

Zinc

SCIENTIFIC NAME

atomic number 30, Zinc, Zn

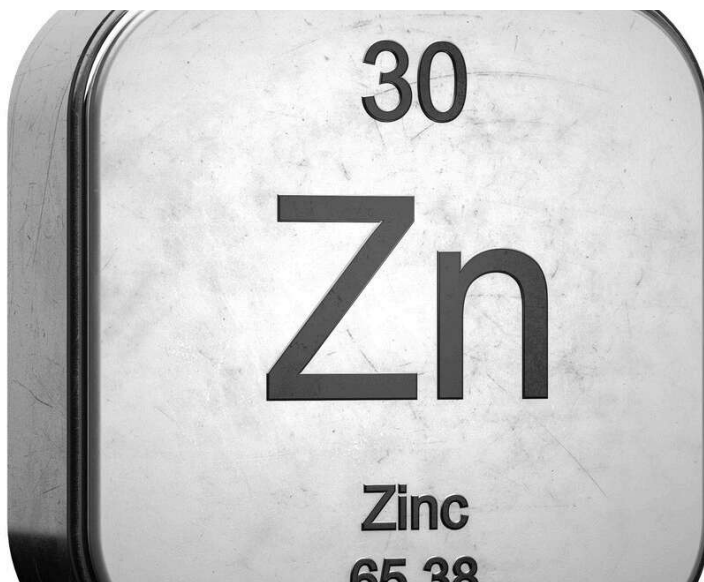
FAMILY

OTHER COMMON NAMES

Acétate de Zinc, Acexamate de Zinc, Aspartate de Zinc, Chelated Zinc, Chlorure de Zinc, Citrate de Zinc, Gluconate de Zinc, Méthionine de Zinc,

+ more

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Overview

Zinc is a mineral and an essential nutrient for plants and animals ([90200](#)). Zinc deficiency can result in short stature, hypogonadism, reduced ability to taste food, and anorexia ([90200](#)). Because the human body does not store excess zinc, an adequate supply must be regularly consumed as part of the diet. Common dietary sources of zinc include red meat, poultry, and fish. Low-income countries in which these foods are not readily available may have a higher prevalence of zinc deficiency ([90200](#)).

Warnings



Coronavirus disease 2019 (COVID-19): While there is some early research suggesting that zinc might be beneficial in patients hospitalized with COVID-19, there is no good evidence to support using zinc for patients with COVID-19 who are not admitted to the hospital. There is also no good evidence to support the use of zinc for prevention of COVID-19. Recommend healthy lifestyle choices and proven prevention methods instead.

Safety



LIKELY SAFE when used orally and appropriately. Zinc is safe in amounts that do not exceed the tolerable upper intake level (UL) of 40 mg daily ([7135](#)). ...when used topically and appropriately ([2688](#), [6538](#), [6539](#), [7135](#), [8623](#), [11051](#), [111291](#)).

POSSIBLY SAFE when used orally and appropriately in doses higher than the tolerable upper intake level (UL). Because the UL of zinc is based on regular daily intake, short-term excursions above 40 mg daily are not likely to be harmful. In fact, there is some evidence that doses of elemental zinc as high as 80 mg daily in combination with copper 2 mg can be used safely for approximately 6 years without significant adverse effects ([7303](#), [8622](#), [92212](#)). However, there is some concern that doses higher than the UL of 40 mg daily might decrease copper absorption and result in anemia ([7135](#)).

POSSIBLY UNSAFE when used intranasally. Case reports and animal research suggest that intranasal zinc might cause permanent anosmia or loss of sense of smell ([11155](#), [11156](#), [11703](#), [11704](#), [11705](#), [11706](#), [11707](#), [16800](#), [16801](#), [17083](#)). Several hundred reports of anosmia have been submitted to the US Food and Drug Administration (FDA) and the manufacturer of some intranasal zinc products (Zicam) ([16800](#), [16801](#)). Advise patients not to use intranasal zinc products.

LIKELY UNSAFE when taken orally in excessive amounts. Ingestion of 10-30 grams of zinc sulfate can be lethal in adults ([7135](#)). Chronic intake of 450-1600 mg daily can cause multiple forms of anemia, copper deficiency, and myeloneuropathies ([7135](#), [17092](#), [17093](#), [112473](#)). This has been reported with use of zinc-containing denture adhesives in amounts exceeding the labeled directions, such as several times a day for several years ([17092](#), [17093](#)). Advise patients to follow the label directions on denture adhesives that contain zinc.

CHILDREN: **LIKELY SAFE** when used orally and appropriately ([7135](#)). Zinc is safe in amounts that do not exceed the tolerable upper intake level (UL). The UL for children is based on age: 4 mg daily for 0-6 months, 5 mg daily for 7-12 months, 7 mg daily for 1-3 years, 12 mg daily for 4-8 years, 23 mg daily for 9-13 years, and 34 mg daily for 14-18 years ([7135](#), [97140](#)).

CHILDREN: **POSSIBLY UNSAFE** when used orally in high doses. Taking amounts greater than the UL can cause sideroblastic anemia and copper deficiency ([7135](#)). ...when used topically on damaged skin. An infant treated with 10% zinc oxide ointment for severe diaper rash with perianal erosions developed hyperzincemia. Absorption seemed to occur mainly via the erosions; plasma levels dropped after the erosions healed despite continued use of the ointment ([106905](#)).

PREGNANCY: **LIKELY SAFE** when used orally and appropriately. Zinc is safe in amounts that do not exceed the tolerable upper intake level (UL) of 34 mg daily during pregnancy in those 14-18 years of age and 40 mg daily in those 19-50 years of age ([7135](#)).

PREGNANCY: **LIKELY UNSAFE** when used orally in doses exceeding the UL ([7135](#)).

LACTATION: **LIKELY SAFE** when used orally and appropriately. Zinc is safe in amounts that do not exceed the tolerable upper intake level (UL) of 34 mg daily during lactation in those 14-18 years of age, and 40 mg daily for those 19-50 years of age ([7135](#)).

LACTATION: **POSSIBLY UNSAFE** when used orally in doses exceeding the UL. Higher doses can cause zinc-induced copper deficiency in nursing infants ([7135](#)).

Adverse Effects

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General

Orally, zinc is well tolerated in doses below the tolerable upper intake level (UL), which is 40 mg daily for adults. Topically, zinc is well tolerated.

Most Common Adverse Effects

Orally: Abdominal cramps, diarrhea, metallic taste, nausea and vomiting (dose-related).

Topically: Burning, discoloration, itching, stinging, and tingling when applied to irritated tissue.

Intranasally: Bad taste, dry mouth, headache, irritation, reduced sense of smell.

Serious Adverse Effects (Rare)

Orally: There have been cases of acute renal tubular necrosis, interstitial nephritis, neurological complications, severe vomiting, and sideroblastic anemia after zinc overdose.

