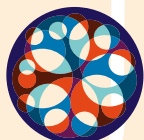




# THE HUNGRY GAMES

## Additional Information and Resources

Discover what foods are good for you and the planet!



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Advancing Nutritional Science

# Some science: information about nutrients

Nutrients are substances that are essential for maintaining our health and growth. We find them in the foods we eat. The main groups of nutrients are: carbohydrates, fats and proteins. Vitamins and minerals are also very important for our health.

Nutrients are molecules and they are so tiny you can't see them with the naked eye!

Molecules are made when two or more atoms stick together. *You can illustrate what these molecules look like using [Molymod](#) models or similar.*

## Vitamins and Minerals

Vitamins and minerals are essential nutrients. Your body needs them in small amounts in order to work properly.

Minerals are necessary for several processes, including building strong bones and teeth, turning food from our diets into energy and controlling body fluids inside and outside our cells.

## Potassium

Potassium is an important mineral for our bodies as it helps regulate the balance of fluid. Potassium also helps to improve your blood pressure. Your kidneys regulate the amount of potassium in your blood.

### Foods that are high in potassium:

- bananas
- avocados
- legumes
- fish
- broccoli
- spinach
- potatoes



<https://www.nhs.uk/conditions/vitamins-and-minerals/others/#potassium>

## Calcium

Our bodies contain more calcium than any other mineral. It has important functions such as helping to build strong teeth and bones, regulating muscle contractions (eg. your heart beat) and ensuring your blood clots normally.

### Good sources of calcium include:

- milk, cheese and other dairy foods
- cereals and cereal products
- bread and anything made with fortified flour

- green leafy vegetables – such as broccoli, cabbage and okra, but not spinach
- soya beans
- tofu
- soya drinks with added calcium
- nuts
- fish where you eat the bones – such as sardines and pilchards



**Adults need 700mg of calcium a day.**

<http://www.nhs.uk/Conditions/vitamins-minerals/Pages/Calcium.aspx>

## Iron

Iron is an essential mineral and has several important roles in our bodies. It helps to make haemoglobin, a protein used by red blood cells to transport oxygen around the body. Iron is also used in various other proteins involved in respiration and energy metabolism, and is also necessary for our immune systems to function properly.

Foods high in vitamin C are good to eat with foods containing iron, as vitamin C improves the bodies absorption of iron.

A lack of iron can lead to iron deficiency anaemia. Iron deficiency is the most common nutritional disorder in the world, commonly found in women of child bearing age and toddlers.

**Good sources of iron include:**

- liver
- meat
- beans
- nuts
- dried fruit – such as dried apricots
- wholegrains – such as brown rice
- fortified breakfast cereals
- soybean flour
- most dark-green leafy vegetables – such as watercress and curly kale



**The amount of iron we need changes during a lifetime:**

- 8.7mg a day for men
- 14.8mg a day for women
- 8.7mg a day for women over 50

**You should be able to get all the iron you need from your daily diet.**

<http://www.nhs.uk/Conditions/vitamins-minerals/Pages/Iron.aspx>

## Vitamin C

Vitamin C is a water-soluble vitamin also known as ascorbic acid. It has antioxidant properties, potentially protecting cells from oxidative damage caused by free radicals. Vitamin C is an important nutrient for the healing process as it is required for collagen production.

It is also involved in keeping the skin healthy, wound healing and in the health of blood vessels and bones. Severe deficiency of vitamin C leads to scurvy.

Vitamin C also increases the absorption of iron from plant sources in the gut.

