



# HME103-Principles of Nutrition

## Components in foods and their relationship with health: Minerals II

Lesson Code: HME103-Principles of Nutrition

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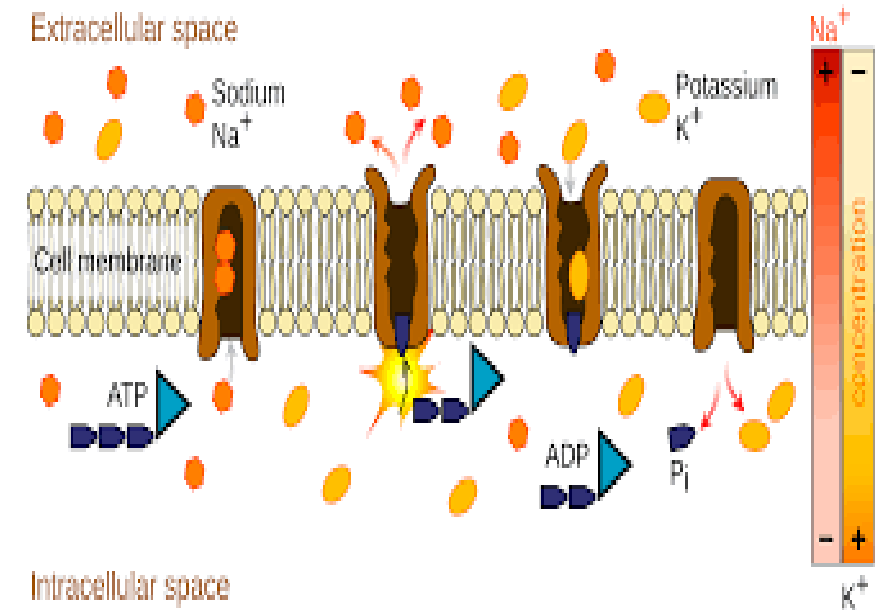
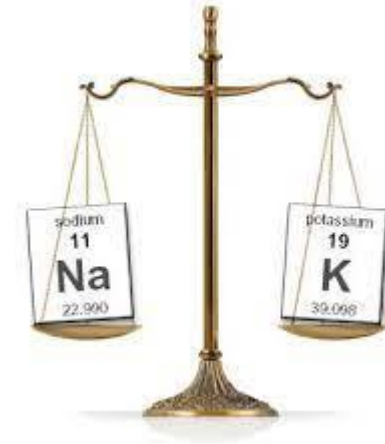
# SODIUM AND POTASSIUM

Sodium (Na) and potassium (K), which are important in maintaining electrolyte balance in the body, are similar to each other in terms of their functions and properties in the body.

**Potassium** is more abundant in the intracellular fluid and **sodium** is more abundant in the extracellular fluid.

## Functions:

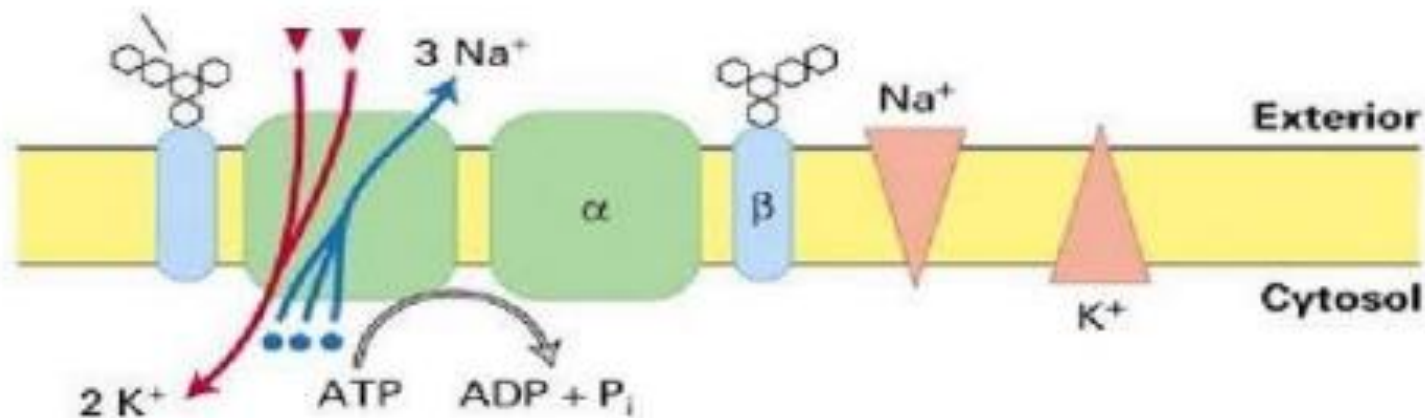
- Since Na and K salts dissolve and ionize easily in water, they are of great importance for the osmotic pressure and acid-base balance of body fluids.
- As it is known, 2/3 of the water in the body is inside the cells and 1/3 is outside the cells. It is important to maintain this distribution for cells to carry out their necessary functions and metabolic reactions. Na and K play an important role in maintaining this fluid balance.
- These minerals have different effects on the functioning of muscles, cell stimulation and transmission of nerve impulses.
- Both mineral substances play a role in keeping blood pressure balanced.



