. Slow and steady release of energy. Any polysaccharide is a complex carbohydrate as they are a chain of sugar molecules which are harder to digest, therefore enter the blood more slowly.

Starches and whole grain foods are complex carbohydrates



Fibre

Non starch polysaccharide (NSP) is another name for dietary fibre.

Fibre is essential for our digestive system as it helps move waste food along so that it is removed easily

Insoluble fibre: dietary fibre which helps prevent constipation.

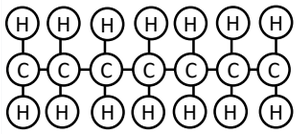
Soluble fibre: dietary fibre which helps reduce cholesterol.

Fats

	Function	Sources	Excess and deficiency
Fats	Fats have an essential role in the body. We need them for warmth as they provide a layer of insulation under our skin. We also need fat to protect our organs from damage. It also provides a concentrated source of energy. 1g of fat provides 9 kcals of energy.	There are both animal and plant sources of fats. Generally animal fats are saturated fats which are considered more unhealthy than plant sources of fats which are unsaturated fats.	Excess fat can be harmful as it can lead to health conditions such as obesity, high cholesterol, heart disease and heart attacks, Deficiency of fat can cause weight loss and a deficiency of fat soluble vitamins (a group of vitamins which are stored in body fat)

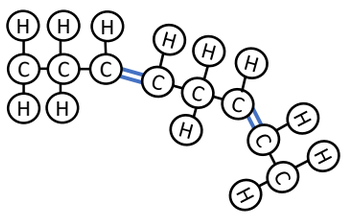
The chemical name for a fat molecule is a triglyceride. A triglyceride is made up of three fatty acid strands. The chemical structure of these strands determine whether it is saturated or unsaturated.

Saturated fatty acid:



The term saturated means carbon surrounded by hydrogen. This means they are SOLID at room temperature.

Unsaturated fatty acid:

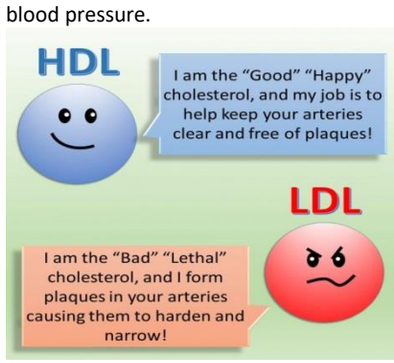


Unsaturated fats are NOT surrounded by hydrogen because they contain some double bonds. These bonds do not allow hydrogen t saturate the carbon, and create gaps. This creates flexible molecules meaning these are LIQUID at room temperature.

Cholesterol

Cholesterol is a fatty, waxy substance which travels around the body and helps form cells and absorb vitamin D. There are 2 types of cholesterol, HDL (High density lipoprotein) and LDL (Low density lipoprotein).

HDL = Found in unsaturated fats and help to reduce the risk of coronary heart disease (CHD), strokes and high blood pressure.



LDL = Found in saturated fats and can cause heart disease, strokes and high blood pressure as they build up as plaque in arteries and block them!

Protein

	Function	Sources	Excess and deficiency
Protein	The main function of protein is the **growth** and **repair** of all body cells. Other functions include being used as an **energy** source when the body does not have enough carbohydrates and also making **hormones** and antibodies. It is especially important that **babies** and **children** get enough protein as they are still growing. **Pregnant** women require more protein as they are growing a baby. **Breastfeeding** mums also require more as they are **lactating** (producing milk) for the child.	There are both **animal** and **plant** sources of protein. Animal proteins are **high biological value** (contain all 20 amino acids). Plant sources are **low biological value** (only contain some of the amino acids needed).	Protein deficiency causes **kwashiorkor**. It can lead to bloated stomach and thin limbs. It is a problem for children in **developing countries**. Excess protein can cause **kidney and liver damage.**

Protein Complementation

Protein is made of building blocks called amino acids. We need 20 in total. There are two types of amino acids, ones our bodies can make themselves and ones we need to get from our diets.

- **Non – essential amino acid:** Amino acids which are made by the human body so are not needed in the diet.
- **Essential amino acid:** Amino acids which are not made by the human body so are needed in the diet.

Depending on the amount of amino acids present in the protein, they can be split into two categories:

HIGH BIOLOGICAL VALUE: Animal proteins contain all 20 of the amino acids we need, so are know as high biological value. They can be high in fat however.

LOW BIOLOGICAL VALUE: Plant proteins do not contain all of the amino acids, it is important to mix and match plant proteins together so that you can get all of the amino acids you need. This is known as protein complementation.

LBV + LBV = HBV meal

We should aim to complement two LBV proteins together as this increases the amount of amino acids in the meal, meaning that protein can fully function.