Intranasally: There have been cases where intranasal zinc caused permanent loss of smell (anosmia).

Dermatologic

+ more

Gastrointestinal

+ more

Hematologic

+ more

Hepatic

+ more

Immunologic

+ more

Musculoskeletal

+ more

Neurologic/CNS

+ more

Oncologic

+ more

Pulmonary/Respiratory

+ more

Renal

+ more

Other

+ more

Effectiveness

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EFFECTIVE

Zinc deficiency. Orally or intravenously, zinc is effective for treating and preventing zinc deficiency.

+ more

LIKELY EFFECTIVE

Diarrhea. Oral zinc reduces duration and severity of acute diarrhea in malnourished children. Doses of 5-20 mg seem to be effective, while 5-10 mg daily is less likely to cause vomiting.

+ more

Wilson disease. Taking zinc orally improves symptoms of this condition.

+ more

POSSIBLY EFFECTIVE

Acne. Orally, zinc might help to reduce symptoms of acne. However, it's unclear how oral zinc compares to conventional acne treatments. Topical zinc doesn't seem to be beneficial if used alone.

+ more

Acrodermatitis enteropathica. Oral zinc seems to improve symptoms of this rare genetic disorder.

+ more

Age-related macular degeneration (AMD). Oral zinc, especially in combination with antioxidant vitamins, seems to slow the progression of AMD.

+ more

Child growth. Oral zinc seems to increase growth when taken by children and improve infant growth in the first year of life when taken by pregnant adults.

+ more

Common cold. Oral zinc seems to help treat cold symptoms in adults. However, it is unclear if zinc is beneficial for common cold prevention.

+ more

Coronavirus disease 2019 (COVID-19). While oral zinc does not seem to speed recovery from COVID-19 in non-hospitalized patients, an analysis of a small number of studies suggests that oral or intravenous zinc might reduce the risk of death in hospitalized patients with COVID-19.

+ more

Depression. Oral zinc seems to be beneficial when used in combination with antidepressant treatments.

+ more

Diabetes. Oral zinc might modestly improve glycemic control in some patients.

+ more

Diaper rash. Topical and oral zinc seem to reduce the incidence and severity of diaper rash in infants.

+ more

Gingivitis. Topical zinc seems to reduce the development of gingivitis.

+ more

Halitosis. Oral zinc seems to reduce halitosis when taken as a gum, mouth rinse, or candy.

+ more

Herpes labialis (cold sores). Topical zinc seems to reduce the severity and duration of cold sores.

+ more

Hypogeusia. Oral zinc might improve taste disturbance and taste acuity in people with hypogeusia of various etiologies.

+ more

Leishmania lesions. Oral zinc and intralesional injections of zinc might improve healing of these lesions.

+ more

Leprosy. Oral zinc seems to be beneficial when used in combination with anti-leprosy drugs.

+ more

Low birth weight. Oral zinc supplementation seems to improve growth in low birth weight infants. Whether oral zinc can improve other outcomes, including mortality, is unclear. Taking oral zinc during pregnancy does not seem to reduce the risk of having a low birth weight infant.

+ more

Peptic ulcers. Oral zinc seems to treat and prevent peptic ulcers.

+ more

Pneumonia. Oral zinc might reduce the risk for pneumonia in children, but it doesn't seem to improve symptoms in children that already have pneumonia.

+ more

Prematurity. Analyses of clinical studies suggest that oral zinc improves growth in premature infants. Whether zinc improves development or reduces the risk of

mortality in these patients is unclear.

+ more

Pressure ulcers. Topical zinc paste seems to work as a skin barrier and improve pressure ulcer healing. Oral zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear.

+ more

Sickle cell disease. Oral zinc seems to improve symptoms of sickle cell disease in patients with zinc deficiency.

+ more

Warts. Oral and topical zinc seem to improve the cure rate of cutaneous warts.

+ more

POSSIBLY INEFFECTIVE

Alopecia areata. Oral zinc does not seem to improve symptoms of this condition.

+ more

Cystic fibrosis. Oral zinc does not improve cystic fibrosis symptoms or progression.

+ more

HIV/AIDS. Oral zinc does not seem to improve outcomes in patients with HIV.

+ more

HIV/AIDS-related pregnancy complications. Oral zinc does not prevent pregnancy complications related to HIV infection.

+ more

HIV/AIDS-related wasting. Oral zinc does not seem to improve HIV-related wasting syndrome.

+ more

Infant development. Oral zinc does not seem to improve infant mental and psychomotor development.

+ more

Inflammatory bowel disease (IBD). Oral zinc does not improve symptoms of IBD.

+ more

Influenza. Oral zinc does not seem to reduce the risk for influenza.

+ more

Otitis media. Oral zinc does not prevent otitis media in children.

+ more

Pre-eclampsia. Oral zinc taken prenatally does not seem to be beneficial for pre-eclampsia prevention.

+ more

Prostate cancer. Oral zinc does not reduce the risk for prostate cancer or prostate cancer-related mortality.

+ more

Psoriasis. Oral zinc does not reduce the severity of psoriasis symptoms.

+ more

Rheumatoid arthritis (RA). Oral zinc does not treat symptoms of RA.

+ more

Sexual dysfunction. Oral zinc does not improve sexual function in males with chronic kidney disease (CKD).

+ more

Tinnitus. Oral zinc does not improve severity of tinnitus or reduce tinnitus-related disability.

+ more

LIKELY INEFFECTIVE

Malaria. Oral zinc does not prevent or treat malaria in undernourished children or pregnant adults in developing countries.

+ more

INSUFFICIENT RELIABLE EVIDENCE TO RATE

Age-related cognitive decline. It is unclear if oral zinc is beneficial in patients with age-related cognitive decline.

+ more

Alcohol-related liver disease. It is unclear if oral zinc is beneficial in patients with alcoholic-related liver cirrhosis.

+ more

Anorexia nervosa. Oral zinc seems to improve weight gain in people with anorexia nervosa.

+ more

Arsenic poisoning. Oral zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear.

+ more

Asthenopia (eye strain). Oral zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear.

+ more

Athletic performance. Oral zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear.

+ more

Atopic dermatitis (eczema). It is unclear if oral zinc is beneficial for alleviating eczema in children.

+ more

Attention deficit-hyperactivity disorder (ADHD). Oral zinc might improve certain symptoms in children with ADHD.

+ more

Autism spectrum disorder. It is unclear if oral zinc is beneficial in children with autism spectrum disorder.

+ more

Autoimmune thyroiditis. It is unclear if oral zinc is beneficial in children with autoimmune thyroiditis.

+ more

Behcet disease. It is unclear if oral zinc is beneficial in patients with Behcet disease.