# SODIUM AND POTASSIUM

## Na<sup>+</sup>- K<sup>+</sup> Pump

- It is a pump located in the membrane of all cells in the body.
- Its function is to pump Na<sup>+</sup> out of the cell and K<sup>+</sup> into the cell.
- This pump pumps out 3 Na<sup>+</sup> for every 2 K<sup>+</sup> it pumps in.
- Thus, a continuous loss of positive charge occurs within the cell (2/3).
- This creates a potential difference of -4 mV in addition to the potential difference created by diffusion through the leakage channels.



# SODIUM AND POTASSIUM

## Deficiency-Excess

Since sodium and potassium are widely found in foods, their deficiency is normally not common.

- Deficiency or excess of these minerals may occur in cases such as excessive sweating, excessive urination, diarrhea, vomiting, and kidney disease.
- When these are taken in excess, they are excreted under the control of hormones and the kidneys and balance is achieved.

## Sources-Requirement

- **Sodium** is taken mostly with table salt. Even if salt is not added to meals, there is approximately 1-3 g of Na in daily foods.
- The daily Na requirement of normal adults is 6 grams. This is equivalent to one teaspoon of table salt.
- 2-4 grams of **Potassium** is taken daily with normal diets.
- It is thought that the daily K requirement of healthy adults is between 1.8-5.6 grams.
- Coffee is very rich in potassium.
- Banana, spinach, lettuce, parsley, legumes, hazelnuts, etc. Foods contain significant amounts of K.



# FOODS RICH IN SODIUM AND POTASSIUM

## Sodium

soy sauce	300 mg
table salt	2.000 mg
canned soup	1.000 mg
Cheese	550 mg
grains	300 mg
Snacks and fast food products	700 mg to 1.500 mg

## Potassium

A medium sized banana	25 mg
plain yoghurt	575 mg
Orange juice	500c mg
Melon	425 mg
baked potatoes	900 mg
Almond butter	650 mg

## SODIUM DEFICIENCY

- -Nervous system diseases
- -Muscle diseases
- -Dizziness
- -Vomiting
- -Circulatory and respiratory disorders
- -Drying of tongue and skin



## POTASSIUM DEFICIENCY

- -Blood pressure
- -Brain diseases
- -Diarrhea
- -Kidney diseases



# MAGNESIUM

An adult human body contains approximately 20-25 g of Mg.

- Most of it found in the structure of bones and teeth, and the rest is found in muscles, liver and body fluids.
- Some of the magnesium in the intracellular fluid is ionized and some is bound to proteins.



# MAGNESIUM

## Functions:

- It is the mineral that helps the nervous system and muscles relax.
- It is known as the "**Anti-stress Mineral**" because it helps calm down.
- Magnesium plays an important role in converting sugar in the blood into energy.
- This vital mineral is necessary for our body to use **Vitamin C, calcium, phosphorus, sodium and potassium** more effectively.
- Magnesium is essential for healthy teeth and digestive comfort.





