

Zinc for human health

Assistant Professor Dr. heba fadhil hassan

- Zinc is a trace mineral, meaning that the body only needs small amounts, and yet it is necessary for almost 100 enzymes to carry out vital chemical reactions. It is a major player in the creation of DNA, growth of cells, building proteins, healing damaged tissue, and supporting a healthy immune system

•What is zinc?

- Zinc is considered an essential nutrient, meaning that your body can't produce or store it. For this reason, you must get a constant supply through your diet. Zinc is required for numerous processes in your body, including
 - ❖ gene expression
 - ❖ enzymatic reactions
 - ❖ immune function
 - ❖ protein synthesis
 - ❖ DNA synthesis
 - ❖ wound healing
 - ❖ growth and development

- Foods that don't naturally contain this mineral, such as breakfast cereals and snack bars, are often fortified with synthetic forms of zinc.
- You can also take zinc supplements or multi-nutrient supplements that provide zinc.
- Because of its role in immune function, zinc is likewise added to some lozenges and other natural cold treatments

- **Food sources**

- Many animal and plant foods are naturally rich in zinc, making it easy for most people to consume adequate amounts.
- Foods highest in zinc include
 - **Shellfish:** oysters, crab, mussels, lobster, and clams
 - **Meat:** beef, pork, lamb, and [bison](#)
 - **Poultry:** turkey and chicken
 - **Fish:** flounder, sardines, salmon, and sole
 - **Legumes:** chickpeas, lentils, black beans, kidney beans, etc.
 - **Nuts and seeds:** [pumpkin seeds](#), cashews, hemp seeds, etc.
 - **Dairy products:** milk, yogurt, and cheese
 - **Eggs**
 - **Whole grains:** oats, quinoa, brown rice, etc.
 - **Certain vegetables:** mushrooms, [kale](#), peas, asparagus, and beet greens

Health Benefits of Zinc

Regulates body

Cure diarrhea

Improves memory

Muscle mass

Aids in pregnancy

Prevents osteoporosis

Deals with acne

Prevents inflammatory skin

Deals with prostate problems

Proper growth



• **Role in your body**

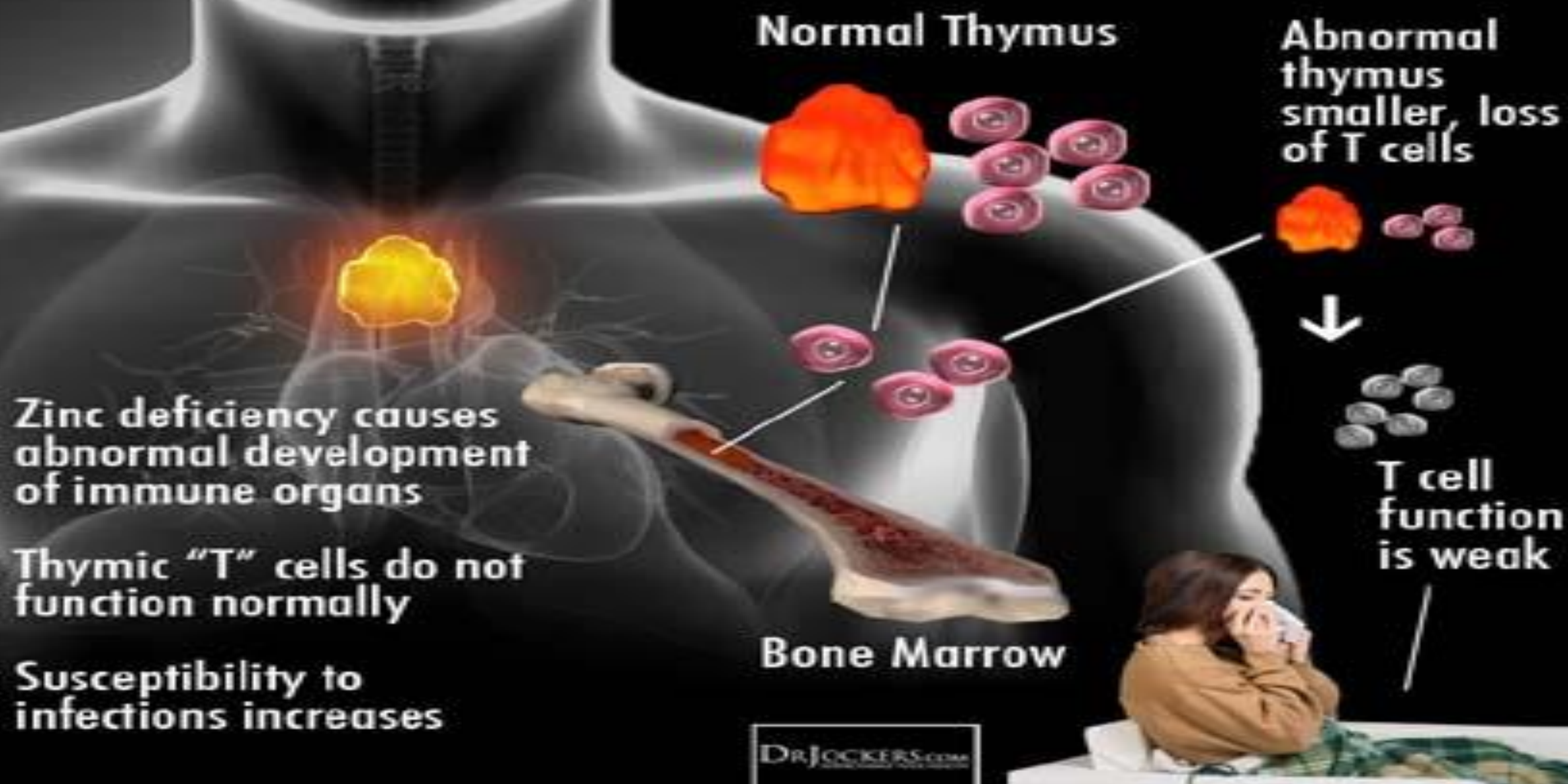
- Zinc is a vital mineral that your body uses in countless ways.
- Zinc is necessary for the activity of over 300 enzymes that aid in metabolism, digestion, nerve function, and many other processes. In addition, it's critical for the development and function of immune cells.
- This mineral is also fundamental to skin health, DNA synthesis, and protein production.
- What's more, body growth and development relies on zinc because of its role in cell growth and division .
- Zinc is also needed for your senses of taste and smell. Because one of the enzymes crucial for proper taste and smell is dependent on this nutrient, a zinc deficiency can reduce your ability to taste or smell .