Vitamins

Vitamin	Function	Sources	Excess/deficiency
Vitamin A	An antioxidant which is stored in the liver. It helps to keep our skin healthy. It also helps our vision in dim light.	Red and yellow vegetables such as carrots and peppers. Yellow fruits, eggs, milk, liver and products made using it such as pâté.	Pregnant women should avoid eating too much as it can be toxic to a baby. Deficiency is very rare in the developed countries but if this happens then night blindness can occur.
Vitamin C	Also an antioxidant. It helps our body heal and repair. It helps our body to absorb iron.	Lots of fruits such as oranges and other citrus fruits. Also vegetables such as broccoli, potatoes and sprouts.	Deficiency is very rare in developed counties but it can cause scurvy. This is when wounds may fail to heal, gums swell and teeth fall out.
Vitamin D	Vitamin D helps our body to absorb calcium. It helps to grow and heal bones and teeth.	Also known as the sunshine vitamin as we got most of it from the suns rays. We also get it from milk, eggs and fortified cereals and spreads.	A deficiency of vitamin D can cause rickets in children. This is when the bones become soft and as a result bend.
Vitamin E	An antioxidant vitamin which helps to prevent cancers and disease. Helps maintain healthy eyes and skin.	Found in plant oils – such as soya, corn and olive oil, nuts and seeds. Also found in cereals.	No known problems with excess but deficiency can lead to poor eye/skin health.
Vitamin B group	The B vitamins help to release energy from food. They help to keep the nervous system healthy.	Fortified breakfast cereals, milk, cheese, eggs, chicken and fish.	Beriberi is a disease caused by deficiency of Vitamin B1. This disease causes muscles to waste away and mostly happens in developing countries.
Folate (A type of vitamin B, also known as folic acid.)	Helps to reduce the risk of nervous system problems in unborn children. It also works with other B vitamins to make new blood cells.	Fortified breakfast cereals and green vegetables such as broccoli, sprouts and spinach.	Can cause spina bifida in babies if the mother does not eat enough folate. This is when the babies spine does not form correctly and can lead to paralysis.

Minerals

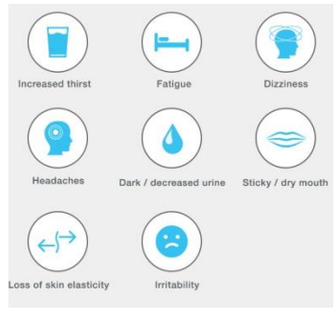
Mineral	Function	Sources	Excess/deficiency
Calcium	Calcium works alongside vitamin D to help develop strong and healthy bones. Without this vitamin, our bodies cannot absorb calcium.	Calcium is found in milk, so any products made using milk also contain calcium. This includes dairy foods such as cheese, butter, cream. Green leafy vegetables such as broccoli and spinach also contain lots of calcium.	In children, too little calcium can cause rickets. In adults and elderly it can cause something called osteoporosis. This is when bones aren't as dense so they are weak and can break/facture easily.
Iron	Iron is needed for making red blood cells, which can carry oxygen around the body. We need calcium to help our bodies absorb iron.	We can get iron for animal and plant sources. Red meats, liver and eggs are animal sources. Green leafy vegetables, seeds and nuts are plant sources. Cereals are often fortified with iron.	A deficiency is known as aneamia. This is when not enough red blood cells have been created. It causes weakness, tiredness and a pale appearance. Often effects females of a child bearing age due to menstruation.
Sodium	Salt is needed to balance the amount of water we have in our bodies.	Processed foods such as sandwich meats, microwave meals and sauces. Bread can also contain a lot of salt. Salt is also added to meals.	Excess salt is linked to high blood pressure. Salt makes the body retain water which raises blood pressure. High blood pressure can lead to strokes and heart disease.
Fluoride	Fluoride is needed to strengthen the enamel layer on the teeth and prevent tooth decay.	We get most of our fluoride from drinking water. We can also get it from saltwater fish where the bones are eaten such as sardines.	Too much or too little fluoride can cause tooth decay and can damage the enamel on teeth.

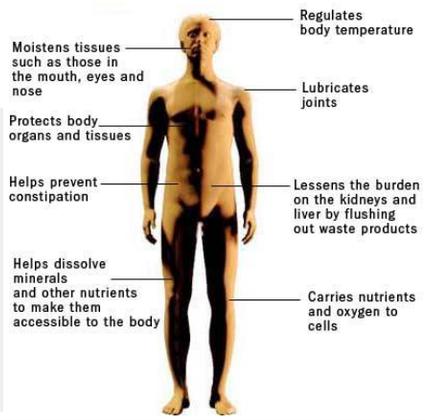
Water is essential for life

Essential Functions of Water

- Acts as a delivery system, taking nutrients to cells and removing waste
- Forms the base of many bodily fluids such as blood and saliva
- Helps regulate body temperature
- Forms fluid surrounding joints
- Needed for digestion, softening and dissolving food components
- Essential for normal bowel movements and preventing constipation
- Keeps skin hydrated.

