

Life Extension Magazine March 2014

Report

## Getting Back To Basics ... How Low-Cost Zinc Helps Combat Deadly Immunosenescence

By Heath Ramsey

Zinc is required by the body for more than 2,000 transcription factors involved in gene expressions of various proteins.<sup>1</sup> What this means in everyday language is that thousands of essential biological functions are dependent on zinc.

The medical community has known of zinc deficiency for more than 50 years, but the health impact of this crucial mineral has been largely ignored by global health organizations. Extensive scientific inquiry has made it clear that nutritional deficiency of zinc is widely prevalent and its morbidities are severe.<sup>1</sup>



Overwhelmingly, the elderly are deficient in zinc<sup>1</sup>. Because zinc governs so many biological functions, a simple zinc deficiency can affect multiple facets of health and development.<sup>1</sup> The result is a decline in our body's vigilant immune system, opening the door for an onslaught of numerous diseases. A zinc deficiency contributes to atherosclerosis, cancer, neurological disorders, autoimmune diseases, and other age-related chronic conditions.<sup>2</sup>

One target that researchers are focusing on is the fact that a zinc deficiency can cause your immune system to decline, a phenomenon known as **immunosenescence**. This decline in immunity places older adults at increased risk for a range of almost every serious disease, from infections and cancer.<sup>3</sup>

Fortunately, supplementing with the proper amount of zinc can provide life-saving benefits against the diseases of aging. Studies have shown that zinc supplementation in the elderly can restore normal function of the killer cells that attack virally-infected and cancerous cells as well as boost the immune system's anti-aging mechanisms.<sup>4-6</sup>

Adequate zinc levels have been found to reduce the risk of infection as well as decrease oxidative and inflammatory markers.<sup>7</sup>

Even if zinc levels are adequate, supplementing with zinc may offer additional protection against cancer. In animals with normal zinc levels, the number of experimentally-induced tumors was **28%** lower when the animals were given a modest zinc supplement.<sup>8</sup>

There is no reason that this readily available and inexpensive mineral should not be an essential component of your personal health program against the dangers of immunosenescence.

### Immunosenescence: The Waning Of The Immune System

Zinc deficiency is rampant among older adults. As with so many other essentials, zinc levels decrease with age.<sup>9</sup> But that's only part of the problem.

Another major cause is that people simply don't get enough of this nutrient on a daily basis. The government's minimum recommended daily allowance (RDA) of zinc is just **15 mg**. Yet **35%** to **45%** of people older than 60 don't even get half of that.<sup>10-13</sup>

Scientists now believe that zinc deficiency plays a direct role in the aging of the immune system, known as **immunosenescence**.<sup>14</sup>

In immunosenescence, there's a *decrease* in the immune system cells that normally identify and destroy abnormal cells (such as bacteria, virally-infected cells, and cancer cells).<sup>15</sup> That leaves older adults increasingly vulnerable to infections and cancers, while making vaccinations less effective as well.<sup>16</sup>

Immunosenescence also increases the frequency and severity of autoimmune disorders (such as rheumatoid arthritis and lupus), in which the immune system attacks and destroys healthy body tissue.<sup>16</sup> In addition, immunosenescence leads to the loss of regulatory control, which adds to the total burden of inflammation in the body, leading to atherosclerosis, osteoporosis, and further heightening the risks of cancer.<sup>14,17</sup>

## Battle Immunosenescence With Zinc



Immunosenescence is a very complex process that is still being understood by researchers. However, what scientists are now realizing is that the immune system in the elderly is the result of a continuous remodelling process.<sup>18</sup> That means it's possible to fight against this phenomenon of aging—for which zinc is a vital component. There are remarkable similarities between immunosenescence and zinc deficiency, similarities so striking that scientists now believe they can't be coincidental.<sup>19,20</sup>

A deficiency in zinc reduces the activity of the thymus gland, which prevents the production of essential “killer” T-cells. This shifts the balance to “suppressor” cells that reduce the immune response.<sup>21</sup>

Low zinc levels also increase the occurrence of autoimmunity and excessive inflammation (as is seen in immunosenescence).<sup>20</sup> Even borderline low levels of zinc can impair immune functioning and decrease the response to vaccinations.<sup>19,21</sup> While inadequate zinc is not likely to be the *only* cause of immunosenescence, it appears to be one of the main contributors.