+ more

Benign prostatic hyperplasia (BPH). Although there is interest in using oral zinc for BPH, there is insufficient reliable information about the clinical effects of zinc for this condition.

Beta-thalassemia. It is unclear if oral zinc is beneficial in patients with beta-thalassemia major.

+ more

Brain tumor. It is unclear if dietary zinc is beneficial for reducing the risk for brain cancer.

+ more

Breast cancer. It is unclear if increased dietary zinc intake is beneficial for reducing the risk for breast cancer.

+ more

Bronchiolitis. It is unclear if oral zinc is beneficial for viral bronchiolitis in infants and children.

+ more

Burning mouth syndrome. Topical zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear.

+ more

Burns. Intravenous zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear. The effects of oral zinc for burn healing are unclear.

+ more

Canker sores. It is unclear if oral zinc is beneficial in patients with canker sores.

+ more

Cataracts. Oral zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear.

+ more

Chemotherapy-induced acral erythema. It is unclear if oral zinc reduces the severity of acral erythema induced in patients treated with the vascular endothelial growth factor receptor-tyrosine kinase inhibitors (VEGFR-TKIs) treatment regorafenib.

+ more

Chemotherapy-related fatigue. It is unclear if oral zinc improves symptoms in patients with fatigue due to chemotherapy.

+ more

Chronic fatigue syndrome (CFS). Oral zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear.

+ more

Cirrhosis. It is unclear if zinc is beneficial for reducing cirrhosis-related mortality.

+ more

Cognitive function. It is unclear if zinc is beneficial for cognitive function.

+ more

Colorectal adenoma. Oral zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear.

+ more

Colorectal cancer. It is unclear if oral zinc is beneficial for reducing colorectal cancer risk.

+ more

Congenital heart disease. It is unclear if oral zinc is beneficial for reducing the risk of congenital heart defects.

+ more

Critical illness (trauma). It is unclear if oral zinc is beneficial for critically ill patients.

+ more

Dementia. Although there is interest in using oral zinc for dementia, there is insufficient reliable information about the clinical effects of zinc for this condition.

Diabetic foot ulcers. Although there is interest in using oral zinc for diabetic foot ulcers, there is insufficient reliable information about the clinical effects of zinc for this condition.

Diabetic neuropathy. It is unclear if oral zinc is beneficial in patients with diabetic neuropathy.

+ more

Down syndrome. It is unclear if oral zinc is beneficial for improving immune function in people with this condition.

+ more

Dysmenorrhea. Oral zinc might reduce pain in some patients with primary dysmenorrhea.

+ more

Epilepsy. There is limited evidence on the oral use of zinc in children with intractable seizures.

+ more

Erectile dysfunction (ED). It is unclear if oral zinc is beneficial in patients with erectile dysfunction.

+ more

Esophageal cancer. It is unclear if oral zinc is beneficial for esophageal cancer prevention.

+ more

Fatigue. It is unclear if oral zinc is beneficial for reducing fatigue in older individuals.

+ more

Gastric cancer. It is unclear if dietary zinc is beneficial for gastric cancer prevention.

+ more

Head and neck cancer. It is unclear if oral zinc improves survival in patients with head and neck cancers.

+ more

Hepatic encephalopathy. It is unclear if oral zinc is beneficial for reducing the severity of hepatic encephalopathy or preventing recurrence.

+ more

HIV/AIDS-related diarrhea. It is unclear if oral zinc is beneficial for preventing diarrhea in adult HIV patients.

+ more

HIV/AIDS-related opportunistic infections. It is unclear if oral zinc is beneficial in opportunistic infections in patients with HIV/AIDs.

+ more

Human papillomavirus (HPV). It is unclear if oral zinc is beneficial for preventing relapse in patients with vulvar warts or for treating HPV infections and cervical lesions in patients with abnormal cervical cytology.

+ more

Hypertension. It is unclear if oral zinc reduces blood pressure in normotensive or hypertensive patients.

+ more

Impaired glucose tolerance (prediabetes). While some conflicting evidence exists, several small clinical studies suggest that oral zinc may improve glycemic control in patients with prediabetes.

+ more

Intestinal parasite infection. It is unclear if oral zinc is beneficial in patients with intestinal parasitic infections.

+ more

Kidney failure. It is unclear if oral zinc is beneficial for patients on hemodialysis who have resistance to erythropoiesis-stimulating agents (ESAs).

+ more

Leukemia. It is unclear if oral zinc is beneficial for improving weight maintenance in children and adolescents with leukemia.

+ more

Liver cancer. It is unclear if oral zinc is beneficial for preventing hepatocellular carcinoma (HCC).

+ more

Lung cancer. It is unclear if increased dietary zinc intake is beneficial for reducing the risk of lung cancer.

+ more

Male infertility. It is unclear if oral zinc is beneficial for infertility in males.

+ more

Melasma. It is unclear if topical zinc reduces melasma severity.

+ more

Menopausal symptoms. It is unclear if oral zinc improves sexual function after menopause.

+ more

Migraine headache. It is unclear if oral zinc is beneficial in patients with migraine.

+ more

Nasopharyngeal cancer. It is unclear if oral zinc is beneficial in patients with this type of cancer.

+ more

Neonatal jaundice. It is unclear if oral zinc is beneficial for neonatal jaundice.

+ more

Nonalcoholic fatty liver disease (NAFLD). It is unclear if oral zinc is beneficial in patients with NAFLD.

+ more

Non-Hodgkin lymphoma. It is unclear if oral zinc is beneficial for non-Hodgkin lymphoma prevention.

+ more

Obesity. Small studies suggest that oral zinc does not reduce weight or calorie intake in people with overweight or obesity.

+ more

Obsessive-compulsive disorder (OCD). It is unclear if oral zinc reduces symptoms in patients with OCD.

+ more

Oral mucositis. It is unclear if oral or topical zinc prevents oral mucositis due to chemotherapy. Some small clinical studies suggest that oral zinc might prevent mucositis due to radiotherapy.

+ more

Osteoporosis. It is unclear if oral zinc improves bone density in patients with osteoporosis.

+ more

Overall mortality. It is unclear if oral zinc reduces overall mortality in young children.

+ more

Periodontitis. Oral zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear.

+ more

Polycystic ovary syndrome (PCOS). It is unclear if oral zinc is beneficial in patients with PCOS.

+ more

Postoperative sore throat. It is unclear if oral zinc is beneficial for postoperative sore throat.

+ more

Postpartum depression. It is unclear if oral zinc prevents postpartum depression after a Cesarean section (C-section).

+ more

Premenstrual syndrome (PMS). It is unclear if oral zinc improves symptoms in patients with PMS.

+ more

Preterm labor. It is unclear if oral zinc reduces the risk of preterm labor.

+ more

Prostatitis. It is unclear if oral zinc improves symptoms in men with chronic prostatitis.

