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## All About SUPPLEMENTS

### Zinc

#### An Indispensable Element That Boosts the Body's Natural Defenses

By Dale Kiefer



The onset of cold and flu season serves as a reminder of the critical importance of maintaining adequate stores of the mineral zinc.

While best known for its role in fighting colds and flus, zinc has far-ranging effects on human health, from strengthening the body's immune defenses to promoting optimal growth and development.<sup>1</sup> The tenth most common element in the human body, zinc is vital to the functioning of more than 300 hormones and enzymes.<sup>2</sup> One of the most important of these is copper/zinc superoxide dismutase, an antioxidant enzyme associated with longevity and protection against oxidative stress.<sup>3-5</sup>

Zinc deficiency is associated with numerous disease states and even with DNA damage, which may contribute to cancer.<sup>6</sup> With a preponderance of scientific evidence suggesting that zinc deficiency is common in the United States and throughout the world, it is all the more important that health-conscious adults take steps to ensure optimal zinc status.

### ZINC: WHAT YOU NEED TO KNOW

- Zinc is a key component of one of the body's most important antioxidant enzymes, copper/zinc superoxide dismutase (Cu/Zn SOD). Research suggests that optimal levels of Cu/Zn SOD are associated with longevity.
- Zinc is crucial for supporting immune health and speeding recovery from infections.
- Zinc should be considered a first line of defense in reducing the severity and duration of cold symptoms.
- Zinc deficiency is associated with higher infant mortality, impaired growth in children, delays in sexual maturation, infertility, and anemia.
- Evidence suggests that zinc protects against DNA mutations and may play a role in averting cancers of the tongue and esophagus.
- Zinc is also critical for strong bones, healthy skin, and optimal wound healing.

### BOOSTING THE BODY'S ANTIOXIDANT DEFENSES

Zinc is an essential component of one of the body's most important natural antioxidants, the enzyme known as copper/zinc superoxide dismutase (Cu/Zn SOD).<sup>3,4</sup> Cu/Zn SOD is one of a family of antioxidant enzymes that disarm dangerous superoxide radicals, which can wreak havoc on cellular compounds such as lipids, proteins, and DNA.<sup>5,7</sup> Cu/Zn SOD rapidly breaks these compounds down into hydrogen peroxide, which is quickly converted to harmless water and ordinary oxygen.<sup>8</sup>

Research suggests that maintaining adequate levels of zinc and SOD is especially important to increasing longevity. Cumulative oxidative damage caused by reactive oxygen species is correlated with aging. In the laboratory, organisms that were manipulated to produce higher levels of SOD demonstrated extended life spans.<sup>5</sup> Conversely, mutations in the gene that encodes Cu/Zn SOD have been associated with familial amyotrophic lateral sclerosis (Lou Gehrig's disease), a fatal neurodegenerative disorder.<sup>7</sup> Oxidative damage to the enzyme itself has recently been implicated in a variety of pathologies, including Alzheimer's and Parkinson's diseases.<sup>9</sup>

Oral supplementation with a bioavailable SOD preparation provides a way to greatly augment the protective benefits conferred by the body's own supply of superoxide dismutase.<sup>10</sup>

## A CORNERSTONE OF HEALTHY IMMUNE FUNCTION

In addition to bolstering the body's antioxidant defenses, zinc plays a crucial role in supporting proper immune system function.<sup>11-15</sup> T-lymphocytes are white blood cells that help fight infection and depend on zinc for their development and activation. In humans, zinc deficiency can result in a decreased number of T-lymphocytes and a diminished ability to fight infection and heal wounds.<sup>16-18</sup> Because supplemental zinc may help fight infection and heal wounds,<sup>17</sup> zinc status is especially important for patients with conditions such as HIV infection.<sup>18</sup>



Maintaining adequate levels of zinc is equally important to aging adults. As people grow older, their immune function declines, partly due to the decreasing size and function of the thymus gland. New evidence suggests that zinc may help to maintain healthy function of the thymus gland in elderly people.<sup>19</sup> Scientists have also found evidence that a zinc deficiency in elderly adults may contribute to impaired immune function with aging, or immunosenescence.<sup>20</sup> These findings suggest that zinc plays a critical role in supporting healthy immune function with age.

