

BIOCHEMICAL ROLE OF ELEMENT ZINC (ZN) IN HUMAN ORGANISM

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Annotation: This article highlights the quantity of zinc in organs and tissues, its biological effects, its role in protein synthesis, its impact on sex hormones, and the mechanisms of its action in certain diseases.

Key words: Antioxidant, somatotropin, gonadotropin, corticotropin, diabetes mellitus, collagen fibers.

Introduction.

Zinc (Zn) is a metal that is part of many enzymes, and its role cannot be replaced by other metals. Zinc participates in numerous metabolic processes, ensuring the normal functioning of all cells in the body.

The zinc element is involved in crucial biological processes in the body, such as protein, DNA, and RNA synthesis, cell division, growth, and regeneration. This property of zinc is particularly important in the healing of trophic and other wounds, as well as in epithelialization.

The amount of zinc in organs and tissues indicates their functional significance. Organs rich in zinc include the pituitary gland, retina, prostate gland (over 150 mg), liver, kidneys, muscles, hair, and bones (over 100 mg). Among the metals in the brain, zinc and iron constitute the largest portion, with a zinc/iron index of 1, while this ratio is much lower in other organs. The synthesis and breakdown of carbohydrates, fats, proteins, and nucleic acids are directly dependent on the body's zinc supply. Approximately 20% of the body's zinc reserves are located in bone tissue. The rate of zinc incorporation into bone tissue is higher than that of calcium, and it is retained longer in bone tissue compared to muscle tissue. It has been found that zinc enhances the absorption and metabolism of calcium and phosphorus, as well as the synthesis of collagen fibers. This increases skin elasticity and ensures the formation of bone surfaces. Therefore, zinc deficiency can lead to the development of osteoporosis.

Materials.

Biological Effects of Zinc:

- Acts as an antioxidant;
- Participates in protein, DNA, and RNA synthesis;
- Facilitates cell division, growth, and regeneration;
- Promotes normal growth of skin, nails, and hair;
- Accelerates wound healing and epithelialization;
- Contributes to body and skeletal weight gain;
- Involved in the synthesis of growth hormone, gonadotropin, and corticotropin;
- Enhances calcium and phosphorus metabolism and absorption;
- Promotes the formation of collagen fibers, ensuring skin elasticity;

- Aids in the formation of joint surfaces;
- Prevents macular degeneration and cataracts;
- Boosts immunity;
- Exhibits anticancer (anticarcinogenic) effects;
- Participates in insulin synthesis and regulates fat-carbohydrate metabolism;
- Enhances normal brain function and memory;
- Regulates appetite and taste perception;
- Participates in blood production and prevents anemia;
- Facilitates the production of testosterone and sperm in males;
- Assists in the elimination of alcohol from the body;
- Zinc is a potent natural antioxidant.

Research and methods.

Zinc is a component of the enzyme superoxide dismutase, a powerful natural antioxidant. This enzyme neutralizes the highly harmful superoxide free radicals that are constantly produced in the body.

When used together with ascorbic acid, the antioxidant effect of zinc is further enhanced. The antioxidant properties of zinc and ascorbic acid are utilized in preventing the development of cataracts and macular degeneration. Zinc accumulates in the retina and aids in the absorption of vitamin A. The activity of retinol-binding protein in the retina is also directly dependent on zinc.

The Role of Zinc in Protein Synthesis:

Zinc is involved in crucial biological processes in the body, such as protein, DNA, and RNA synthesis, cell division, growth, and regeneration. This property of zinc is particularly important in the healing of trophic and other wounds, as well as in epithelialization. Additionally, zinc enhances collagen and protein synthesis in regenerating tissues, exerting a positive effect in atherosclerosis and ischemic heart disease. Zinc is a component of insulin, influencing its production efficiency. In patients with diabetes mellitus, zinc levels in the blood are reduced, and its excretion through urine is increased. Therefore, zinc deficiency is commonly observed in diabetes mellitus.

Impact on Hormones:

The synthesis intensity of somatotropin, gonadotropin, and corticotropin hormones produced by the pituitary gland, as well as the overall hormonal status of the body, is directly related to zinc levels. Zinc deficiency during pregnancy can lead to hydrocephalus, spinal curvature, various deformities, and cleft palate in the fetus. Rapidly growing children often experience zinc deficiency.

Results.