What this means to you is that by restoring zinc levels to those found in younger people, we may be able to slow immunosenescence and protect ourselves against cancer, infection, autoimmunity, and chronic inflammation.<sup>21</sup>

Zinc supplementation in the elderly has been shown to confer the following benefits:

- Restore normal function of the killer cells that go after virally-infected and cancerous cells.<sup>4,5</sup>
- Boost the stress response of white blood cells from older adults, providing an immune system anti-aging mechanism.<sup>6</sup>
- Boost the immune response to vaccines, which are becoming increasingly vital to protecting older adults from dangerous infections.<sup>5,22</sup>
- Improve cellular immunity and increase survival rates in older mice.<sup>19,23</sup>

Zinc supplementation is so widely recognized as essential to healthy immune system support that it now figures broadly in international health programs aimed at reducing the death tolls from diseases such as severe diarrhea, malaria, and tuberculosis.<sup>24-27</sup>

## Guard Immune Health With Zinc

- Immunosenescence, the aging of the immune system, is a major contributor to the higher rates of serious infections and cancers seen in older adults.
- A major contributor to immunosenescence is falling zinc levels, which occur in a large proportion of people as they age.
- Zinc deficiency, therefore, is closely related to the risk of infection and cancer, and is also being seen in obese people and those with diabetes.
- Supplementation with zinc has been shown to enhance the aging immune system's performance, reducing the risks of infections, cancers, and obesity/diabetes.
- Zinc deserves a prominent place in your supplement regimen for all of these reasons.



## Zinc Battles Infections

Infections, especially those of the respiratory system, are a serious threat to the health of adults over 60 years old. Supplementing with zinc can help lower the risk of these dangerous infections in older adults.

One study showed that a daily **45 mg** dose of zinc reduced the incidence of all infections, including those of the respiratory tract, in elderly adults.<sup>7</sup> And at a very high dose (**80 mg/day**), zinc was found to reduce overall deaths by **27%** over an median of 6.5 years.<sup>28</sup> (Please note: Zinc should not be consumed at doses higher than **90 to 100 mg/day**; at those doses it can have a negative effect on immunity and may produce urinary tract symptoms.<sup>3,29</sup>)

Two specific threats for which zinc has proven effective include pneumonia and influenza.

**Pneumonia** is one of the leading causes of death in the US for older adults.<sup>28</sup> Pneumonia is prevalent in this age group precisely because of *immunosenescence*, the waning protection against infection. But remember, immunosenescence can be a direct result of **zinc deficiency**. That helps explain why people with low zinc status are even more likely to get pneumonia and to have a more severe infection, are more likely to need more antibiotics for longer, and are more likely to die from pneumonia, than are people with healthy zinc levels.<sup>29</sup>

Fortunately, studies show that simply restoring zinc to normal levels helps combat pneumonia, reducing its incidence by as much as **41%**, cutting new antibiotic prescriptions nearly in half, and shortening the duration of the illness.<sup>30</sup> In a two-year study of nursing home residents, daily supplementation with **20 mg** of zinc and **100 micrograms** of selenium decreased the average number of respiratory infections compared with patients taking a placebo.<sup>31</sup>

Another larger study showed that the same doses of zinc and selenium improved antibody production in elderly people after a vaccination against pneumonia-causing germs.<sup>32</sup>

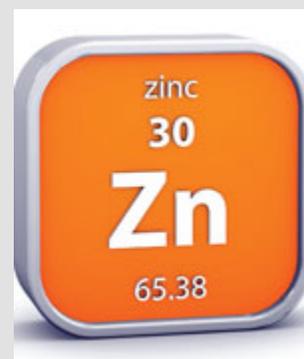
Zinc has also been found to be beneficial against **influenza**, another infection that can be especially dangerous for older adults. Influenza virus infection of lung tissue produces rapid destruction of cells through inflammation and *apoptosis*.<sup>33</sup> Zinc has the ability to directly combat these negative effects of influenza.