• **Boosts your immune system**

Zinc helps keep your immune system strong. Because it is necessary for immune cell function and cell signaling, a deficiency can lead to a weakened immune response.

- Zinc supplements stimulate particular immune cells and reduce oxidative stress. For example, a review of seven studies demonstrated that 80–92 milligrams (mg) per day of zinc may reduce the length of the common cold by up to 33%.
- What's more, some older research suggests that zinc supplements significantly reduce the risk of infections and promote immune response in older adults

HOW ZINC DEFICIENCY AFFECTS THE IMMUNE SYSTEM



- **Accelerates wound healing**

- Zinc is commonly used in hospitals as a treatment for burns, certain ulcers, and other skin injuries. Because this mineral plays critical roles in collagen synthesis, immune function, and inflammatory response, it is necessary for proper healing.
- While a zinc deficiency can slow wound healing, supplementing with zinc can speed recovery in people with wounds.

- **May reduce the risk of certain age-related diseases**
- Zinc may significantly reduce your risk of age-related diseases, such as pneumonia, infection, and age-related macular degeneration (AMD).
- Zinc may relieve oxidative stress and improve immune response by boosting the activity of T-cells and natural killer cells, which help protect your body from infection.
- Older adults who supplement with zinc in some older studies experience improved influenza vaccination response, reduced risk of pneumonia, and boosted mental performance

- **Decreases inflammation**
- Zinc decreases oxidative stress and reduces levels of certain inflammatory proteins in your body .
- Oxidative stress leads to chronic inflammation, a contributing factor in a wide array of chronic illnesses, such as heart disease, [cancer](#), and mental decline

- **Deficiency symptoms**

- Although severe zinc deficiency is rare, it can occur in people with rare genetic mutations, breastfeeding infants whose mothers don't have enough zinc, people with alcohol addictions, and anyone taking certain immune-suppressing medications.
- Symptoms of **severe zinc deficiency** include impaired growth and development, delayed sexual maturity, skin rashes, chronic diarrhea, impaired wound healing,
- Milder forms of zinc deficiency are more common, especially in children in developing countries where diets are often lacking in important nutrients.
- It is estimated that around 2 billion people worldwide are deficient in zinc due to inadequate dietary intake .
- Since zinc deficiency impairs your immune system — increasing the chances of infection — zinc deficiency is thought to cause over 450,000 deaths in children under 5 every year

- Those at risk of [zinc deficiency](#) include people with gastrointestinal diseases like
- Crohn's disease
- vegetarians and vegans
- people who are pregnant or breastfeeding
- older infants who are exclusively breastfeed
- people with sickle cell anemia
- people with chronic kidney disease
- people with alcohol use disorder
- Symptoms of mild zinc deficiency include diarrhea, decreased immunity, thinning hair, impaired taste or smell, dry skin, fertility issues, and impaired wound healing .
- Zinc deficiency is difficult to detect using laboratory tests due to your body's tight control over zinc levels. Thus, you may still be deficient even if tests indicate normal levels.