### Good sources of vitamin C include:

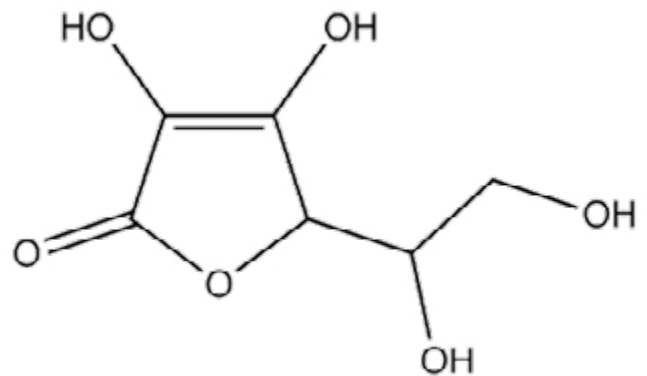
- fresh fruits especially citrus fruits and berries
- green vegetables
- peppers
- tomatoes
- potatoes (especially new potatoes)



<http://www.nhs.uk/Conditions/vitamins-minerals/Pages/Vitamin-C.aspx>

## Try Making

**Vitamin C (ascorbic acid)**  
– structure  $C_6H_8O_6$



## Proteins

Proteins are the building blocks of life. Our bodies use protein to build and repair tissues, including muscles, skin, hair and nails. It is essential for growth and maintaining good health.

Proteins are made up of small molecules called amino acids. The number of amino acids and their sequence determine the activity of the protein. There are about 20 amino acids found in plant and animal proteins and for human adults, nine of these 'essential' amino acids have to come from our diet.



- Protein is essential for growth and repair of the body and maintenance of good health.
- Protein provides energy; 1 gram provides 17 kJ (4 kcal).
- The Reference Nutrient Intake (RNI) is set at 0.75g of protein per kilogram bodyweight per day for adults. The amount of protein we need changes during a lifetime.
- Different foods contain different amounts and different combinations of amino acids. Protein from animal sources (e.g. meat, fish, eggs and dairy products) contain the full range of essential amino acids needed by the body. However, vegans and vegetarians can get the amino acids they need by combining different plant sources of protein, e.g. pulses and cereals.
- You also use protein to make enzymes, hormones, and other body chemicals.

Source: -

<https://www.nutrition.org.uk/nutritionscience/nutrients-food-and-ingredients/protein.html>

## Proteins in our diet

### Milk, Cheese, and Yogurt

Not only are dairy foods like milk, cheese, and yogurt excellent sources of protein, but they also contain valuable calcium, and many are fortified with vitamin D. Choose skim or low-fat dairy to keep bones and teeth strong and help prevent osteoporosis.



### Eggs

Eggs are one of the least expensive forms of protein. Eggs can be safely eaten as part of a healthy diet.

### Beans

One-half cup of beans contains as much protein as an ounce of broiled steak. Plus, these nutritious nuggets are loaded with fibre to keep you feeling full for hours.

### Chicken

Chicken has approximately 25g of protein per 100g. Poultry production is also kinder to the environment as it uses less land, less water and produces less environmentally damaging greenhouse gas.

For more information on a healthy, balanced diet, see the UK Eatwell Guide [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/528193/Eatwell\\_guide\\_colour.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/528193/Eatwell_guide_colour.pdf)

## Amino acids

Proteins are large molecules made up of long chains of amino acids. Amino acids are the building blocks of proteins. The biochemical activity of proteins is characterised by their individual structure, size and shape. These factors are determined by the sequence and characteristics of the constituent amino acids.

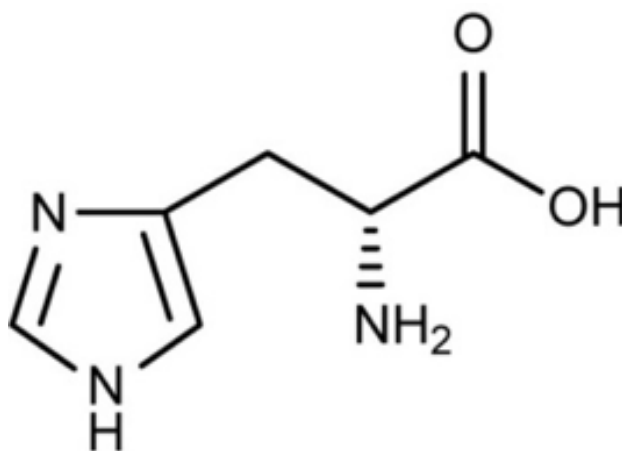
For adults, there are nine essential amino acids which are provided by the diet. These are:

- Histidine
- Leucine
- Isoleucine
- Valine
- Threonine
- Methionine
- Phenylalanine
- Tryptophan
- Lysine.