# MAGNESIUM

## Food sources:

- Magnesium is mostly found in green leafy vegetables, tropical fruits such as bananas, avocados and mangoes, and hazelnuts, peanuts, almonds, walnuts, sunflower seeds, legumes and grains, **and less in animal foods.**



# MAGNESIUM



## In Magnesium Deficiency:

- Depression
- Asthma
- Heart diseases
- Migraine
- Hypoglycemia
- kidney diseases
- Liver diseases
- Diabetes
- Hypertension



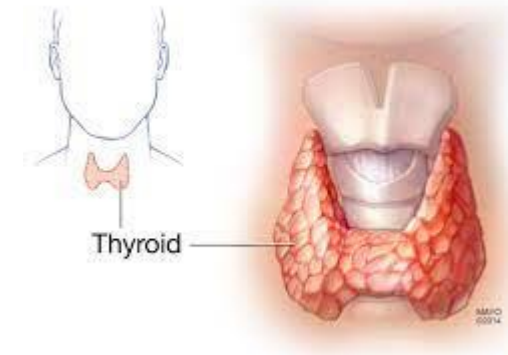
# MICRO MINERALS

- They are present in less than 0.01% of body weight.
- When all the micro mineral substances in the body are collected together, it is only about a tablespoon.
- It is sufficient to take **less than 50 milligrams per day.**
- They primarily have a regulatory function.
- Some of the micro mineral substances found in our body and in foods are **iron, zinc, copper, selenium, fluorine, iodine and manganese.**

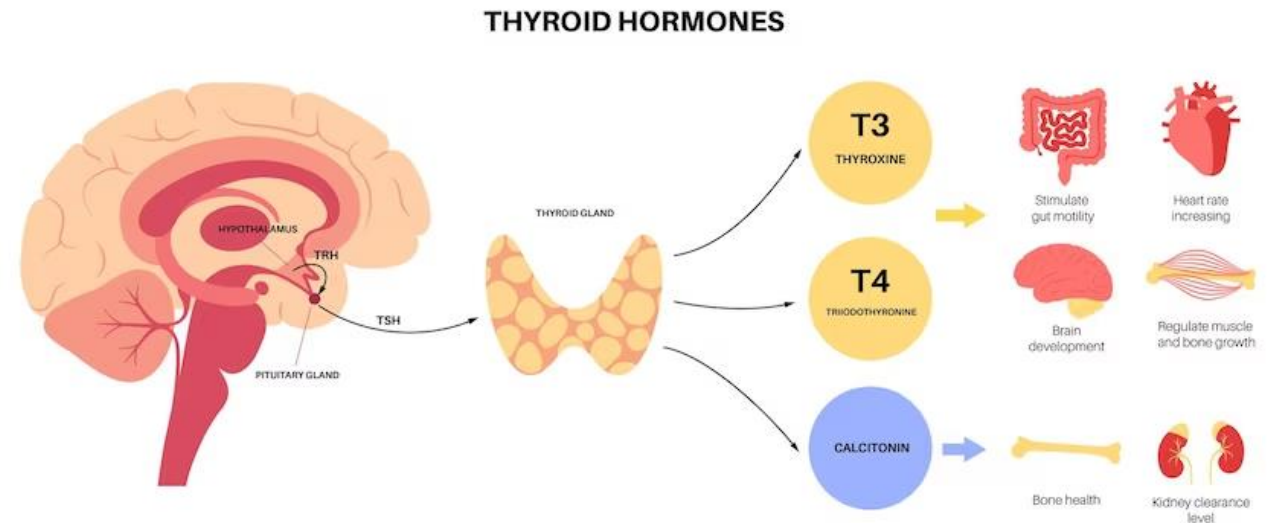


# IODINE

- It is a mineral necessary for the synthesis of thyroid gland hormones.
- In the adult body, 60% is in the thyroid gland, a significant part of the remainder is in the blood, and the rest is in various tissues such as ovaries, mammary glands and muscles.
- Most of the iodine taken into the body is absorbed in the small intestine. Approximately 98% of the iodine that passes into the blood is taken by the thyroid gland, where it combines with globulin and is stored by forming a substance called "triglobulin".
- Iodine is taken from this substance and used in the synthesis of thyroid hormones, namely trioxin and triiodotrianine.
- These hormones contain iodine and tyrosine.
- These hormones regularly mix with the blood and are carried to the cells.



