Minerals

Minerals are one of the micronutrients. The body requires approximately 20 minerals to protect itself against disease.

Classification of minerals

Minerals are classified into two main type:

Macro minerals: required in relatively large amounts, e.g., calcium, phosphorus potassium and sodium.

Trace minerals: required in trace amounts, e.g., iron, zinc, iodine and fluorine.

Calcium

Calcium is the most plentiful mineral in the body. Approximately 99% of the body's calcium is in the bones and teeth, the remaining 1% is found in the muscles, nerves and blood.

Sources	Recommended Daily Allowance (RDA)/Reference Intake (RI)
Milk Cheese Yoghurt Sardines Leafy green vegetables Sesame seeds	Group RDA Children 800 mg Adolescents 1,200 mg Adults 800 mg Pregnant or lactating women 1,200 mg
Functions	Effects of deficiency
Aids the formation of strong bones and teeth.	Increased risk of bone diseases, such as rickets, osteomalacia and osteoporosis, and tooth decay.
Assists blood clotting which is necessary if an injury causes damage to blood vessels.	Slow blood clotting of ruptured blood vessels. This can cause haemorrhaging.
Aids normal muscle contraction.	Muscles fail to relax after contraction. This can cause muscular spasms, cramps and convulsions.

Absorption of calcium

Only 20-30% of calcium intake is absorbed by the body. A variety of factors assist and hinder absorption.

Factors assisting calcium absorption

Vitamin D stimulates the production of calcium-binding protein, assisting absorption.

The hormone parathormone, released from the parathyroid gland, controls the levels of calcium in the blood.

The hormone oestrogen, produced in the ovaries, promotes calcium absorption.

Phosphorus combines with calcium, creating calcium phosphate, which is easier to absorb.

An acid environment promotes calcium absorption. Consuming foods high in vitamin C provides this.

Factors hindering calcium absorption

Tannins present in tea and coffee bind to calcium, inhibiting absorption.

Excess dietary fibre binds to calcium, inhibiting absorption.

Excess fat binds with calcium, creating insoluble and non-absorbable calcium soaps.

As the body burns excess protein for energy it produces sulfate. Sulfate increases the amount of calcium excreted in urine.

Phytic acid in wholegrain bread and seeds binds to calcium, inhibiting absorption.

Oxalic acid in rhubarb and spinach binds to calcium, inhibiting absorption.

Iron

Over half of the body's iron is found in the blood, as part of the haemoglobin of the red blood cells. The remainder is found in the muscles, bone marrow, cell enzymes and organs, such as the liver and spleen.

Forms	
Haem iron: also known as ferrous iron. Easily absorbed by the body.	Non-haem iron: also known as ferric iron. Not easily absorbed by the body, it must be changed into ferrous iron to be easily absorbed.
Sources	Recommended Daily Allowance (RDA)/Reference Intake (RI)
Haem iron Non-haem iron Red meat Cereals Offal Pulses Poultry Eggs Meat products Leafy green vegetables	Group RDA Children and adult males 10 mg Adolescents and adult females 14 mg Pregnant or lactating women 15 mg
Functions	Effects of deficiency
Makes red blood cells and forms haemoglobin, a red protein pigment found in red blood cells responsible for carrying oxygen around the body.	Anaemia may occur due to a lack of haemoglobin and red blood cells, causing a reduction in the oxygen levels in the blood.

	Symptoms include tiredness, pale skin, shortness of breath and dizziness.
Forms part of myoglobin, which carries oxygen to the muscles for energy.	Muscle fatigue due to lack of oxygen. This decreases athletic performance.
Works with enzymes to release energy from food.	The body has less energy.

Absorption of iron

Only 15% of iron intake is absorbed by the body. A variety of factors assist and hinder iron absorption.

Factors assisting iron absorption

Consuming haem and non-haem iron together increases non-haem iron absorption.

Consuming food high in vitamin C chemically changes non-haem iron to the more easily absorbed haem iron.

Acidity from hydrochloric acid (HCL) in the stomach chemically changes non-haem iron to the more easily absorbed haem iron.

Factors hindering iron absorption

Tannins present in tea and coffee bind to iron, inhibiting absorption.

Excess dietary fibre binds to iron, inhibiting absorption.

Phytic acid in wholegrain bread and seeds binds to iron, inhibiting absorption.

Oxalic acid in rhubarb and spinach binds to iron, inhibiting absorption.

Zinc

Sources	Recommended Daily Allowance (RDA)/Reference Intake (RI)
Meat Pulses Milk Seafood Eggs Seeds	Group RDA Children 4 – 7 mg Adolescents and adults 7 – 10 mg
Functions	Effects of deficiency
Aids the metabolism of fats, carbohydrates and protein to release energy.	Tiredness and irritability due to a lack of energy.
Helps the healing of wounds and repair of tissues.	Impaired wound-healing, which can lead to infection.

Helps maintain healthy skin and hair.	Hair loss and dry skin conditions, e.g., eczema.

Iodine

Sources	Recommended Daily Allowance (RDA)/Reference Intake (RI)
Meat Milk Seafood Cod liver oil Seaweed, e.g., nori	Group RDA Children 70 – 100 µg Adolescents and adult 120 – 130 µg
Functions	Effects of deficiency
Aids the manufacture of the hormone thyroxine in the thyroid gland, which regulates metabolism.	Reduced basal metabolic rate (BMR), increases risk of obesity due to a lack of thyroxine.
Essential for normal growth and development during gestation and childhood.	Stunted or delayed physical or mental growth in children.
Maintains the thyroid gland, preventing swelling and breathing difficulties.	Goitre, an abnormal enlargement of the thyroid gland in the neck.

Sodium (salt)

Sources	Recommended Daily Allowance (RDA)/Reference Intake (RI)
Table salt Cheese Snack foods, e.g., crisps White bread Cured meats, e.g., bacon	Group RDA Children 1.6 g (4 g salt) Adolescents and adults 2.4 g (6 g salt)
Functions	Effects of deficiency
Regulates blood pressure.	Low blood pressure (hypotension), reducing oxygen getting to organs as blood flow is slowed down.
Supports healthy nerve activity.	Delayed nerve impulses leading to cognitive impairment, e.g., memory loss or disorientation.
Aids normal muscle contraction.	Muscles fail to relax after contraction. This can cause muscular spasms, muscle cramps and convulsions.

Overconsumption of salt

In Ireland, many people eat more than twice the amount of salt their bodies need. Research shows that overconsumption of salt can increase blood pressure levels and increase the risk of heart attacks or strokes. Salt consumption can be reduced by:

Avoiding high-salt snack foods.

Buying reduced salt products.

Not adding salt when cooking.

Reading nutritional labels carefully when shopping as food may contain hidden sodium, e.g., monosodium glutamate, a sodium salt.

Potassium

Sources	Recommended Daily Allowance (RDA)/ Reference Intake (RI)
Meat Bananas Milk Fish Leafy green vegetables	Group RDA/RI Children 0.8 - 2 g Adolescents and adults 3.1 g
Functions	Effects of deficency
Aids the metabolism of carbohydrates and protein to release energy.	Tiredness and irritability due to a lack of energy.
Supports healthy nerve activity.	Delayed nerve impulses leading to cognitive impairment, e.g., memory loss or disorientation.
Aids normal muscle contraction.	Muscles fail to relax after contraction. This can cause muscular spasms, muscle cramps and convulsions.