+ more

Pruritus. There is limited evidence on the oral use of zinc for reducing pruritis in hemodialysis patients.

+ more

Psoriatic arthritis. It is unclear if oral zinc improves psoriatic arthritis symptoms.

+ more

Respiratory tract infections. It is unclear if oral zinc reduces respiratory tract infections in children.

+ more

Rosacea. It is unclear if oral zinc improves symptoms of rosacea or quality of life.

+ more

Seizures. It is unclear if oral zinc reduces recurrent febrile seizures in children.

+ more

Sepsis. It is unclear if oral zinc is beneficial in pediatric or adult patients with sepsis.

+ more

Shigellosis. It is unclear if oral zinc is beneficial in patients with acute shigellosis from food poisoning.

+ more

Sleep deprivation. Oral zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear.

+ more

Substance use disorder. It is unclear if oral zinc is beneficial for substance use disorder.

+ more

Tonsillopharyngitis. It is unclear if oral zinc is beneficial in patients with tonsillopharyngitis.

+ more

Traumatic brain injury (TBI). There is limited evidence on the parenteral use of zinc for closed head injury.

+ more

Tuberculosis. It is unclear if oral zinc can improve outcomes in patients receiving tuberculosis treatment.

+ more

Urinary tract infections (UTIs). It is unclear if oral zinc is beneficial in children with UTI.

+ more

Venous leg ulcers. It is unclear if oral or topical zinc is beneficial for leg ulcer healing.

+ more

Vertigo. Oral zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear.

+ more

Water warts. It is unclear if oral zinc is beneficial for the treatment of water warts in children.

+ more

Wound healing. Topical zinc might be beneficial for the healing of uncomplicated wounds.

+ more

Wrinkled skin. Topical zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear.

+ more

Fecal incontinence. Topical zinc has only been evaluated in combination with other ingredients; its effect when used alone is unclear.

+ more

More evidence is needed to rate zinc for these uses.

Dosing & Administration

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Adult

Oral:

For adults, the Recommended Dietary Allowance (RDA) of zinc has been established. The daily RDAs are as follows: females 18 years of age, 9 mg; females 19 years and older, 8 mg; males 18 years and older, 11 mg. During pregnancy, 13 mg in those 18 years of age, 11 mg in those 19 years and older. During lactation, 17 mg in those 18 years of age; 12 mg in those 19 years and older ([7135](#)).

Zinc supplements are often used to treat sequelae of zinc deficiency. For other uses, see [Effectiveness](#) section for condition-specific information.

Zinc binds to proteins, becoming available for absorption as the protein is digested ([7135](#)). The type of protein influences how much zinc is absorbed. Animal proteins generally enhance zinc absorption, while plant proteins like soy might reduce zinc absorption ([7135](#), [11672](#), [11673](#), [11675](#)). It is not known whether high-protein diets influence zinc balance in adults. Phytates in food can reduce the amount of zinc absorbed from foods. Phytate is found in grains (e.g., maize, corn, sorghum), legumes, seeds (e.g., sunflower, pumpkin), and soy ([7135](#), [11673](#), [11680](#)). It forms non-absorbable complexes with zinc. The absorption-inhibiting effect of phytate can be prevented by the presence of phytases, food processing (e.g. fermentation, germination, soaking, milling, and heat), amino acids in animal proteins, and higher zinc intake ([1858](#), [7135](#), [11617](#), [11673](#), [11679](#)).

Topical:

Zinc has been used in various formulations, including lotions, gels, ointments, mouth rinses, and others. See [Effectiveness](#) section for condition-specific information.

Children

Oral:

The adequate intake (AI) of zinc for infants up to 6 months of age is 2 mg daily ([7135](#)). For older infants and children, the daily Recommended Dietary Allowance (RDA) of zinc is based on age as follows: 7 months to 3 years, 3 mg; 4-8 years, 5 mg; 9-13 years, 8 mg; females 14-18 years, 9 mg; males 14-18 years, 11 mg.

Zinc supplements are often used to treat sequelae of zinc deficiency. For other uses in children, see [Effectiveness](#) section for condition-specific information.

Standardization & Formulation

Different salt forms provide different amounts of elemental zinc. Zinc sulfate contains 23% elemental zinc; 220 mg zinc sulfate contains 50 mg zinc. Zinc gluconate contains 14.3% elemental zinc; 10 mg zinc gluconate contains 1.43 mg zinc ([506](#)).

Interactions with Drugs

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AMILORIDE (Midamor)

Interaction Rating MINOR Be watchful with this combination.

Severity INSIGNIFICANT **Occurrence** PROBABLE

Level of Evidence B (Lower quality RCT)

Amiloride can modestly reduce zinc excretion and increase zinc levels.

+ more

ATAZANAVIR (Reyataz)

Interaction Rating MINOR Be watchful with this combination.

Severity INSIGNIFICANT **Occurrence** PROBABLE

Level of Evidence B (Lower quality RCT)

Zinc modestly reduces levels of atazanavir, although this effect does not seem to be clinically significant.

+ more

BICTEGRAVIR/EMTRICITABINE/TENOFOVIR ALAFENAMIDE (Biktarvy)

Interaction Rating MODERATE Be cautious with this combination.

Severity MODERATE **Occurrence** PROBABLE

Level of Evidence D (Theoretical based on pharmacology)

Theoretically, zinc might decrease levels of bicittegravir/emtricitabine/tenofovir alafenamide by reducing its absorption.

+ more

CEPHALEXIN (Keflex)

Interaction Rating MODERATE Be cautious with this combination.

Severity MODERATE **Occurrence** PROBABLE

Level of Evidence **B** (Lower quality RCT)

Zinc might decrease cephalexin levels by chelating with cephalexin in the gut and preventing its absorption.

+ more

CISPLATIN (Platinol-AQ)

Interaction Rating MODERATE Be cautious with this combination.

Severity HIGH **Occurrence** POSSIBLE

Level of Evidence **D** (In vitro or animal study)

Theoretically, zinc might interfere with the therapeutic effects of cisplatin.

+ more

INTEGRASE INHIBITORS

Interaction Rating MODERATE Be cautious with this combination.

Severity HIGH **Occurrence** POSSIBLE

Level of Evidence **D** (Theoretical based on pharmacology)

Theoretically, taking zinc along with integrase inhibitors might decrease the levels and clinical effects of these drugs.

+ more

PENICILLAMINE (Cuprimine, Depen)

Interaction Rating MODERATE Be cautious with this combination.

Severity MODERATE **Occurrence** PROBABLE

Level of Evidence **B** (Lower quality RCT)

Zinc might reduce the levels and clinical effects of penicillamine.

+ more

QUINOLONE ANTIBIOTICS

[Interaction Rating](#) MODERATE Be cautious with this combination.