Lab studies show that zinc supplementation of cells in culture blocks the inflammatory response, shuts down the self-destructive cycle of apoptosis, and reduces the release of new viruses from the fragmented cells.<sup>33,34</sup>

Human studies confirm these results. Most importantly from a prevention standpoint, supplementation with zinc markedly enhances the response to influenza vaccines among older adults.<sup>23,32,35</sup> An increase in anti-influenza antibody occurred in **87%** of supplemented people and just **41%** of controls. In response to the vaccine, supplemented subjects achieved white blood cell proliferation that was **tenfold** that of the control group.<sup>35</sup>

#### ADDITIONAL BENEFITS OF ZINC

Zinc has an impact on a wide variety of diseases. Today we can say with confidence that zinc plays an important role in **cardiovascular disease** (where it improves lipid profiles),<sup>60-66</sup> in **neurological disorders** and cognition (where it may improve mental performance and decrease the risk of depression),<sup>9,67-77</sup> and in preventing **age-related macular degeneration**, a leading cause of blindness in the elderly.<sup>78-83</sup>



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### Support Your Body's Anti-Cancer Surveillance System

Whether you realize it or not, every one of us experiences dozens of pre-cancerous cell changes daily. The reason we don't all develop malignancies every day is thanks to the aggressive anti-cancer surveillance by the body's immune system, particularly the aggressive "natural killer" cells that seek out and destroy abnormal cells.<sup>36</sup>

Zinc is absolutely essential for this anti-cancer surveillance system to function properly. That's why, when zinc levels drop, we see a substantially higher rate of cancer, especially in the mouth, esophagus, and stomach.<sup>37</sup> The tissues of your digestive tract are particularly vulnerable because they're more exposed to the outside toxins that we ingest.

Restoring your body's levels of zinc prevents loss of natural killer cell function, reduces the inflammation that promotes cancer, and reduces cancer cells' ability to grow new blood vessels.<sup>36,38-40</sup> As a result, zinc supplementation has been associated with a reduced incidence and/or progression of tongue, esophageal, stomach, and colon cancer in animals with zinc deficiencies.<sup>8,37,41-45</sup>

Zinc offers additional protection against cancer by starving tumors of the glucose they need to grow and spread. Cancer cells take up glucose at a very high rate compared with non-malignant tissues; that's presumably because the rapidly-growing tumors have exceptionally high energy requirements.<sup>46</sup> Zinc supplements appear to reduce glucose uptake in malignant cells, thus reducing the availability of energy cancer cells need to replicate and progress.<sup>46</sup>

Zinc is important in cancers outside of the digestive tract as well. The risk of non-Hodgkin's lymphoma, a common blood cancer, is **42%** lower in people with higher levels of zinc compared to those with lower levels.<sup>47</sup> And among patients with head and neck cancers, nearly **65%** were found to be zinc deficient.<sup>39</sup>

Prostate cancer is also sensitive to zinc. Normally the prostate contains tenfold the amount of zinc found in other soft tissues, but zinc accumulation in prostate tissue decreases shortly after prostate cancer begins.<sup>48</sup> Supplementation restores normal prostate zinc levels and reduces levels of a promoter of tumor growth (IGF-1).<sup>48</sup> Supplementation also supports natural antioxidant enzymes in the prostate; those enzymes are impaired as the result of high oxidant stresses imposed by growing malignancies.<sup>49</sup>

Even if your zinc levels are adequate, supplementing with zinc could offer additional protection against cancer. In animals with normal zinc levels, the number of experimentally-induced tumors was **28%** lower when the animals were given a modest zinc supplement.<sup>8</sup>

#### DIETARY SOURCES OF ZINC<sup>10</sup>

Food	Mg of zinc per serving
Oysters	74.0
Beef chuck roast	7.0
Lobster	3.4
Pork loin	2.9
Baked beans	2.9
Chicken	2.4
Yogurt	1.7
Cashews	1.6



- Minimum RDA of zinc is **15 mg** according to the government. Optimal supplemental doses for aging humans may be five times higher—up to **80 mg** daily.<sup>86</sup>
- Although it's possible to get zinc from plant sources, your body can't utilize it as well because molecules found in breads, cereals, and legumes can bind the zinc and prevent your body from absorbing it.<sup>10</sup>

## Diabetes And Obesity

The science demonstrating zinc's importance in preventing diabetes and its consequences is so strong that zinc has become widely accepted as an important supplement for those at risk for—and even those already suffering from—diabetes.

