

S3 FOODS AND NUTRITION

MINERAL ELEMENTS

Mineral elements are inorganic compounds which appear as ash when all the carbon, hydrogen, oxygen and nitrogen in food are burnt.

Characteristics of mineral elements

- Do not provide energy.
- They are all water-soluble so very little water should be used in cooking foods containing them.
- They are not much affected by heat and food processing.

NB

Mineral elements are needed in definite amounts in definite places. Those needed in very small quantities are known as trace elements and normally act as catalysts. These include iron, iodine, manganese, copper, zinc and fluorine and are also called micro-nutrients

Macro-nutrients are needed in relatively large amounts. These are calcium, phosphorus, potassium, sodium, chlorine, magnesium.

General functions of mineral elements in the body.

1. They are absolutely essential for the proper functions of many parts of the body.
2. They enter the structural framework of the body e.g calcium and phosphorus are present in bones and teeth.
3. They form constituents of body cells such as muscles fibres, nerves cells, blood corpuscles e.g phosphorus for nerve cells.
4. As soluble salts in the body fluids they contribute to the composition and stability of the fluids e.g sodium helps to maintain the water balance in the blood.
5. Acts as catalyst of various functions in the body e.g muscle contractions , body metabolism
6. Aid in the clotting of blood e.g calcium

CALCIUM

-More Ca is found in the body than any other mineral. Most of it is found in the bones and teeth , the fluids and soft tissues contain the rest.

Functions of Calcium in the body.

1. Formation of bones and teeth together with phosphorus , vitamin D and C and even strengthen them.
2. Ca takes part in the mechanism of blood clotting.
3. Ca assists muscles to contract and transmit the nerve signals to the muscles which initiate the orderly movement.
4. Cell membrane permeability. ionized Ca controls the passage of fluid through cell membranes by affecting cell wall permeability.
5. Assists to maintain a normal rhythmic heart beat.
6. It also regulates the use of other minerals in the body.

Food sources of calcium

Best sources-milk and milk products such as cheese and yoghurt

Good sources are canned fish, flour fortified with calcium carbonate, hard water, leafy green vegetables and broccoli

People who need higher requirements of calcium are

1. Pregnant women because of the growing foetus has priority to calcium
2. Nursing mothers because they need Ca in milk production which the baby has to feed on.
3. Growing children
4. old people- their bones may become brittle and easily broken without adequate supply of ca.
5. Young people reaching puberty because of spurt of growth

Factors assisting calcium absorption.

1. The presence of vitamin D promotes the production of a carrier protein needed for the absorption of calcium.
2. Vitamin C increases calcium absorption.
3. Lactose increases the solubility of calcium absorption upon hydrolysis of milk sugar.
4. Body need i.e children, pregnant and lactating mothers need more calcium.
5. Phosphorus when carried with calcium.
6. The degree of acidity i.e gastric acids in the stomach. Calcium is soluble in acid medium, the HCL of the gastric juice is very important in its absorption because it helps to dissolve the Ca so that it can be more easily absorbed from the small intestines directly into the bloodstream.

Factors which affect the absorption of calcium are;

1. Phytic acid found in whole grain cereals and pulses. It binds calcium forming insoluble salts hence hindering its absorption.
2. Oxalic acid found in spinach. It binds calcium forming insoluble salts.
3. Cellulose is indigestible in human stomach therefore Ca in vegetables is likely not to be absorbed.
4. Excess fats especially saturated fatty acids form insoluble salts with calcium hence hindering its absorption.

Deficiency of calcium in the body.

1. In children, bones and teeth are not mineralized properly and are improperly formed.
2. In extreme cases rickets occur in children.
3. In adults the strength of bones and teeth is not maintained resulting in osteomalacia(adult rickets)
4. Poor quality and badly deformed teeth.
5. Both children and adults suffer from tooth decay.
6. Muscles and nerves do not function correctly resulting in tetany (muscles contract rapidly and the patient has convulsions)
7. Abnormal clotting of blood.
8. Osteoporosis. This is due to the continual loss of bone mass. It is common among women because they have less bone mass than men. symptoms are weak bones, brittle bones that break easily.

Excess calcium.

Too much calcium in the body is dangerous as it will be deposited in organs such as the kidneys, heart and arteries.

Osteoporosis

This is due to the continual loss of bone mass. It is common among women because they have less bone mass than men.

Symptoms of osteoporosis

- bones become weak
- brittle bones and break easily

PHOSPHORUS

This is second to calcium in the amount found in the body. It is found in all living tissues in the molecules of nucleic acids (RNA and DNA)

1. Forms the structure component of bones and teeth together with calcium.
2. It controls the release of energy within the body and its storage.
3. It transports fatty acids . Phosphorus combines with fat forming phospholipids and so phosphorus helps provide a transport form for fat.
4. It is a constituent of blood.
5. It is necessary for the reproduction of body cells.
6. It regulates the acid base balance in the body during the protein metabolism, hydrogen ions are liberated and these combine with the phosphorus-protein to form a buffer.
7. Phosphorus forms structural parts of nucleotides e.g DNA(deoxyribonucleic acid) and RNA(Ribo nucleic acid) which are responsible for protein synthesis and genetic coding.