- **Recommended dosages**

- In order to avoid overconsumption, stay away from high dose zinc supplements unless recommended by a doctor.
- The Recommended Dietary Allowance (RDA) is 11 mg for adult males and 8 mg for adult females .
- People who are pregnant and [breastfeeding](#) should consume 11 and 12 mg per day, respectively

- **Toxicity and dosage recommendations**
- Just as a deficiency in zinc can cause health complications, excessive intake can also lead to negative side effects.
- The most common cause of zinc toxicity is too much supplemental zinc, which can cause both acute and chronic symptoms.

Symptoms of toxicity include :

- nausea and vomiting
- diarrhea
- abdominal cramps and pain
- headaches

Zinc excess

Brain

- lethargy
- focal neuronal deficits

Respiratory tract

- respiratory disorder after inhalation of zinc smoke
- Metal fume fever

Gastrointestinal tract

- nausea/vomiting
- epigastric pain
- diarrhea

Prostate

- elevated risk of prostate cancer

Systemic symptoms

- Copper deficiency and sequelae
- Altered lymphocyte function

Zinc deficiency

Brain

- Decreased nerve conduction
- Neuropsychiatric disorders
- Neurosensory disorders
- Mental lethargy

Thymus

- Thymic atrophy

Skin

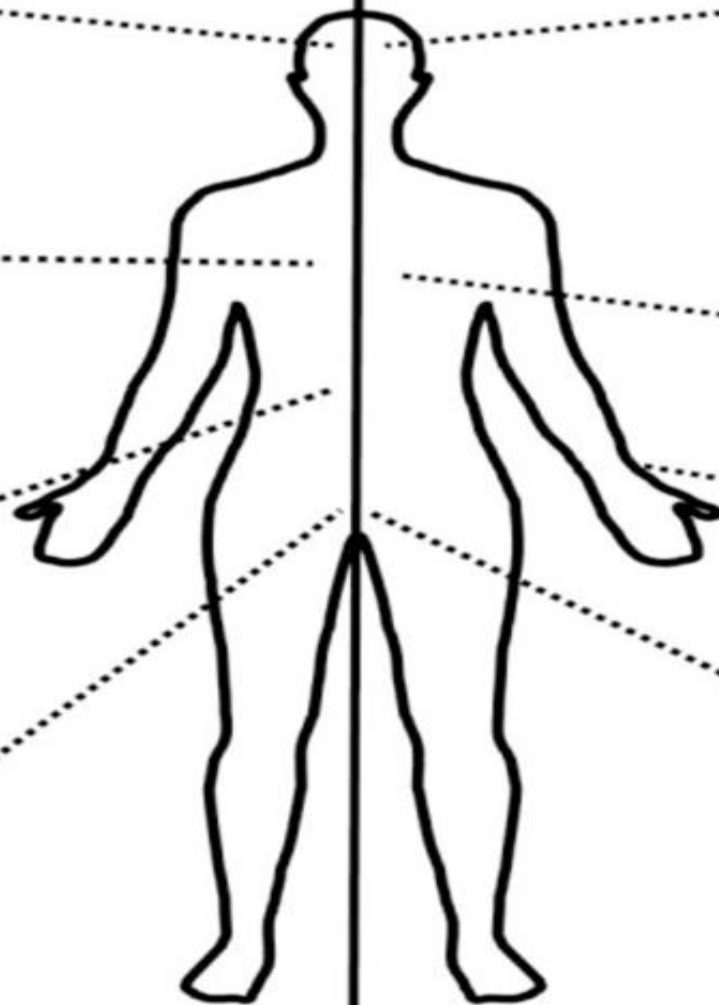
- Skin lesions
- Decreased wound healing
- Acrodermatitis

Reproductive system

- Infertility
- Retarded genital development
- Hypogonadism

Systemic symptoms

- Growth retardation
- Immune dysfunction and infection



- **Acrodermatitis enteropathica (AE)**

- is a disorder of zinc metabolism that occurs in one of three forms: an inborn (congenital) form and two acquired forms. The inborn form of AE is a rare genetic disorder characterized by intestinal abnormalities that lead to the inability to absorb zinc from the intestine. The lack of zinc presents, characteristically, as:
 - (1) skin inflammation with pimples (pustular dermatitis) occurring around the mouth and/or anus
 - (2) diarrhea
 - (3) abnormal nails (nail dystrophy).
- AE results from mutations in the zinc transporter gene ***SLC39A4*** leading to improper enteral zinc absorption.