- Thyroid hormones regulate many cellular activities in the body.
- These hormones increase the amount of cells according to their usage status.
- Thyroxine hormone plays a role in growth and skeletal development.
- Thyroid hormones are necessary for the regular functioning of the nervous system.
- In adults, if the thyroid gland is underactive, mental fatigue occurs; if it is overactive, overexcitation and moodiness occur.



- The most important task of T3 and T4 hormones is to regulate the calories spent in the body and ensure energy production.
- They regulate the body's temperature.
- If the thyroid gland is underactive, body temperature drops and we feel cold.
- With the slowing down of metabolism, symptoms such as slowing down of the heart, weight gain, drowsiness, slowing down of the intestinal system and constipation occur. Blood fats cannot be burned excessively, cholesterol and triglycerides increase.
- On the other hand, excessive secretion of thyroid hormones increases the burning of blood fats and blood levels decrease.
- The heart accelerates, excessive sweating, weight loss, tremors, and frequent defecation occur.
- Thyroid hormones must be sufficient for healthy growth in children. In case of low secretion, growth retardation, short stature, and mental retardation may develop in children.



- ❑ Daily iodine need; is between 50-75 micrograms.
- ❑ Iodine is found in drinking water, its amount varies depending on environmental characteristics.
- ❑ Seafood and iodized salt are the main foods it is found in.

### In iodine deficiency:

- -Irregular functioning of the thyroid glands
- -Lack of energy and weight
- -Goiter



- ❑ It is one of the important minerals in the human body.
- ❑ Human body contain 1-2 grams.
- ❑ Most of it is located in the liver, kidney, pancreas, bone and epithelial tissues.
- ❑ 75% of the zinc in the blood is found in the structure of red blood cells.
- ❑ In addition, zinc is found in the structure of enzymes such as carboxy peptidase, carbonic anhydrase, etc. Among these, the carbonic anhydrase enzyme takes part in many reactions related to the removal of CO<sub>2</sub> resulting from oxidation in cells.
- ❑ Zinc plays an important role in protein and nucleic acid metabolism, cell division, wound healing, normal growth and gender development.





## Sources:

- ✓ Zinc is mostly found in foods such as liver, meat, mussels, seafood, milk and its derivatives, and eggs.
- ✓ It is also found in foods such as wheat, barley, oats, corn, almonds and walnuts.