### ZINC FIGHTS SYMPTOMS OF THE COMMON COLD

One of zinc's most important uses in recent years is reducing the severity and duration of colds. The common cold is caused by any one of more than 200 distinct viruses that target the respiratory tract.<sup>23</sup> Zinc interferes with the viruses' ability to attach to the surface of respiratory tract cells and reproduce, which may help prevent infections from taking hold and causing symptoms.<sup>24</sup>

Numerous clinical trials, involving hundreds of child and adult patients, support the effectiveness of zinc lozenges in mitigating cold symptoms.<sup>23-29</sup> One study concluded that lozenge use within 24 hours of the first onset of cold symptoms reduces the severity of symptoms, the duration of the illness, subsequent use of antibiotics to treat secondary symptoms, and overall incidence of colds per year.<sup>29</sup>

### ZINC EXHIBITS CANCER-PREVENTIVE PROPERTIES

Among its many health-promoting properties, zinc appears to be cancer preventive.<sup>6,21</sup>

Scientists in Philadelphia found that zinc regulates cyclooxygenase-2 (COX-2), an enzyme that is involved in pain and inflammation, and also implicated in the development of certain cancers. Noting that zinc is often deficient in patients with cancer of the tongue and esophagus, and that levels of COX-2 are especially elevated in tumors associated with these cancers, the scientists wondered whether zinc influences COX-2 levels. Using a rodent model of these cancers, they determined that zinc deficiency encourages tumor growth and excess COX-2, while zinc replenishment reduces COX-2 and tumor incidence.<sup>22</sup>

Colds can also lead to even more serious secondary conditions, such as sinusitis in adults and middle ear infections in children. Indeed, acute upper-respiratory infection is the single most common reason people seek medical treatment in the United States.<sup>25</sup> Vanderbilt University scientists discovered that zinc inhibits the activity of a common respiratory virus that routinely threatens children's health. The doctors added zinc salts, such as zinc sulfate and zinc lactate, to cell cultures infected with a common pediatric respiratory disease known as respiratory syncytial virus. Zinc salts prevented the harmful virus from replicating freely.<sup>30</sup>



To be most effective, zinc lozenges should be taken within 24 hours of the appearance of initial cold symptoms, and should be taken continuously throughout the course of the illness. Although generally well tolerated, some patients have reported mild nausea when taking zinc lozenges, and temporary alterations in taste sensation are not uncommon. Taking zinc with food may help to alleviate these effects.

### SUPPORTING HUMAN GROWTH AND MATURATION

Zinc is vital to human growth and maturation. Studies have shown that zinc deficiency results in cognitive deficits and growth retardation, including delays in sexual maturation, among both males and females.<sup>36-39</sup> Scientists in California report that even moderate zinc deficiency results in disruptions in normal growth and maturation among rhesus monkeys, and behavioral changes, including lethargy, may precede physical manifestations of deficiency.<sup>40,41</sup> The same appears to hold true for humans. Zinc deficiency is linked to deficits in healthy bone mineralization, and has been linked to short stature and developmental delays.<sup>36-39</sup>

According to researchers in California who conducted a meta-analysis of clinical trials examining the effects of zinc supplementation on children's growth, "Zinc supplementation produced highly significant, positive responses in height and weight

increments.”<sup>42</sup> Researchers in Turkey recently reported that zinc supplementation stimulates the production of insulin-like growth factor 1 (IGF-1) and other proteins and polypeptides involved in bone and overall growth.<sup>43</sup> IGF-1 responds directly to growth hormone and is responsible for regulating the growth and development of a wide range of cells, as well as DNA synthesis.

