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Chapter 9 : Minerals

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Chapter 9
Minerals

- → Minerals are the elements which are necessary for different types of Physiological functions and many of biochemical process.
- → Minerals are essential for the normal growth and maintenance of the body. Many of the essential minerals are widely distributed in foods, and most people eating a mixed diet are likely to receive adequate intakes. daily requirement of mineral is more than 100 mg, they are called major elements or macro minerals. If the requirement of minerals is less than 100 mg/day, they are known as minor elements or microminerals or trace elements.
- → Mineral availability depends on the region/soil or environmental condition because of mineral percentage vary region to region.

Types

1) **Macro-Minerals or Essential or Major Minerals :** The minerals are required more than 100mg per day as a daily requirement are called Macro-minerals such as : Sodium , Potassium , Calcium , chloride , Magnesium , Phosphorus.
2) **Micro-Minerals or Trace Minerals :** The minerals are required less than 100mg per day as a daily requirement are called Macro-minerals such as : Iodine , Fluorine , Copper , Cobalt , Manganese , iron , zinc, Selerium , Sulphate , Arsenic , Vanadium.

Functions of Minerals

- ➢ They are required for :
    - For transport of Oxygen (Fe)
    - For maintenance of tissues and bones . (Ca++)
    - For working of nervous system . (Ca++)
    - For muscle contraction . (Ca++)
    - For blood coagulation (Ca++)
    - For Cardiac activity (K+)
    - For acid-base balance (Na+)
    - For thyroid Hormone synthesis (Iodine)
    - For formation of sperms (Zn)
    - For maintenance of Osmotic pressure of blood (Na+ , K + , Cl -)

Macro-Minerals

Calcium

→ Calcium is a main component of bone and teeth , calcium is taken in diet in the form of Calcium Phosphate and calciumcarbonate . It is the most abundant mineral in human body (1200 g approximately).

Functions

- For formation and development of bone and teeth.
- Calcium is necessary for bone calcification (it is a process in which calcium builds up in the bones and teeth and make them harden.
- It is helps in the blood coagulation , helps in conversion of prothrombin into thrombin.
- It helps the body in muscles contraction.
- It activates enzymes.
- It acts as an intracellular Messenger of different Hormones.
- It increase the permeability of Plasma membrane.
- It plays an important role in action Potential.

Deficiency Diseases

- Hypocalcemia (Low blood calcium level)
- Osteoporosis (weak and fragile)
- Tetany (Involuntary muscles contraction due to lack of calcium in blood)
- Rekets (in children)
- Osteomlacia (In adult)

Recommended Dietary Requirement

- 500m g /day for a healthy adult , 1.5 - 1.0 g /d for Pregnant women.

Phophorus

→ It is also a major component of bones and used for Energy production.

Functions

- Formation and development of bone and teeth.
- For formation of nucleic acids and Phospholipids.
- For formation of Co-enzymes like NADP,
- For formation of ATP , ADP, AMP.

Deficiency Diseases

- Hypophosphatemia.
- Rikets
- Osteomlacia

Recommended Dietary Requirement

- 500-700 mg /d for a healthy adult.

Sodium

→ It is the chief cation of the extra cellular compartment , around 50mmol/kg sodium is found in a healthy man.

Function

- It involves in maintaining body fluid through osmosis.
- It retains water in the body.
- It helps in excitability of nerves.
- It helps in acid - base balance.
- It helps in maintaining viscosity of blood.
- It maintains electrolyte balance.

Deficiency Diseases

- Hyponatremia

Recommended Dietary Requirement

- 5-6 g / for a healthy adult

Potassium

It is major intracellular Cation , and performs following functions

Functions

- For acid-base balance
- It helps in cardiac muscles function
- For neuromuscular function activity

Deficiency diseases

- Hypokalemia

Recommended Dietary Requirement

- 2-2.4 g for a healthy adult.

Chloride

→ It is major anoin in the body . Around 125mmol/l chloride is found in cerebrospinal fluid (CSF) . about 80 g chloride ions found in a healthy adult.

Functions

- It involves in acid-base balancing.
- It helps in secretion of HCL in stomach.
- It helps in maintaining fluid balance by osmosis.

Deficiency Disease

- Hypochloremia

Recommended Dietary Requirement

- 5-10 g for a normal adult

Magnesium

Functions

- It helps in activation of enzymes.
- It is required for DNA replication , transcription , and translations.

Deficiency diseases

- Fatigue , Weakness , appetite loss , nausea and vomiting.

Daily requirement

- 350 mg/d for a adult man.

Micro-Minerals

Iron

→ It very important for formation of haemoglobin , around 3-5 g oiron is found in a healthy adult.

Functions

- It required For formation of Hb /RBCs
- It required For formation myoglobin .(it store oxygen in muscle cells)
- It required for synthesis of DNA.
- It transport O2 Co2.

Deficiency diseases

- Iron deficiency anemia

Recommended Dietary Requirement

- 15-20 mg /d for a healthy adult

Iodine

Functions

- It required For synthesis of thyroid Hormone
- It required for growth and development of body

Deficiency diseases

- Goiter , Hypothyrodism , Cretinism (stopped physical and mental growth).

Recommended Dietary Requirement

- 120- 140 mcg

Copper

Functions

- It involves in haemoglobin synthesis
- It required for melanin formation.

Deficiency diseases

- Hypochromic,
- Recommended Dietary Requirement
- About 900 mcg /d for a normal adult.

Fluorine

Functions

- Tooth development,
- Dental health,
- Bone development (it increase calcium and phosphate reaction).

Deficiency diseases

- Dental caries

Recommended Dietary Requirement

- 2-4 mg /d for adults

Zinc

Functions

- It requires for enzyme formation it requires for sperm formation.
- It helps in production of DNA and proteins.
- It helps in wound healing

Deficiency diseases

- Diarrhoea,
- Skin disorders,
- obesity,
- diabetes mellitus.
- Delay in wound healing

Recommended Dietary Requirement

- 8 - 11 mg for adults

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