## Requirement:

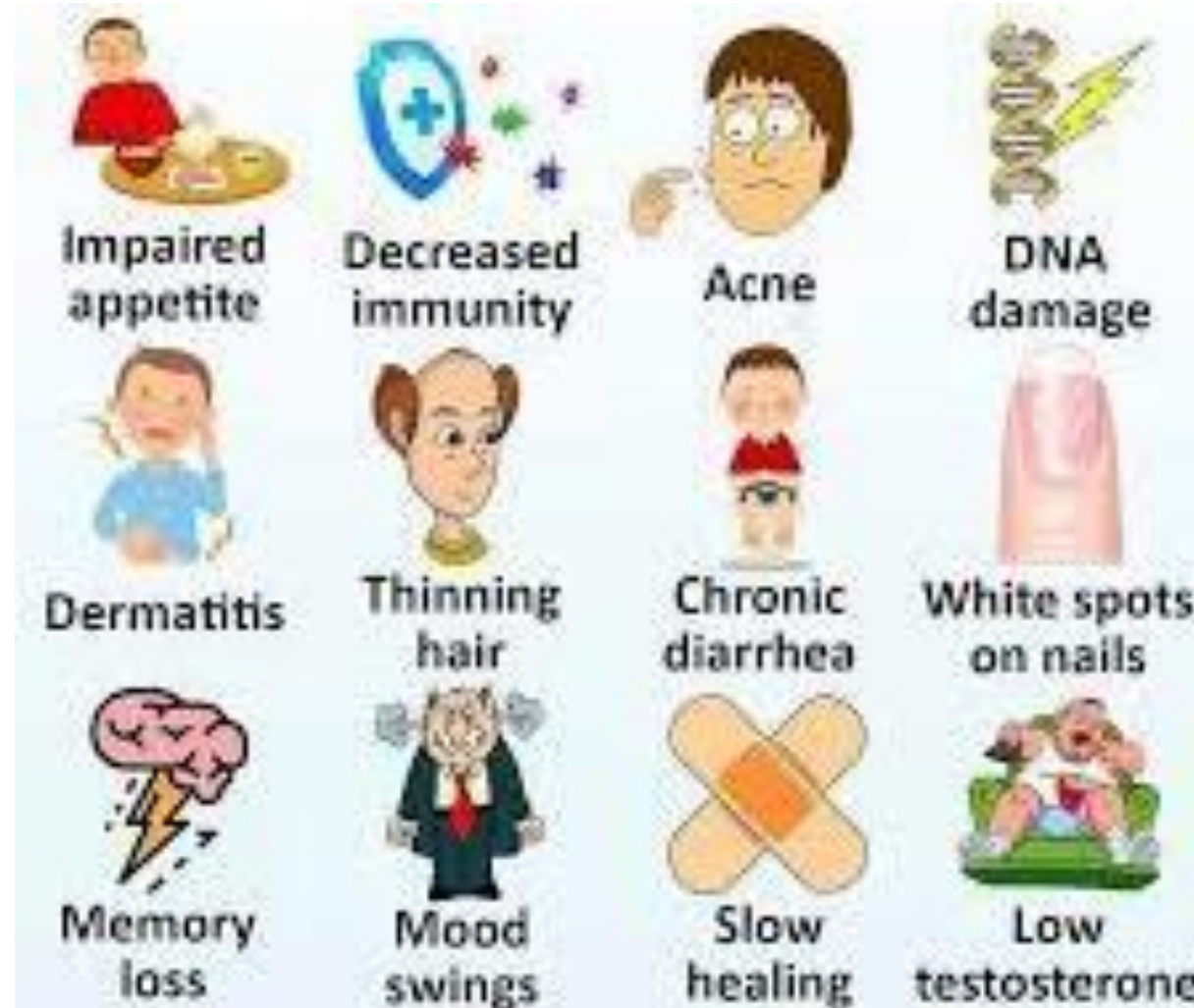
- The daily requirement for adults is 10-12 mg.



## Deficiency

- -Anorexia,
- -Growth retardation (dwarfism),
- -Swelling in the joints,
- -Enlargement is seen in the liver and spleen

# ZINC DEFICIENCY SYMPTOMS



# IRON

Although iron is widely available, it is the mineral substance most deficient in the organism.

There is a total of **4-5 g of iron** in the body of an adult person. A **significant part of this is in hemoglobin and iron stores**. In summary, 2/3 of the iron is in the blood.

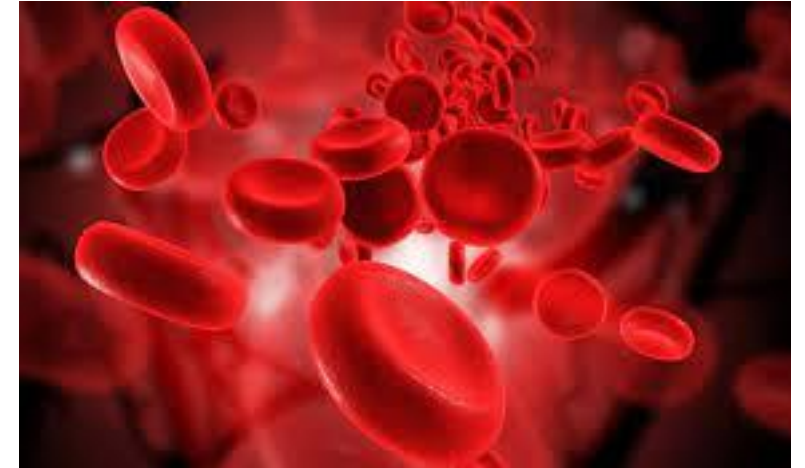
- Most of the iron in the blood is in the structure of **hemoglobin**, which gives red blood cells their color. The other part is stored in the liver, spleen and bone marrow.
- Iron also serves as a **cofactor** in the reactions of many enzymes in energy metabolism. It is an important mineral substance in providing energy from carbohydrates, fat and protein.