[Severity](#) MODERATE [Occurrence](#) PROBABLE

[Level of Evidence](#) B (Nonrandomized clinical trial)

Zinc can decrease the levels and clinical effects of quinolones antibiotics.

+ more

RITONAVIR (Norvir)

[Interaction Rating](#) MODERATE Be cautious with this combination.

[Severity](#) MILD [Occurrence](#) PROBABLE

[Level of Evidence](#) B (Lower quality RCT)

Zinc modestly reduces levels of ritonavir.

+ more

TETRACYCLINE ANTIBIOTICS

[Interaction Rating](#) MODERATE Be cautious with this combination.

[Severity](#) MODERATE [Occurrence](#) PROBABLE

[Level of Evidence](#) B (Nonrandomized clinical trial)

Zinc might reduce levels of tetracycline antibiotics.

+ more

Interactions with Supplements

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[EXPAND ALL](#) | [COLLAPSE ALL](#)

BETA-CAROTENE

Zinc might reduce levels of beta-carotene.

[+ more](#)

BROMELAIN

Theoretically, zinc might reduce the effects of bromelain.

[+ more](#)

CALCIUM

Calcium supplements might decrease dietary zinc absorption.

[+ more](#)

CHROMIUM

Chromium and zinc might impact each other's absorption.

[+ more](#)

COFFEE

Coffee might reduce zinc absorption.

[+ more](#)

COPPER

Zinc can reduce the absorption of copper.

[+ more](#)

EDTA

EDTA might increase urinary zinc excretion and reduce zinc levels.

[+ more](#)

FOLIC ACID

Folic acid might impact zinc absorption.

[+ more](#)

IP-6 (Phytic acid)

Phytic acid might reduce zinc absorption.

[+ more](#)

IRON

Iron and zinc can interfere with each other's absorption.

[+ more](#)

MAGNESIUM

Magnesium and zinc can interfere with each other's absorption.

[+ more](#)

MANGANESE

Zinc might increase the absorption of manganese.

[+ more](#)

RIBOFLAVIN

Riboflavin might improve zinc absorption, although the clinical significance is unclear.

[+ more](#)

VITAMIN A

Zinc might increase vitamin A absorption.

[+ more](#)

VITAMIN D

Vitamin D might alter absorption of zinc, although the clinical significance is unclear.

+ more

Interactions with Conditions

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[EXPAND ALL](#) | [COLLAPSE ALL](#)

ALCOHOL USE DISORDER

+ more

BARIATRIC SURGERY

+ more

CHRONIC KIDNEY DISEASE

+ more

COPPER DEFICIENCY

+ more

VEGETARIANISM

+ more

Interactions with Lab Tests

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None known.

Nutrient Depletions

×

[EXPAND ALL](#) | [COLLAPSE ALL](#)

CAPTOPRIL (Capoten)

[Depletion Rating](#) INSIGNIFICANT

A supplement is not needed for most patients.

Captopril might increase urinary zinc excretion and decrease zinc levels.

+ more

CHOLESTYRAMINE (Questran)

[Depletion Rating](#) INSIGNIFICANT

A supplement is not needed for most patients.

Cholestyramine might modestly reduce zinc absorption and zinc levels.

+ more

CISPLATIN (Platinol-AQ)

[Depletion Rating](#) INSIGNIFICANT

A supplement is not needed for most patients.

Cisplatin might increase urinary zinc excretion and temporarily reduce zinc levels.

+ more

CORTICOSTEROIDS

[Depletion Rating](#) INSIGNIFICANT

A supplement is not needed for most patients.

Corticosteroids might modestly reduce zinc levels.

+ more

DEFEROXAMINE (Desferal)

[Depletion Rating](#) MODERATE

Monitor for depletion; a supplement is needed in some patients.

Deferoxamine increases urinary zinc excretion and might decrease zinc levels.

+ more

DEXRAZOXANE (Zinecard)

[Depletion Rating](#) INSUFFICIENT EVIDENCE

Clinical significance is not known.

Dexrazoxane might increase urinary zinc excretion and decrease zinc levels.

+ more

DISULFIRAM (Antabuse)

[Depletion Rating](#) INSUFFICIENT EVIDENCE

Clinical significance is not known.

A disulfiram metabolite might reduce zinc absorption and zinc levels.

+ more

ESTROGENS

[Depletion Rating](#) INSIGNIFICANT

A supplement is not needed for most patients.

Estrogens might reduce, or have no effect on, zinc levels.

+ more

ETHAMBUTOL (Myambutol)

[Depletion Rating](#) INSUFFICIENT EVIDENCE

Clinical significance is not known.

Ethambutol might increase zinc excretion and reduce zinc levels.

+ more

H2-BLOCKERS

[Depletion Rating](#) INSIGNIFICANT

A supplement is not needed for most patients.

H2-blockers might modestly reduce zinc absorption and reduce zinc levels.

+ more

PANTOPRAZOLE (Protonix)

[Depletion Rating](#) INSIGNIFICANT

A supplement is not needed for most patients.

Pantoprazole might increase zinc excretion; however, it doesn't seem to affect zinc levels.

+ more

PENICILLAMINE (Cuprimine, Depen)

[Depletion Rating](#) MODERATE

Monitor for depletion; a supplement is needed in some patients.

Penicillamine might increase zinc excretion and reduce zinc levels.

+ more

PHENYTOIN (Dilantin)

[Depletion Rating](#) INSIGNIFICANT

A supplement is not needed for most patients.

Phenytoin might increase zinc excretion and reduce zinc levels.

+ more

PROPOFOL (Diprivan)

[Depletion Rating](#) MODERATE

Monitor for depletion; a supplement is needed in some patients.

EDTA in propofol might increase zinc excretion and reduce zinc levels.

+ more

PROTON PUMP INHIBITORS (PPIs)

[Depletion Rating](#) INSIGNIFICANT

A supplement is not needed for most patients.

PPIs might reduce modestly zinc absorption and reduce zinc levels.

+ more

QUINOLONE ANTIBIOTICS

[Depletion Rating](#) INSIGNIFICANT

A supplement is not needed for most patients.

Quinolones might reduce zinc absorption and reduce zinc levels.

+ more

TETRACYCLINE ANTIBIOTICS

[Depletion Rating](#) INSIGNIFICANT

A supplement is not needed for most patients.

Tetracyclines might reduce zinc absorption and reduce zinc levels.

+ more

THIAZIDE DIURETICS

[Depletion Rating](#) MODERATE

Monitor for depletion; a supplement is needed in some patients.

Thiazide diuretics might increase zinc excretion and reduce zinc levels.

+ more

VALPROATE

[Depletion Rating](#) INSIGNIFICANT

A supplement is not needed for most patients.

Valproic acid might increase zinc excretion and reduce zinc levels.

+ more

ZIDOVUDINE (Retrovir)

[Depletion Rating](#) INSUFFICIENT EVIDENCE

Clinical significance is not known.

