

Zinc

Physiological Functions

Zinc has numerous functions in the body. This mineral serves as a cofactor for over 100 enzymes in the body, especially those involved with the metabolism of protein, carbohydrate, fat and alcohol.

Zinc also is essential for protein synthesis, integrity of cell membranes, maintenance of DNA and RNA, tissue growth and repair, wound healing, taste acuity, prostaglandin production, bone mineralization, proper thyroid function, blood clotting and cognitive functions. Considering this nutrient's role in growth and development, zinc is an integral mineral for fetal development and sperm production.

Factors Affecting Availability

More than half of the body's zinc supply is found in muscle tissue. This mineral is also found in other parts of the body, which include the bones, eyes, prostate gland, testes, skin and kidneys.

Since minerals may compete for absorption sites in the intestine, excess intakes of iron or copper can adversely interfere with zinc absorption. Likewise, excess intake of zinc (from supplements or fortified foods) can impair iron and copper absorption.

Although phytates and fiber found in unprocessed grains inhibit the bioavailability of zinc, whole grains are still a better source of zinc than that found in refined grains (e.g. white bread). Whole grain yeast breads enhance the absorption of zinc by producing enzymes that destroy phytates. Zinc from meat products, on the other hand, is four times more bioavailable than that found in fibrous grain foods.

The body best absorbs smaller amounts of zinc at one time. Overall, the body absorbs 15-40% of dietary zinc, depending on the body's requirement for this mineral.

Deficiency

Zinc deficiency is rare in the US. However, populations at risk of zinc deficiency are those who have a marginal intake of this nutrient: alcoholics, elderly, low-income children and vegetarians. Symptoms of deficiency include anemia,

delayed growth, birth defects, spontaneous abortion, impaired sexual maturation, sterility, delayed wound healing, glucose intolerance, poor appetite and skeletal abnormalities.

Toxicity

Clinical manifestations of zinc toxicity (doses > 80 mg/day) include decreased levels of HDL-cholesterol, white blood cells and copper. Impaired cholesterol metabolism and gastrointestinal disturbances can also result from excess intake of zinc supplements.

- ❖ *The upper limit of safety for zinc established by the Food and Nutrition Board of the Institute of Medicine is 40 milligrams daily for adults. See table below for more age- and gender specific guidelines.*

Zinc Tolerable Upper Intake Levels	
Life Stage	Zinc (mg/day)
Infants	
0-6 mo	4
7-12 mo	5
Children	
1-3 y	7
4-8 y	12
Males, Females	
9-13 y	23
14-18 y	34
19-70 y	40
70 y	40
Pregnancy	
< 18 y	34
19-50 y	40
Lactation	
< 18 y	34
19-50 y	40

Dietary Requirements

The Daily Reference Intakes (DRI) for zinc are shown in the table below.

Zinc Requirements Daily Reference Intakes	
Life Stage	Zinc (mg/day)
Infants	

0 – 6 months	2
7 – 12 months	3
Children	
1 – 3 years	3
4 – 8 years	5
Males	
9 – 13 years	8
14 – 18 years	11
19 – 30 years	11
31 – 50 years	11
51 – 70 years	11
> 70 years	11
Females	
9 – 13 years	8
14 – 18 years	9
19 – 30 years	8
31 – 50 years	8
51 – 70 years	8
> 70 years	8
Pregnancy	
< 18 years	13
19 – 30 years	11
31 – 50 years	11
Lactation	
< 18 years	14
19 – 30 years	12
31 – 50 years	12

Dietary Sources

Rich sources of zinc are oysters, beef, liver, crab, seafood, poultry, nuts and seeds, whole grains, tofu, legumes and mild. Zinc found in breast milk is better absorbed than that in formula milk. The list below provides the zinc content of selected foods.

Zinc Content of Food	
Food	Zinc (mg)
Oysters, 3.5 oz ckd	39
Beef pot roast, 3.5 oz ckd	8.5
Ground beef, 3.5 oz ckd	5.5

Turkey, dark meat, 3.5 oz ckd	4.5
Chicken liver, 3.5 oz ckd	4.3
Pumpkin seeds, 1/4 cup	4.2
Wheat germ, 2 Tbl	2.4
Yogurt, low fat, 1 cup	2.2
Soynuts, 1/4 cup	2.1
Almonds, 1/4 cup	2.0
Peanuts, 1/4 cup	1.7
Sunflower seeds, 1/4 cup	1.7
Shrimp, 3.5 oz ckd	1.6
Chicken, light meat, 3.5 oz ckd	1.3
Lentils, 1/2 cup cooked	1.3