In addition, zinc is involved in the synthesis, storage, and release of insulin. Zinc deficiency is associated with insulin resistance, impaired glucose tolerance, and obesity. In a study of obese individuals supplemented with **30 mg** zinc for one month, researchers found significant reductions in body weight, body mass index (BMI), and triglycerides.<sup>50</sup>

Studies show that supplementation with zinc lowers both fasting and after-meal glucose levels and reduces the long-term measure of blood glucose called *hemoglobin A1c*.<sup>51-55</sup> Zinc supplementation also improves insulin sensitivity and lowers insulin levels, a major factor in people with “pre-diabetes” (impaired fasting glucose).<sup>56-58</sup>

Higher blood levels of zinc are associated with the following:

- **10 to 15%** decrease in the risk of **diabetes**.
- **34 to 43%** lower risk of **glucose intolerance**.
- **12 to 13%** reduction in **central obesity**.
- **23 to 43%** reduction in **coronary artery disease**.<sup>59</sup>

In another study, body weight and body mass index decreased following supplementation with **20 mg** of zinc.<sup>58</sup> That's particularly important because of the relationships between obesity, high insulin levels, and cancer. Zinc supplementation also markedly improves **nerve conduction velocity**, a measure of diabetic nerve damage.<sup>52</sup>

#### ZINC AND COPPER: A BALANCING ACT

Research has shown that higher dosing of supplemental zinc has produced significant benefit.<sup>86</sup> However, long-term supplementation of zinc at doses above around **50 mg** can interfere with copper bioavailability and result in deficiency of copper.<sup>87</sup> High intake of zinc induces the intestinal synthesis of a copper-binding protein called metallothionein.<sup>87</sup> Metallothionein traps copper within intestinal cells and prevents its systemic absorption. Copper deficiency can lead to clinical manifestations such as anemia, low levels of neutrophils (the most abundant type of white blood cell), and bone abnormalities, including fractures.<sup>88</sup> Low levels of copper can also lead to increased concentration of total cholesterol and LDL cholesterol, reduction of HDL cholesterol, diminished glucose tolerance, and altered cardiac rhythm.<sup>88</sup> Individuals supplementing with more than **50 mg** of zinc on a chronic basis should consider supplementing with **2 mg** of copper daily to address the risk of copper deficiency associated with high zinc ingestion. Short term supplementation of high doses of zinc is unlikely to affect copper distribution in the body.<sup>87</sup>



## Summary

Immunosenescence, the aging of the immune system, is a major contributor to the higher rates of serious infections and cancers seen in older adults. Although immunosenescence was previously thought of as a natural effect of aging, scientists now believe that it could be caused in part by a deficiency in zinc.

That means that something as simple as supplementing with zinc could slow or reverse immunosenescence. Studies show that supplementing with zinc reduces the risk of serious infections such as pneumonia and influenza. Lab studies also demonstrate a remarkable cancer-preventive effect of supplementary zinc. Even the twin scourges of obesity and diabetes show signs of yielding to zinc therapy, with improved measures of blood glucose and reduced body mass, as well as fewer diabetic complications such as nerve and kidney damage.

If you are not taking a zinc supplement today, you should consider it to minimize the impact of *immuno-senescence* on your body.

If you have any questions on the scientific content of this article, please call a **Life Extension**<sup>®</sup> Health Advisor at 1-866-864-3027.

Health Concern	Impact of Insufficient Zinc
Immune Function	Increased susceptibility to pneumonia and other infections <sup>28</sup>
Wound Healing	Slow or incomplete wound healing <sup>84</sup>
Gastrointestinal Health	Worsening of inflammatory bowel diseases and increased production of inflammatory cytokines <sup>85</sup>
Vision	Increased risk of age-related macular degeneration (AMD) <sup>78-83</sup>
Cardiovascular Health	Increased plasma lipids, markers of atherosclerosis <sup>62</sup>
Cancer	Diminished immune surveillance against cancer cells <sup>39</sup>
Diabetes	Decreased blood sugar control <sup>55</sup>
Neurological and Mental Health	Increased risk of depression; decreased cognitive performance <sup>9,77</sup>

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