Zidovudine might reduce levels of zinc.

+ more

Overdose

×

Presentation

Symptoms of acute zinc overdose and toxicity may include epigastric pain, nausea, and vomiting ([116212](#)). Case reports of hyperzincemia describe low copper levels, blood dyscrasias, and neurological problems, including sensory disturbances, numbness, tingling, limb weakness, and difficulty walking ([17092](#), [17093](#), [90205](#), [90233](#), [112473](#), [116751](#)). Zinc overdose has also been reported to cause acute renal tubular necrosis and interstitial nephritis ([331](#), [1352](#), [87338](#)). In one case report of an acute overdose with tablets providing 4.5 grams of zinc sulfate, acute epigastric pain, nausea, and vomiting was reported. This patient's serum zinc levels remained within the normal range, suggesting limited total zinc absorption ([116212](#)).

Treatment

Acute zinc overdose may be treated with supportive care. Severe zinc toxicity resulting in hematological abnormalities and/or copper deficiency may require treatment with chelating agents and copper supplementation ([116751](#)). One case report describes the use of supportive therapy including antiemetics, fluids, pain management, and proton pump inhibitors for the treatment of acute gastrointestinal symptoms ([116212](#)).

Absorption

About 15% to 40% of the zinc in foods is absorbed. Bioavailability is influenced by zinc status. Absorption increases in states of zinc deficiency ([87122](#)) and if zinc intakes are low ([6903](#), [87123](#)). Zinc is mostly absorbed in the small intestine, particularly the jejunum ([7135](#)). In human research, zinc oxide absorption is best in an acidic environment ([2809](#)). Zinc acetate is absorbed over a wide pH range and might be a better choice in people with reduced stomach acid ([2809](#)). In laboratory research, zinc uptake in human intestinal epithelial cells is similar for zinc chloride, zinc methionine, and zinc propionate ([2739](#)). Human research also shows that glycoprotein matrix-bound zinc is more extensively absorbed when compared with zinc oxide ([114762](#)).

Zinc absorption may be influenced by dietary factors. In humans, diets high in phytate result in a reduced bioavailability of zinc, even during fortification ([6903](#), [87123](#)). Vegetarian diets also result in a decrease in the total amount of zinc absorbed, but these diets are without effect on fractional absorption ([87041](#)). However, although zinc absorption may be increased with some protein sources, others, such as bovine serum albumin and soy protein, may reduce its absorption ([8866](#)).

Distribution

More than 85% of the total zinc in the body is in skeletal muscle and bone. Plasma zinc is tightly regulated at a concentration of approximately 10 to 15 $\mu\text{mol/L}$ ([7135](#)).

Metabolism

In human research, zinc given intravenously or orally resulted in zinc going rapidly to the liver, followed by two component exponential loss patterns ([87351](#)). Plasma levels following intravenous administration decreased to <2% of that injected by 24 hours; following oral administration levels decreased from a maximum of 1.2% of that ingested 3 hours after intake to 0.7% by 24 hours ([87351](#)). Over a 5-day period, zinc levels increased in red blood cells to maximum values of 6.4% of injected amounts or 2.4% of ingested amounts ([87351](#)).

Excretion

Most zinc is excreted in the feces, with a small amount eliminated in the urine ([7135](#), [8631](#), [87027](#)). However, urinary zinc levels appear to increase in patients with type 2

diabetes and congestive heart failure ([87444](#)). During lactation, zinc excretion increases via breast milk. The body seems to compensate for this increased demand by increasing zinc absorption and conserving endogenous zinc ([8631](#)).

Mechanism of Action

×

General

Zinc is a biologically essential trace element and is the second most abundant trace element in the body. The total body content is about 2 grams ([8621](#)). It is a cofactor in many biological processes including DNA, RNA, and protein synthesis. About 30% of cellular zinc is found within the nucleus. A large number of proteins that play a role in the regulation of gene expression are thought to contain zinc ([8619](#)). Zinc also plays a role in immune function, wound healing, reproduction, growth and development, behavior and learning, taste and smell, blood clotting, thyroid hormone function, and insulin action ([331](#)). Zinc is found in more than 300 enzymes ([8619](#)). About 300 enzymes depend on zinc as a catalyst ([7135](#), [96074](#)). Zinc is also required in hepatic synthesis of retinol binding protein, the transport protein of vitamin A ([8630](#)). Without adequate zinc, symptoms of vitamin A deficiency can appear, despite vitamin A supplementation ([8630](#)).

Meat, seafood, dairy products, nuts, legumes, and whole grains contain relatively high concentrations of zinc ([331](#)). Many breakfast cereals are fortified with zinc ([7135](#)). Zinc oxide and zinc sulfate are typically used to fortify wheat products ([10668](#)).

Zinc deficiency is characterized by growth retardation, low insulin levels, reduced levels of insulin-like growth factor (IGF)-1, anorexia, mental lethargy, irritability, low sperm count, generalized hair loss, rough and dry skin, skin lesions, slow wound healing, decreased thyroid function, delayed onset of puberty, poor sense of smell and taste, diarrhea, and nausea ([8619](#)). Although zinc deficiency and tri-iodothyronine (T3) have complementary roles in growth and development, growth failure in zinc deficiency does not seem to be the result of impaired T3 function ([8619](#)). Zinc deficiency is not uncommon worldwide, but deficiency is rare in the US; most diets provide more than the recommended dietary allowance ([8632](#)). Moderate zinc deficiency is associated with malabsorption syndromes, alcoholism, chronic renal disease, and chronic debilitating diseases ([8621](#)). Zinc levels also appear to be lower in acute attacks of paranoid schizophrenia ([12584](#)).

There is no reliable test in clinical use to determine zinc deficiency. Serum or plasma zinc on its own is neither sensitive nor specific. It seems to be useful to measure zinc

status on a population basis, but is an inaccurate measure in individuals, particularly in people with chronic infections or inflammatory conditions ([8625](#)). The most reliable method for diagnosing marginal zinc deficiency is a positive response to zinc supplementation and improvement in subtle symptoms such as growth retardation or altered ability to taste or smell ([8621](#)).

Anti-gingivitis effects

Most clinical evidence shows that using zinc toothpaste or mouthwash alone or in combination with triclosan can prevent plaque accumulation, gingivitis, or the formation of calculus ([6523](#), [6524](#), [6525](#), [6526](#), [6527](#), [6528](#), [6529](#), [87418](#), [87507](#)). It is possible that this is due to antimicrobial effects of zinc ([87012](#), [87217](#)).