Food sources of phosphorus

Milk, cheese, nuts, fish, eggs, meat , poultry , liver , kidneys, oatmeal, cabbages , spinach , cereals

IRON**Functions of iron in the body**

1. Iron is needed for the formation of haemoglobin which gives blood its red colour. Iron combines with protein in our bodies to make haemoglobin in our red blood cells required to transport oxygen to every cell for production of energy and maintenance of all cell functions. sss
2. Iron acts as a co-enzyme, this helps in the release of energy from foods. A body starved of iron cannot burn enough food to produce energy.
3. Iron takes part in the formation of myoglobin, a protein present in the muscles. Myoglobin also acts as a store of oxygen in the muscles. it receives oxygen from haemoglobin and stores it.
4. Maintains brain function. Our brain uses approximately 20% of oxygen found in our bloodstream. Since iron is responsible for creating the proteins that transport this oxygen. Our brain is dependent on its iron reserves for continued function.
5. Maintain metabolism. Our metabolism can slow itself down to accommodate for low oxygen Levels. This can results in fatigue and lethargy, the two biggest signs of an iron deficiency . When we provide our bodies with the proper amounts of iron, however, our metabolism can function at its normal pace.

Food sources of iron

Liver ,beef, kidneys, egg yolk, brown bread, green vegetables i.e spinach, amarathus etc peas, cocoa, dried fruits , beans

Deficiency of iron

- Deficiency of iron causes the haemoglobin to fall
- In severe cases causing nutritional anaemia in the body.

Anaemia

It's a condition that results when the blood has very few red blood cells or too little red pigment.

Symptoms of anaemia- pale complexion, tiredness, breathlessness,

Causes of anaemia

- lack of food which supply iron
- children who are born early with a small stock of iron
- children born to anaemic mothers.
- children who feed long on only milk after the first 4 months
- having worms especially hook worms that feed on the blood inside the body.

Excess or too much of iron in the body.

- large amount of iron in the diet can be harmful because iron stores may become overloaded.

Factors that favour absorption of iron.

1. Body need i.e people recovering, people at high altitudes these people have high demand.
2. Acidity. Ascorbic acid aids the absorption of iron by its reducing action and effect on acidity so foods containing vitamin C should be eaten with it whenever possible.
3. Calcium. An adequate amount of calcium helps bind and remove agents such as phosphate and phytate which if not removed combine with iron and inhibit its absorption.

Factors hindering absorption of iron

1. Binding agents. Phosphate, phytate and oxalate are binding agents that remove iron from the body.
2. Reduced gastric acid secretion. Surgical removal of stomach tissue reduces the number of cells that secrete HCL acid and acid medium necessary for iron reduction is therefore not provided.
3. Infection. Severe infection hinders iron absorption
4. Gastrointestinal disease such as diarrhea hinders iron absorption.
5. Chemical state of iron. It is mainly the divalent form that it is absorbable .

Special requirements

1. Babies are born with a supply of iron to last them up to 4 months as milk contains very little iron
Then later to be given iron in form of solid food or mineral drops.
2. Pregnant /expectant mothers need an increase in iron for the development of the growing baby's blood supply. Supplement of iron tablets can also be given.
3. Girls and women. The regular menstrual loss of blood means that iron is lost and must be replaced. After birth of a baby iron supplies must be replaced.
4. Injuries and operations result in loss of blood and iron must be replaced.

How is iron lost from the body?

- Through wear and tear of the body
- During menstruation period
- Through excretion
- Through bloodsucking by parasites like worms, mosquitoes
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SODIUM**Functions of sodium**

1. Maintains fluid balance in the body.
2. Maintains Acid-base balance
3. Helps regulate blood pressure
4. Helps with muscle and nerve action

Food sources of sodium **-Table salt, -Processed food**

POTASSIUM

Functions of potassium

1. Potassium controls acid-base balance. ionised potassium exerts an influence on the acid-base balance through its operation with ionized sodium and ionized hydrogen.
2. It takes part in fluid electrolyte balance.
3. Maintains osmotic pressure within the cells.
4. Takes part in muscle activity and nerve action.
5. Assists in maintaining the heart beat.

Food sources of Potassium

-It is found in a wide range of foods. Potatoes, beef, offals, fish, eggs, milk, ,cheese, poultry, many fruits and vegetables such as spinach, lettuce, broccoli, peas, tomatoes, oranges, bananas, apples, avocados

CHLORIDE

Functions of chloride

1. Assists in maintaining the fluid balance in your body.
2. Assists in transmitting nerve signals.

Food sources- Table salt

IODINE

Functions of iodine

1. Iodine participates in the synthesis of thyroid hormone.
2. It is essential for proper functioning of the thyroid gland and the hormone thyroxine which controls the metabolic rate.
3. In the fetus , iodine is needed for the development of the nervous system.

Main sources

Fish and other sea food, water, cod liver oil, sea weeds, iodized table salt.

Effects of deficiency of iodine in the body

1. Enlargement of thyroid gland resulting into goiter
2. lack of energy
3. obesity
4. mental backwardness
5. cretinism a medical condition in which there is a failure of mental or physical development.
6. lack of thyroxine causes a fall in basal metabolism.

ZINC

Function of Zinc in the body

1. Zinc assists the body make proteins, heal wounds and form blood.
2. It assists in growth and maintenance of all tissues.
3. Assists the body use carbohydrates, fats and proteins
4. Affects the senses of tastes and smell.
5. Assists the body use vitamin A.

Food sources of zinc

-meat, liver, poultry, fish, dairy products, dry beans and peas, peanuts whole grain breads and cereals, egg

Magnesium**Functions of magnesium in the body**

1. Assists build bones and make proteins
2. Assists nerves and muscles work normally.

Foods sources of magnesium in the body

-whole grain products, green vegetables, dry beans and peas, nuts and seeds

Copper**Functions**

1. Helps iron make red blood cells.
2. Helps keep your bones, blood vessels and nerves healthy.
3. helps the heart work properly

Food sources

. whole-grain products, sea food, organ meat, dry beans and peas, nuts

Flourine**Functions**

1. Helps in formation of bones and teeth and strengthens them
2. Prevents dental decay

Sources

Offals, fish, drinking water

Effects of deficiency

Dental caries

Questions

- 1.