# IRON DEFICIENCY

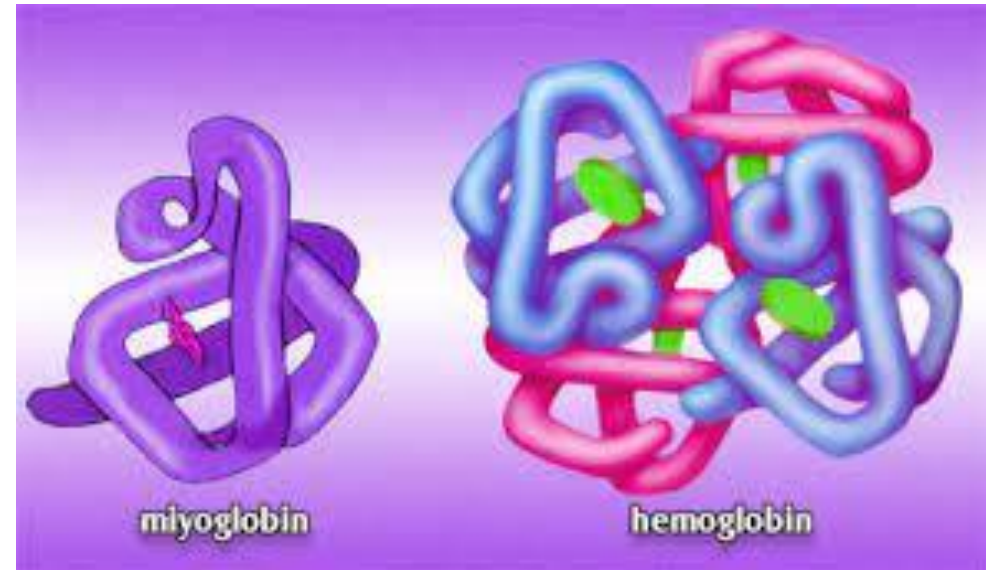
Iron deficiency usually occurs in situations such as malnutrition and blood loss.

- ❑ Once iron enters the body, the body does not want to lose it. Body benefits from it again in different ways.
- ❑ The body loses very little iron through urine and other ways.
- ❑ The iron released as a result of the death of blood cells is re-evaluated.
- ❑ Depending on the body's needs, the absorption rate of iron from the intestine (bioavailability) may vary.
- ❑ Our body can store excess iron through proteins called **ferritin and hemosiderin**.
- ❑ **Anemia** occurs in iron deficiency. In this case, the number of red blood cells in the blood decreases and the amount of hemoglobin decreases.



## THE WAY IRON IS PRESENT IN FOOD

- Iron is found only in meat and blood as **heme iron (hemoglobin)** and **iron bound to myoglobin**. Their bioavailability varies between approximately **20-30%**.
- Non-heme iron is found in plants and fruits, especially legumes, grains, and fiber-rich green foods.
- At the same time, **40-60%** of the iron in meat is in the form of non-heme iron. The bioavailability of non-heme iron is approximately **5-10%**.
- Various factors in foods can increase or decrease the bioavailability of non-heme iron.



**The daily iron requirement of 15 mg can be met with diets based on animal foods.**

## Sources:

The best iron source foods are, in order of importance:

- ❖ Meat
- ❖ Liver
- ❖ Kidney
- ❖ Egg
- ❖ Grape
- ❖ Molasses
- ❖ Dry beans
- ❖ Dried fruits
- ❖ Green leafy vegetables.



• Milk and its products are poor in iron



# IRON TOXICITY

- Iron has a strong oxidant effect and **excessive iron intake should be avoided as excess iron can cause damage to cells.**
- As it is known, iron is difficult to expel. These are recycled and stored, but only a small portion is excreted from the body.
- Toxicity occurs due to excessive oral iron intake. Symptoms of this are **nausea, vomiting and cramp-like abdominal pain.**





## FACTORS THAT REDUCE IRON ABSORPTION

- Alkaline environment -Antacids (binds Fe)
- Phytates - oxalates (combine with iron to form insoluble compounds that do not dissolve in water)
- • Tannins (tea, coffee, cocoa)
- Polyphenols
- malabsorption
- Excessive dietary fiber intake
- Diets poor in protein
- Excessive presence of aluminum, calcium, phosphorus, magnesium and zinc in the environment

## Factors That Increase IRON ABSORPTION

- Ascorbic acid