Anti-inflammatory effects

It is hypothesized that low levels of plasma zinc may be one of the nonspecific features of inflammation ([87440](#)). In two meta-analyses, zinc supplementation reduced inflammatory markers, including C-reactive protein (CRP), high-sensitivity (hs) CRP, tumor necrosis factor alpha (TNF-alpha), interleukin 6, malondialdehyde, and neutrophils ([104820](#), [104952](#)). In healthy elderly individuals, zinc has been shown to decrease inflammatory biomarkers for atherosclerosis, including hsCRP, macrophage chemoattractant protein 1 (MCP-1), vascular cell adhesion molecule 1 (VCAM-1), malondialdehyde and hydroxyalkenals (MDA+HAE) ([87214](#), [96073](#)). Also, zinc supplementation has been shown to decrease inflammatory biomarkers such as CRP in hemodialysis patients ([87171](#)). In addition, zinc supplementation reduces serum immunoglobulins and increases serum albumin, which appears to be associated with reduced joint pain, increased mobility, and decreased joint swelling in patients with psoriatic arthritis ([6515](#)). However, taking zinc orally does not seem to help treat rheumatoid arthritis ([6517](#), [6518](#), [6519](#), [87406](#)).

Topical zinc might be effective for treating acne ([819](#), [820](#), [2687](#), [2688](#)) due to anti-inflammatory activity resulting from inhibition of polymorphonuclear leukocyte chemotaxis induced by decreased granulocyte zinc levels ([104056](#)).

Anti-ulcer effects

Taking zinc orally seems to help treat and prevent peptic ulcers in clinical research ([6588](#), [6589](#), [6590](#), [6591](#), [87097](#), [87285](#)). Although the mechanism of action is not clear, in human research, the antiulcer effects of zinc were suggested to be due to inhibition of gastric secretion as opposed to interactions on parietal cell receptors ([87478](#)).

Antidiabetic effects

Zinc has been shown to decrease blood glucose and increase insulin levels in human studies ([86933](#), [87520](#)), but the mechanism of these effects is unclear. There is some evidence that zinc can increase glucose transport into cells and potentiate insulin-induced glucose transport, possibly by affecting the insulin intracellular signaling (second messenger system) pathway ([8620](#)). Zinc has also been shown to increase serum levels of insulin-like growth factor (IGF)-1 by 30% and improve glucose tolerance ([8624](#)). Additionally, some animal research shows that zinc can prevent renal oxidative and inflammatory damage due to hyperglycemia in a rat model of diabetes, possibly via induced expression of metallothionein and suppressed connective tissue growth factor ([87161](#)). These results suggest that zinc's antidiabetic effects may be explained by antioxidant and anti-inflammatory mechanisms. Preliminary research also shows that some patients with type 2 diabetes are zinc deficient, possibly as a result of altered zinc metabolism ([6531](#), [6532](#)). Whether zinc deficiency is involved in the development of insulin resistance is unknown. In type 1 diabetes with zinc deficiency, zinc supplementation might reduce lipid peroxidation ([6533](#)).

Antiviral effects

The mechanism for the effect of zinc on the common cold is unclear. It does not influence interleukin-8 in nasal secretions, suggesting that zinc does not affect the immune response to colds ([10783](#), [10784](#)). Zinc can inhibit rhinovirus replication in vitro, but it is unclear whether this happens in vivo ([10783](#), [10784](#), [18216](#)). The rhinovirus replicates in the nasal mucosa, and some researchers question whether orally administered zinc produces sufficient levels in nasal tissues and secretions to inhibit viral replication ([8628](#), [8629](#)). The amount of available ionized zinc varies with different formulations and might influence the effectiveness of zinc for the common cold ([336](#), [340](#)). The addition of flavoring agents such as citric acid, mannitol, or sorbitol to zinc gluconate lozenge preparations decreases the extent of zinc ionization, while the addition of glycine to zinc gluconate lozenges does not ([300](#)).

Zinc ions might also have effects against other viruses, including respiratory syncytial virus (RSV) and herpes virus ([6538](#), [6539](#), [6541](#), [18216](#)). In vitro research also shows that high intracellular zinc levels might stop replication of SARS-CoV-2, and zinc is also reported to have a synergistic effect with antivirals ([106903](#)).

Biliary effects

Zinc is thought to be a cofactor for enzymes involved in the metabolism of bilirubin. It has been shown to reduce serum bilirubin levels in animals ([104814](#)).

Dermatologic effects

Clinical research suggests that zinc has beneficial effects on the skin when used orally or topically. For example, oral zinc can improve acne due to its anti-inflammatory activity ([104056](#), [106233](#)) and its ability to decrease skin sebum secretion ([819](#), [87275](#), [87378](#), [106233](#)). Some research also suggests that zinc has antimicrobial activity against *Cutibacterium acnes* ([106233](#)).

Topical zinc, along with other antioxidants, appears to improve the look of aging skin ([6155](#)).

Fertility effects

Male fertility appears to be influenced by zinc ([6573](#), [6574](#), [6575](#), [6576](#)). Infertile males have lower seminal plasma zinc, with normal or reduced blood zinc ([6575](#), [6577](#)). Clinical research suggests that short-term dietary zinc depletion results in reduced serum testosterone concentrations, seminal volume, and total seminal zinc loss per ejaculate ([6576](#)). Supplementation with zinc improves sperm parameters in men with reduced sperm mobility ([6578](#)). However, excess zinc might reduce sperm motility ([6573](#)). In male cigarette smokers with infertility, supplementation with zinc improved sperm quality, possibly by reducing testicular accumulation of cadmium induced by cigarette smoking ([86915](#)). In infertile men, zinc improved total sperm count ([9334](#), [87430](#)). Some of the benefits of zinc on fertility may be due to hormonal effects. For example, in human research, zinc increased serum testosterone or dihydrotestosterone levels in some ([6708](#), [87430](#)), but not all ([6569](#), [87095](#)) studies.

Immunomodulating effects

Zinc is important for neutrophil, natural killer cell, and T-lymphocyte function ([6551](#)). Even mild zinc deficiency might adversely affect T-cell functions ([6552](#)). Interestingly, high-dose zinc supplementation, 20 times the RDA, can have a negative effect similar to deficiency on immune function ([8625](#)). In human research, zinc decreased levels of the suppressor T cells and increased the ratio of helper to suppressor cells ([6578](#), [87156](#)). Zinc, alone or with other micronutrients, has been shown to affect numbers of other CD(+) cells and other lymphocytes, and both increase and decrease levels of cytokines ([824](#), [6555](#), [6566](#), [6578](#), [6596](#), [10809](#), [71430](#), [86910](#), [87065](#)) ([87115](#), [87140](#), [87246](#), [87317](#), [87414](#), [87453](#), [87514](#)).

In children with enterotoxigenic *Escherichia coli*-induced diarrhea, zinc has been shown to modulate the innate immune system, as evidenced by an increase in phagocytic activity, a decrease in oxidative burst activity, and an increase in the ratio of naïve to memory T cells ([87208](#)). Also, in children with zinc deficiency, daily zinc supplementation seems to increase plasma levels of *E. coli*-specific IgG ([109780](#)). In healthy elderly individuals, zinc supplementation enhanced natural killer cell activity

([87273](#)); however, in patients with inflammatory bowel disease, zinc decreased natural killer cell activity ([6915](#)).