Dehydration symptoms include: having very dark yellow urine, very dry skin, feeling dizzy, rapid heartbeat, rapid breathing, Sleepiness, lack of energy, confusion or irritability or even fainting.





Deficiencies of micronutrients

Rickets — When children's bones become soft and bend due to lack of calcium and vitamin D.

Osteoporosis — When adults bones are less dense and become weak and brittle, meaning they break or fracture easily.

High blood pressure — When the body has excess salt so it retains water. This can lead to heart disease and stroke.

Aneamia — When the body is deficient in iron so hasn't produced enough red blood cells. This makes people tired and weak. It often affects women due to menstruation.

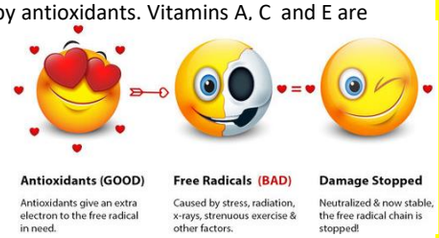
Tooth decay — When the body does not have enough fluoride/calcium/vitamin D so the tooth and the enamel become weak. Too much sugar speeds this up!

Scurvy — A deficiency of vitamin C causes scurvy. This is when gums swell, teeth fall out and muscles waste away.

Spina Bifida — A deformity in the spinal cord of an unborn child which can lead to paralysis.

Antioxidant vitamins

Antioxidants are types of vitamins which protect our body cells from damage and reduce the risk of cancer. When certain body cells are damaged, they can become 'free radicals'. These types of cells are dangerous unless repaired by antioxidants. Vitamins A, C and E are antioxidant vitamins. **A.C.E.**



Fortification

Fortification : This is when food manufacturers will add extra nutrients to food, even though they aren't present in the food naturally.

Fortified foods include bread and breakfast cereals and spreads. Some foods have to be fortified by LAW, such a flour and spreads. This is to help to health of the population. Some foods are fortified by choice, and a company just do it to encourage people to buy their foods, such as cereals.

Fat soluble and water soluble vitamins

Vitamins can be placed into two categories.

Those which are fat soluble and those which are water soluble.

Fat soluble vitamins	Water soluble vitamins
• Stored in the fat cells and the liver. • Can be lost from foods if cooked in fat. • Can be toxic if we consume too much. • Vitamins A, D, E, K.	• Cannot be stored in our bodies. • Can be lost from foods if cooked in water, • Cannot build up in toxic amounts in our body as excess leaves our body in urine. • Vitamins C and B (group).

How can we reduce vitamin loss when cooking?

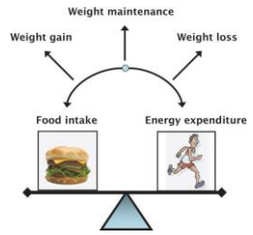
1. For foods high in water soluble vitamins, avoid cooking in water. Instead steam, roast fry or grill.
2. For foods high in fat soluble vitamins, avoid cooking in fat. Instead boil, steam or grill.
3. Prepare foods just before serving. Avoid leaving to sit in fat/water.
4. Avoid lots of cutting of vegetables. The skins help to retain vitamins.
5. Avoid peeling vegetables were possible.

Energy Balance

Energy is essential for fuelling our bodies. We need it to:

- To make our muscles move so we can carry out physical activity such as walking
- To keep our bodies at the correct temperature of 37°C
- To keep our involuntary muscles working (ones that we do not need to think bout like heart beat and breathing)
- To enable out body cells to grow and repair

We get energy from all 3 macronutrients (carbohydrates, fats and protein) and energy is measured in calories.



Carbohydrates = 7 calories per 1 gram.
Fat = 9 calories per 1 gram
Protein = 4 calories per 1 gram.

- **BMR** (Basal metabolic rate) is the amount of calories our body needs in order to keep all of our organs working during a day. This includes all of the calories used to breathe, sleep etc. In other words, it is the minimum amount of energy required to keep you alive!
- **PAL** (Physical Activity Level) is a measure of how active you are and how much exercise you get. If you are more active you will have a higher PAL.

$$\text{Physical Activity Level (PAL)} = \frac{\text{Total Energy Expenditure}}{\text{Basal Metabolic Rate}}$$

Life Stages and Dietary Needs

Babies 0-1 years

- Breastfeeding is the optimal method of infant feeding and exclusive breastfeeding is recommended for the first 6 months to ensure babies have the best start in life.
- By around 6 months of age, breast or formula milk alone will no longer be sufficient to meet a baby's nutritional needs and the process of weaning onto solid foods should begin.
- Fruit, vegetables and non-wheat cereals are suitable first weaning foods; the amount and variety of foods should gradually be increased to include other types of cereals, dairy foods, meat, fish, eggs and pulses.
- From the age of 6 months, infants receiving breast milk as their main drink should be given a supplement (in the form of liquid drops) providing vitamins A, C and D.
- Food should be pureed or in very small pieces so that it is easy to swallow and will not be a choking hazard.