## Try Making

### Histidine (an essential amino acid)

– structure  $C_6H_9N_3O_2$



Histidine is an essential amino acid, involved in the synthesis of haemoglobin, tissue repair and the strengthening of the immune system. The human body only produces small amounts of histidine, so it is important to take histidine in through our diet.

Deficiency in histidine can lead to growth disruptions or rheumatoid arthritis in adults.

Source: <http://aminoacidstudies.org/l-histidine/>

## Fats

Fats are an essential part of a balanced, healthy diet. They are a great source of slow-release energy, and help us to absorb some vitamins such as A, D and E.

Fats are made up of fatty acids, some of which are essential to the human diet, such as omega-3 and omega-6. Fatty acids are also used in our bodies to build cells and to send signals between them.

Some types of fat are not good for us, especially in large quantities. Saturated fats can lead to fatty deposits building around our arteries, making it difficult for blood to reach our organs. Foods high in saturated fats include biscuits and cakes, fatty cuts of meat and ice cream.

Unsaturated fats, such as omega-3 and omega-6 fatty acids, monounsaturated fats and polyunsaturated fats can reduce the likelihood of fatty deposits. Foods containing these 'good' fats include avocados, salmon, Brazil nuts and olive oil.

- Essential fatty acids (EFA) eg. Omega 3 and omega 6 are good for humans but we should aim to consume more omega 3 than omega 6.
- Fats help us to absorb 'fat soluble' vitamin A, D and E
- Fats are a source of energy, more so than carbohydrates or protein. 1g of fat provides 36kj (9kcal).
- We should avoid saturated and trans-fats
- EFA's, and fatty acids synthesised from them, are used in cell membranes, and are also important signalling molecules



### Food sources include:

#### Saturated fats

- Sausages
- Hard cheese
- Ice cream
- Cake

#### Unsaturated fats

- Avocado
- Brazil nuts
- Olive oil
- Salmon
- Eggs (if enriched with omega-3 fatty acids)

There are labelling guidelines set by the European Union to help you work out whether or not a food is high in fat and saturated fat. The nutrition labels on the back of food packaging can help you cut down on total fat and saturated fat (also listed as saturates, or sat fat).

#### Total fat

High fat – more than 17.5g of fat per 100g

Low fat – 3g of fat or less per 100g, or 1.5g of fat per 100ml for liquids (1.8g of fat per 100ml for semi-skimmed milk)

Fat-free – 0.5g of fat or less per 100g or 100ml

#### Saturated fat

High in sat fat – more than 5g of saturates per 100g

Low in sat fat – 1.5g of saturates or less per 100g or 0.75g per 100ml for liquids

Sat fat-free – 0.1g of saturates per 100g or 100ml





## Most adults and children in the UK eat too much sugar.

The type of sugar we eat too much of are known as “free sugars”. Free sugars are any sugars added to food or drinks, or found naturally in honey, syrups and unsweetened fruit juices. Many foods and drinks that contain added sugars can be high in energy, or calories, and often have few other nutrients. Eating these foods too often can mean you eat more calories than you need, which can lead to weight gain and obesity. Free sugars should not exceed 5% of total energy for all age groups over 2 years.