Plasma zinc levels are low in people with HIV infection, but this appears to be a marker of disease progression rather than a treatable cause of progression. Some evidence suggests that zinc supplementation might increase disease progression and mortality in HIV infected patients, but other evidence suggests that avoiding zinc deficiency might allow normal or improved immune function, particularly T-lymphocyte mediated cellular immunity. It also might inhibit susceptibility of T-lymphocytes to apoptosis ([8625](#)). More research is needed to tell if zinc should be avoided or prescribed for zinc deficiency in HIV disease.

Plasma levels of zinc are also lower in patients with multiple sclerosis (MS). For over 30 years, researchers have been trying to determine the role of zinc in the pathogenesis of MS. Some preliminary clinical research found that zinc levels are reduced during an MS exacerbation and normalize during a remission. However, to date, no clinical research has shown zinc supplementation to be beneficial in patients with MS ([97137](#)).

Lipid metabolizing effects

Acrodermatitis enteropathica is a zinc-deficiency disorder characterized by low plasma levels of zinc and decreased activity of the zinc-dependent enzyme alkaline phosphatase. Intestinal alkaline phosphatase helps regulate lipid absorption ([90933](#)). In patients with acrodermatitis enteropathica, zinc supplementation seems to help regulate linoleic acid and serum lipoprotein metabolism ([2689](#)).

Preliminary clinical research suggests that taking zinc sulfate reduces serum cholesterol in patients with coronary artery disease ([87299](#)). However, in other clinical research, zinc has had mixed effects. For example, in individuals with low baseline cholesterol levels, zinc resulted in increased total and low density lipoprotein (LDL)-cholesterol levels and lacked an effect on high density lipoprotein (HDL)-cholesterol levels ([86953](#)). In other human research, zinc did not affect total cholesterol levels, but resulted in decreased LDL-cholesterol, and had mixed effects on HDL-cholesterol types, with increased HDL2 and a slight decrease in HDL3 ([87306](#)). The mixed effect of zinc on these parameters may be due to dosing, the age and/or sex of the participant, or baseline zinc and/or plasma lipid levels ([87193](#)).

Neurologic effects

There is interest in using zinc for various neurological conditions. The role of zinc in Alzheimer disease might be both protective and causative. Laboratory studies

suggest that zinc might contribute to aggregation of amyloid beta peptide, but protect against subsequent neurotoxicity as an antioxidant ([6510](#), [6511](#), [6512](#)). Zinc levels and zinc intake appear to be reduced in some people with depression ([6562](#), [90227](#), [97139](#)). In the human brain, zinc is believed to play a role in the hippocampus in communication between neurons ([90221](#), [97139](#)). Zinc is also believed to potentiate the activity of some antidepressants ([90221](#)). Some clinical evidence shows that taking zinc along with antidepressant treatment improves depression scores in patients diagnosed with major depression better than antidepressant alone ([86985](#), [90221](#)).

Ocular effects

Zinc plays a key role in the maintenance of vision. It is present in high concentrations in the eye, particularly in the retina and choroid. Zinc deficiency can alter vision, and severe deficiency causes changes in the retina and retinal pigment epithelium (RPE). Zinc interacts with taurine and vitamin A in the retina, modifies plasma membranes in the photoreceptors, regulates the light-rhodopsin reaction within the photoreceptor, modulates synaptic transmission, and serves as an antioxidant in both the RPE and retina. It seems to slow the progression of some degenerative retinal diseases ([8621](#)). Topically, zinc sulfate ophthalmic solution acts as a mild astringent, precipitating protein and clearing mucus from the outer surface of the eye ([15](#)).

Prostate cancer effects

In some clinical research, taking zinc in combination with other vitamins and minerals reduces the risk of prostate cancer ([14135](#)). Also, in laboratory research, zinc has been shown to inhibit prostate carcinoma cell growth ([86909](#)). However, other evidence, based on population research, suggests that zinc might adversely affect prostate cancer risk ([10306](#), [15607](#)). The reason for this discrepancy is not clear. It has been shown that zinc levels appear to decrease in the prostate tissue and prostatic fluid in men with prostatic carcinoma ([6909](#), [6910](#)). Also, laboratory research suggests that in malignant prostate cells, zinc up-regulated the expression of certain metallothionein (MT)-1 enzymes, as well as genes implicated in oncogenic pathways, such as Fos, Akt1, Jak3, and PI3K ([87152](#)). Laboratory research also suggests that zinc induced apoptosis ([87490](#)). Other potential mechanisms of action, as shown in laboratory research, include the role of zinc in the regulation of zinc transporters such as LIV-1 (ZUP6) ([87267](#)).

Sickle cell effects

People with sickle cell disease (SCD) are commonly zinc deficient. Zinc deficiency in SCD might cause a cell-mediated immune disorder, and increase the risk of infection

in SCD. Some researchers think zinc deficiency leads to increased production of tumor necrosis factor (TNF)-alpha and interleukin-1 (IL-1) which might result in vaso-occlusive pain. This may explain the benefit of zinc supplementation in some patients with SCD ([8627](#)).

Skeletal effects

There is interest in using zinc for preventing osteoporosis. Zinc seems to be involved in the mineralization of bone. In animal models, zinc deficiency has been linked to abnormal bone formation. In humans, increased zinc content in bone appears to be associated with increased bone strength ([14410](#)). In people with osteoporosis, urinary zinc excretion is increased, possibly as a result of bone resorption ([6918](#)). Serum zinc levels and zinc intake seem to be lower in people with osteoporosis ([6918](#), [6920](#), [14410](#)). However, moderately high dietary zinc intake (53 mg per day) seems to increase magnesium excretion without affecting copper metabolism in postmenopausal adults ([12424](#)). Supplementation with high doses of zinc, 142 mg/day, also appears to decrease magnesium absorption and magnesium balance in healthy adult males ([9624](#)). This might adversely affect bone health. Zinc may compete with magnesium for ion exchange transport in the intestine ([12424](#)). More research on the clinical importance of these observations is needed.

Wilson disease

Wilson disease is a condition in which too much copper accumulates in vital organs, including the liver and brain. Zinc blocks copper absorption and increases copper elimination in the stool of people with Wilson disease ([2692](#)).

Wound-healing effects

For aiding in wound healing, topical zinc might enhance re-epithelialization and collagen synthesis, decrease inflammation, and inhibit bacterial growth ([2699](#)).

Classes

[Immunomodulators](#), [Nephrotoxic Agents](#), [Testosterone Enhancers](#)

References

[See Monograph References](#)

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