Toddlers 1-4 years

- Regular meals + drinks. Small portions.
- Trying new foods regularly.
- Minimising choking hazards by cutting up foods.
- Drink unsweetened drinks such as water and milk, avoid processed foods and drinks such as milkshakes, cakes, biscuits etc.
- **Children at this stage are growing rapidly so protein and calcium are very important for strong teeth and bones.**

Children 5- 12 years

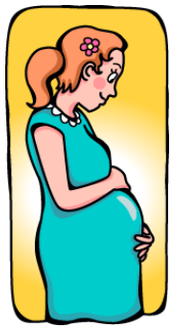
- Energy needs are high The brain and body need to have a 'kick start' to the day. Fortified cereals have B vitamins (to release energy from foods); calcium (for strong teeth and bones) and wholegrain (for a healthy digestive system). Fibre and protein help to feel fuller for longer to avoid mid morning snacking.
- **Children at this age should be following the eatwell guide and avoiding sugary foods to prevent tooth decay.**

Adolescents

- **Energy needs are high as the body is growing rapidly.**
- The brain and body need to have a 'kick start' to the day. Fortified cereals have B vitamins (to release energy from foods); calcium (for strong teeth and bones) and wholegrain (for a healthy digestive system).
- Fibre and proteins help to feel fuller for longer to avoid mid morning snacking.
- The B group of vitamins release energy from foods and allows the brain to concentrate.
- 6-8 glasses of water a day are required to aid concentration.
- Iron intake for females is important as menstruation begins and iron levels can drop due to blood loss which can lead to anaemia. Vitamin C is needed to help absorb iron.
- Boys need more protein than girls at this stage as their muscle mass is developing.

Adults

- Avoid too much saturated fat as this can lead to heart problems such as heart disease
- Follow a balanced diet using the eatwell guide.
- Adults should make sure they are also exercising regularly to maintain energy balance and avoid obesity.
- Vitamins A, C, E intake should be increased in order to increase the antioxidant vitamins in the body. This will help to fight off diseases such as cancers. Plenty of fruit and vegetables will help to increase vitamin intake.
- **Peak bone mass is achieved at 30 years old so regular exercise and calcium/vitamin D intake is needed to secure good bone health.**



Pregnant women

- **An extra 200 kcal/day during the third trimester only is advised. Eating for two is not needed.**
- Excessive weight gain should be avoided.
- Pregnant women are advised to take folic acid supplements before conception and during pregnancy to lower the risk of neural tube defects in the fetus such as spina bifida.
- Vitamin D supplements are recommended during pregnancy to allow optimal bone development of the unborn child and to help avoid rickets during childhood.
- To help avoid iron deficiency during pregnancy, a healthy, varied diet containing iron rich foods such as meat, eggs, beans, nuts, dark green vegetables and fortified foods (such as some breakfast cereals), should be consumed.
- During pregnancy, supplements containing vitamin A, liver and liver products (as they are high in vitamin A) should be avoided as excess vitamin A is toxic to a baby.
- Women who are pregnant or planning a pregnancy are advised to stop drinking alcohol altogether.
- Caffeine intake during pregnancy should be limited to 200 mg/day, which equates to about two mugs of instant coffee a day or around 3 mugs of tea per day.

Elderly

- Weight management – to avoid health risks associated with unhealthy weight. E.g. CHD. Older people do not require as much energy as generally they are less mobile and active so should only consume small portions.
- As taste buds become less sensitive, elderly people can over season foods but this must be avoided. Avoid processed foods with too much sodium (salt) as this can lead to dehydration and high blood pressure.
- Osteoporosis - to protect bone health calcium/phosphorus/vitamin D should be eaten to help avoid breaks and fractures.
- Memory problems and Alzheimer's – eat plenty of vitamin B12 and folate to help support brain function.
- There is an increased risk of constipation so plenty of fibre (in the form of whole grain foods and oats will help to support a healthy digestive system.
- There is a risk of anaemia so iron rich foods (red meat, green leafy vegetables) should be consumed alongside vitamin c rich foods (fruits such as oranges, lemons etc and potatoes) as you need vitamin C to absorb iron.
- **Include the antioxidant vitamins A, C and E may help to prevent cancer and heart diseases.**