

Zinc

BCH 282 (Lec 9)

Distribution:

20% of total body zinc is present in the skin and the remaining amount is present in the pancreas, bones, teeth, prostate and choroids of the eye.

Absorption:

- Zinc absorption is increased by low pH, vitamin D, high protein diet, pregnancy and male sex hormones.
- The absorption of zinc is decreased by presence of phytic acid in the diet, excess dietary copper and calcium.

Excretion:

Zinc is important for:

1. Normal growth, reproduction and wound healing.
2. Storage and release of insulin.
3. Zinc is required as cofactor for more than 100 enzymes e.g. alkaline phosphatase.
4. Interact with platelets in blood clotting.
5. Effect thyroid hormone function.
6. Assists in immune function.
7. Is needed to produce the active form of vit. A.

Zinc deficiency:

Zinc deficiency in human was first reported in 1960. From studies of growing children and male adolescents in Egypt, Iran and Turkey. Their diets were low in Zn^{2+} and high in fiber and phytates (which impair Zn^{2+} absorption).

The main marks of Zinc deficiency are:

1. Severe growth retardation.
2. Arrested sexual maturation and hypogonadism).
3. Impaired wound healing.

Since that time Zn^{2+} deficiency has been recognized elsewhere is know to affect other than the growth, the immune function, causes loss of appetite and during pregnancy may lead to development disorder.

Zinc Toxicity:

- A high Zinc²⁺ intake is known to produce copper-deficiency anaemia by inducing the intestinal cells to synthesize large of a protein that captures copper in nonabsorbable form.
- High level consumption of Z²⁺ can cause vomiting, diarrhea, fever, exhaustion and other symptoms.
- Large dose can ever be fatal.

Zinc recommendations:

- ✓ For men is 15 mg/day
- ✓ For women is 12 mg/day

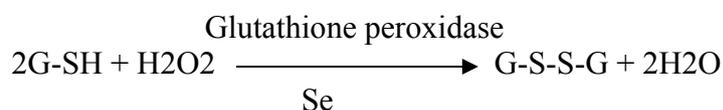
Zinc sources:

- Z²⁺ is most abundant in foods high in protein e.g. shell fish, meat, liver.
- Milk, whole-grain products are good sources of Zinc if eaten in large amounts.
- Zn²⁺ supplementations are not recommended except in Zn²⁺ deficiency diagnosis because normally it should be possible to obtain enough Zn²⁺ I from diet.
- Selenium (Se).

Selenium has the following important functions:

1. Se is part of an antioxidant enzyme called glutathione peroxidase.

This enzyme prevent free radical formation.



Therefore, this enzyme protects cell membrane against the toxic effect of hydrogen peroxide (H₂O₂)

2. Se also play a role in converting thyroid hormone to its active form.
3. Important for normal growth and fertility.
4. Quinone biosynthesis (component of the respiratory chain) and formation of ATP.
 - There is also relation between selenium and vitamin E as both are considered to be antioxidants.

Selenium and Cancer:

Some research suggest that Se supplements may reduce the incidence of some types of cancers.

Selenium deficiency:

- Se deficiency is associated with heart disease in children and young women living in China, where the soil and foods lack selenium.
- The heart disease is named Keshan disease for one of provinces of China where it was studied.

Se Toxicity:

High doses of Se are toxic. Se toxicity causes vomiting, diarrhea, loss of hair and nails and lesions of the skin and nervous system.

Se recommendation and source:

- If you eat a normal diet composed mostly of unprocessed foods not worry about meeting Se and recommendation (RDA 55 $\mu\text{g}/\text{day}$).
- Selenium is distributed in foods such as meats, shell fish and in vegetables and grain grown on Se-rich soil.

IODINE

- Iodine occurs in the body in minute amounts. Iodine is an integral part of the thyroid hormones, which regulates the body temperature, metabolic rate, reproduction, growth, making of blood cells.

Iodine deficiency:

- When the I^- conc. in the blood is low, the cells of the thyroid gland enlarge in attempt to trap as many particles as I^- as possible.
- If the gland enlarge until it is visible, the swelling is called simple goiter.

Toxic Goiter:

- I^- deficiency may have serious effects on fetal development.
- Severe thyroid under-secretion during pregnancy causes extreme and irreversible mental and physical retardation known as Cretinism. This can be prevented if the pregnant women's deficiency is detected and treated in time.

I^- Toxicity:

- Excessive intakes of iodine can enlarge the thyroid gland just as deficiency can.
- In infants, the goiter like condition can be so severe as to block the airways and cause suffocation.

I^- Intake:

- The need for I^- is easy to meet by consuming sea food, vegetables grown in iodine-rich soil and ionized salt.
- In general, RDA for iodine is 150 $\mu\text{g}/\text{day}$.

- Sea foods are important iodine source.
- The amount of I⁻ in diet is variable and reflects the amount present in the soil in which plants are grown, and on which animals grass.