## Foods which contain carbohydrate include:

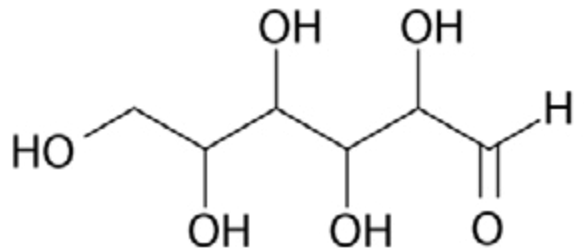
Free sugars	Starch	Fibre
Chocolate	Potatoes	Root vegetables
Orange juice	Pasta	Oats
Cake	Couscous	Apples
Ice cream	Bananas	Walnuts
Jam	Bread	Wholemeal bread
Honey	Breakfast cereal	Beans and pulses

## Other carbohydrate facts

- As well as starch, complex carbohydrates often contain calcium, iron and B vitamins.
- Some forms of complex carbohydrates, such as pectin in fruit and beta glucan in oats, may slightly reduce the level of cholesterol in blood.
- The level of glucose in the blood is carefully monitored and kept within narrow limits by the action of the hormone insulin. Some glucose is needed in the blood to fuel our cells and give us energy but if there is too much blood can become too sticky and not flow as well round the body.
- The glycaemic index (GI) of a food is a measure of how quickly glucose is released into the bloodstream after eating. Low GI foods, such as brown pasta, porridge, beans and lentils, breakdown slowly during digestion and therefore release glucose slowly into the blood stream.

Source: British Nutrition Foundation: <https://www.nutrition.org.uk/nutritionscience/nutrients-food-and-ingredients/carbohydratesandhealth.html>

## Try Making Glucose (a sugar) - structure $C_6H_{12}O_6$



When our bodies digest food, carbohydrates are broken down into molecules of glucose. Glucose can be used immediately by our bodies for energy, or it can be stored for use later on. It is the primary energy source for our brain and other cells throughout our bodies. It helps with muscle contraction, nerve cell conduction, the production of chemical substances and active transport.

## Environmental impact and sustainability

The population is predicted to rise to 9 billion people by 2050. The Food and Agriculture Organisation of the United Nations (FAO) has predicted that agricultural production will have to increase by 70% by 2050, to cope with this increase in the population.

In order to feed everyone, we will need to find sustainable, safe food choices that have a low environmental impact; using less land space and emitting fewer greenhouse gas emissions.

Diets which are high in plant based products and contain less meat produce are considered to have less environmental impact. We must also consider the amount of water used to produce our food, it takes 3,000 – 5,000 litres of water to produce 1 kg of rice, 2,000 litres for 1kg of soya, 900 litres for 1kg of wheat and 500 litres for 1kg of potatoes.

### Useful links:

<https://sustainabledevelopment.un.org/?menu=1300>

[http://www.fao.org/sustainability/en/?utm\\_source=faohomepage&utm\\_medium=web&utm\\_campaign=featurebar](http://www.fao.org/sustainability/en/?utm_source=faohomepage&utm_medium=web&utm_campaign=featurebar)

<http://mocomi.com/sustainability/>

## Links and further information

[McCance and Widdowson's composition](#) of foods gives detailed information of the nutritional content of the foods we eat.

Eatwell guide provides guidance on following a healthy, sustainable diet [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/528193/Eatwell\\_guide\\_colour.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/528193/Eatwell_guide_colour.pdf)

[The Food Standard Agency's Food Portion Sizes](#) gives recommended portion sizes.

[Daily reference values](#) for micronutrients.

[The traffic light system](#) for food labelling in the UK helps us to choose foods as part of a balanced diet.

[The WWF Livewell Initiative](#) gives information on a healthy and sustainable diet.

[Foodsecurity.ac.uk](#) gives information about global food security.

[The World Health Organisation](#) has more information about the definition of food security.

[Check out this video](#) about food waste from the Royal Society of Biology.

[The Crunch](#) is the Wellcome Trusts 2016 initiative. Take part in exciting events and activities and think about how our food, health and the planet are all interconnected.

[Check out this infographic](#) about the amount of food wasted globally and in the UK.

The Biochemical Society, Royal Society of Biology and Nutrition Society would like to give special thanks to Dr Glenys Jones RNutr, Association for Nutrition and Suzanna Abraham, MRC Human Nutrition Unit for their specialist nutrition expertise and advice.