Below is information on the mechanisms of zinc's action in certain diseases:

1. Colds and Flu: Ascorbic acid and zinc are essential components for boosting immunity. Zinc is necessary for the production of interferon (a substance in the body that fights viruses) and antibodies (substances that combat microbes). Zinc is a natural immunomodulator (strengthens the immune system). It enhances the activity of macrophages, which are responsible for local immunity. This helps children recover faster and prevents the recurrence of illness. Zinc is essential for all components of the immune system, which is why it is also used in HIV/AIDS.
2. Diarrhea: According to the World Health Organization, administering 10 mg of zinc supplements for 14 days during diarrhea accelerates recovery and prevents recurrence. Zinc directly kills microbes and accelerates the repair of microvilli (villi) in the intestinal wall.
3. Liver Diseases (Hepatitis and Cirrhosis): Zinc is a component of liver enzymes, which require zinc for normal function. This improves the liver's detoxification activity. Additionally, by boosting immunity, zinc helps fight viruses.

4. Appetite Stimulation: Ascorbic acid and zinc increase appetite and improve gastrointestinal function. Zinc enhances the activity of taste receptors on the tongue and olfactory receptors in the nose.

5. Various Bleeding (Uterine, Nasal, Pulmonary): Ascorbic acid strengthens blood vessel walls and enhances blood clotting.

Discussion.

Prostate Diseases (Prostatitis and Prostate Adenoma): Zinc reduces the activity of the 5-alpha reductase enzyme in the body. This enzyme converts testosterone into its dangerous form (dihydrotestosterone), which promotes the development of prostate adenoma. Thus, zinc influences the pathogenesis of adenoma and is used in its prevention and treatment. Zinc also enhances the activity of macrophages, aiding in the prevention and treatment of prostatitis.

Infertility: Zinc is a precursor to sex hormones and male sperm (spermatozoa). Zinc deficiency delays puberty, reduces male sexual potency (impotence), and leads to infertility.

Diabetes Mellitus: Zinc plays a crucial role in the synthesis, storage, and release of insulin in the pancreatic beta cells. In diabetes mellitus, zinc excretion through urine is 2-3 times higher than normal. Therefore, patients should regularly take zinc supplements. Zinc also prevents cataracts in the eye lens.

Pathologies in Sexual Development (PMS, Cryptorchidism, Hypogonadism, Testicular Hypotrophy): Zinc regulates the activity of male and female hormones.

Obstetrics and Gynecology: Zinc regulates female sex hormones, normalizing menstruation and follicle maturation.

Conclusion: In summary, zinc plays an active role in the functioning of the immune system, cellular metabolism and growth, brain activity, and wound healing. Zinc is crucial for intercellular biochemical processes. For example, insulin hormone contains zinc, and without zinc, vitamin A cannot be absorbed, and bones cannot strengthen. Zinc has antiviral and antitoxic properties. It is essential for taste and smell perception and fetal development.

References:

1. I.Asqarov, M,Ashuraliev. Kimyoviy elementlar inson organizmida.T."Tafakkur" 2020.
2. Nizomiddinovich T. F. et al. DORI MODDALARNING JIGAR VA BUYRAK FAOLIYATIGA SALBIY TA'SIRI //ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ. – 2024. – Т. 55. – №. 3. – С. 102-106.
3. Байкулов А. К., Муртазаева Н. К., Тошбоев Ф. Н. ДИНАМИКА ВЛИЯНИЯ ЛАКТАТДЕГИДРОГЕНАЗЫ ПРИ ЭКСПЕРИМЕНТАЛЬНОМ ИНФАРКТЕ МИОКАРДА //World of Scientific news in Science. – 2024. – Т. 2. – №. 3. – С. 244-251.
4. Yusupova S. S., Kholmurodova D. K., Kiyamova D. S. Vexibia Alopecroides-How to New Source for the Synthesis of Physiologically Active Substances Used in Medicine //Global Scientific Review. – 2023. – Т. 20. – С. 25-30.
5. Toshboyev F. N. et al. SELECTIVITY OF YKS CATALYZATION IN THE SYNTHESIS OF VINYL ACETATE FROM ETHYLENE AND ACETIC ACID //World of Scientific news in Science. – 2023. – Т. 1. – №. 2. – С. 31-35.
6. Sh, Keldiyorova. "OKSIDATIV STRESS VA UNING ORGANIZMGA TA'SIRI." ZAMONAVIY TA'LIMDA FAN VA INNOVATSION TADQIQOTLAR JURNALI 2.18 (2024): 68-74.