Zinc also plays a key role in spermatogenesis, the process by which the male testes produce sperm capable of fertilizing an egg, or ovum. Numerous studies comparing fertile and infertile men have demonstrated that zinc is abnormally low in the blood serum and seminal fluid of infertile men.<sup>44-47</sup> Replenishing zinc levels may thus be helpful in optimizing male fertility.



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#### MILD ZINC DEFICIENCY "COMMON" IN THE US

Zinc deficiency affects more than 2 billion people in both developing and developed nations.<sup>49</sup> Moreover, zinc and iron deficits often go hand in hand.

A diet lacking adequate sources of bioavailable zinc (such as red meat) and high in dietary fiber (vegetarian or grain-based diets) carries a double risk of zinc deficiency. Certain dietary fibers, calcium, and phytates (present in cereal products, legumes, and nuts) effectively block zinc absorption, while lack of beef (the richest natural source of zinc) leads to an inadequate dietary supply of this essential nutrient. Because beef is also the best source of bioavailable iron (except for certain artificially fortified foods), low zinc and low iron often occur simultaneously. Low iron in the bloodstream leads to iron-deficiency anemia, characterized by listlessness in adults and physical and neurological abnormalities in young children.<sup>50,51</sup>



According to University of Texas researcher Harold Sandstead, data from the Third National Health and Nutrition Examination Survey (NHANES III) suggest that "mild [zinc] deficiency is . . . common in the US."<sup>52</sup> It may well be important, therefore, to supplement one's diet with zinc on a daily basis. The Institute of Medicine has established a zinc RDA value for men of 11 mg/day. For women, the RDA ranges from 8 mg/day for healthy adult women to 14 mg/day for lactating women. Alcoholism and chronic diarrhea may seriously deplete zinc stores, and evidence suggests that the elderly suffer zinc deficiency more commonly than younger adults.<sup>53</sup>

Long-term supplementation with high levels of zinc may deplete copper levels.<sup>54</sup> Thus, individuals supplementing with zinc may need to supplement concomitantly with copper.

#### ZINC DEFICIENCY THREATENS DEVELOPING NATIONS

Zinc's value extends far beyond its ability to boost antioxidant defenses, strengthen immunity, and relieve cold symptoms. Particularly in developing nations, ensuring adequate zinc intake may be a matter of life or death, particularly for children.

Infectious pathogens associated with contaminated water, such as typhoid fever and cholera, are endemic in developing nations, where they cause dangerously dehydrating diarrhea. Children are at special risk. In countries where zinc is often deficient in the diet, zinc supplementation has been shown to reduce infant mortality and decrease susceptibility to pneumonia, diarrhea, skin infections, and fever.<sup>31-33</sup> In fact, the World Health Organization and the United Nations Children's Fund have endorsed zinc supplementation as a cost-effective treatment for diarrhea, which may be life threatening to vulnerable children.

Scientists in India recently noted that "a large section of the world population is at risk of developing zinc deficiency."<sup>34</sup> Traceable to inadequate zinc content in the soil and a diet heavily reliant on cereals and grains, zinc deficiency is believed to be responsible for a variety of ailments. According to the Indian scientists, "Zinc deficiency in children results in stunting, underweight, and increased risk of infections like diarrhea and pneumonia."<sup>34</sup> One researcher noted that infant mortality is significantly reduced when zinc supplements are given to low-birth-weight babies for one year, adding that "zinc deficiency may have adverse effects on physical growth and neurodevelopment."<sup>35</sup>

#### CONCLUSION

Overwhelming scientific evidence from around the world underscores the critical importance of zinc to human health. Given this preponderance of evidence indicating zinc's utter

**ZINC PROMOTES HEALTHY SKIN IN CHILDREN**

indispensability to health—and the widespread prevalence of zinc deficiency—it is prudent to include this potent micronutrient in one's daily vitamin/mineral regimen.

Infants and children are prone to developing dermatitis, an itchy, inflammatory skin condition. When zinc was orally administered to zinc-deficient infants suffering from dermatitis, all experienced a resolution of their symptoms.<sup>48</sup>

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