

Editorial

Fighting Diabetes with the Power of Zinc

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Received: March 01, 2014; **Accepted:** March 05, 2014;

Published: March 14, 2014

It has been well established and highly publicized in research literature and clinical use that antioxidants, like zinc, are good for human health. A new and exciting research field has set out to prove that antioxidants, specifically zinc, are not only good for human health, but also good for diabetes [1]. These new findings have been demonstrated and confirmed in basic science research experiments over the past five years, but its novelty, and failure to capture the media's eye has kept them from becoming breaking news.

For those of us who need a recap, zinc is an essential trace metal vital for many biological functions in the human body [1]. Zinc plays a crucial role in more than 300 enzymes residing in the body, which as a whole, contains about 2-3 grams of zinc. Zinc is found in organs, tissues, bones, muscles, fluids and cells. Muscles and bones contain most of the body's concentration of zinc (90%) while particularly high amounts are found in the prostate gland and semen [1].

Adults need zinc in order to maintain good health. Zinc is vital for promoting healthy hair, skin, and nails and is required for a proper sense of taste and smell. Zinc plays an integral role in immune function, protein synthesis, wound healing, DNA synthesis and cell division. Zinc is also important for lipid, carbohydrate, and protein metabolism, as well as cell signal transduction, and reduction-oxidation regulation. In males, zinc has been shown to protect the prostate gland from infection and enlargement, which has been linked to being a risk for prostate cancer. In females, zinc can help treat menstrual problems and alleviate associated symptoms. Zinc may also protect from night blindness and prevent the development of cataracts. Children need zinc to grow, maintain a healthy body weight, fight off diseases such as pneumonia, diarrhea and diabetes, as well as shorten the length of the common cold [1-3].

What does zinc have to do with Diabetes, you ask? First, it has been proven in our lab and others that much of the end organ damage caused by diabetes is due to oxidative stress. This leads to many common and well-known complications of diabetes, such as cardiomyopathy, nephropathy and neuropathy [1,3]. This oxidative stress induced organ damage can be halted, and in some cases, even reversed by the induction of a potent antioxidant called metallothionein. Metallothionein is a metal binding protein that protects cells and tissues from oxidative-stress induced damage. Zinc happens to be a strong inducer of metallothionein making zinc a great

candidate for helping to prevent the onset or progression of diabetes and diabetes complications [4].

Also, Zinc has insulin like effects on cells by promotion of lipogenesis and promotion of glucose transport. This suggests that zinc may stimulate tissues to: enhance insulin signaling, use glucose, maintain normal lipid metabolism, and maintain normal cellular functions. So why not take a zinc supplement? Not only is zinc safe, but it is recommended for our body. Excess zinc is readily removed from the body via excretion in feces or removed from the blood by the pancreas or liver. Zinc has a low toxicity profile making it safe to use in children. A daily intake of zinc is required for our body in order to maintain a steady state because the body has no specialized zinc storage system. The recommended daily allowance for zinc is about 8-11mg per day, the exact dosage being based on age and gender.

Still not convinced that you should be taking zinc? Let's review what we know. We know that most type-2 diabetics, prediabetics, and obese patients suffer from zinc deficiency or decreased total body zinc. Hyperglycemia, rather than any primary lesion related to diabetes, causes increased urinary loss and a decrease in total body zinc. Zinc supplementation may qualify as a potential treatment adjunct in type-2 diabetes and prediabetes by promoting insulin signaling and subsequent euglycemia, especially in zinc deficient patients. We know that zinc deficiency exacerbates diabetes induced testicular and hepatic damage and zinc supplementation prevents the onset or progression of diabetic cardiomyopathy. We have also recently demonstrated in our lab that zinc supplementation prevents the development and or the progression of diabetic nephropathy [2,3].

We know that diabetics are considered to be immunocompromised patients. Zinc treatment has the ability to correct plasma zinc levels to normal values as well as enhance the body's percentage of CD4 T-cells indicating that zinc supplementation might be useful to enhance immune status. In some recent animal studies and clinical trials, zinc supplementation has been shown to control glucose levels, correct lipid metabolism, maintain normal blood pressure, and act as an anti-inflammatory agent. Lastly, zinc supplementation has been shown to produce metabolic effects and trends toward improvements in liver function, hepatic encephalopathy, and nutritional status. This may show promise for advances in treatment of Nonalcoholic Fatty Liver Disease, a condition commonly associated with obesity and type-2 diabetes.

In closing, taking a zinc supplement could not only help children and adults live stronger healthier lives, but new research is showing that it zinc can also do that for diabetic and prediabetic patients alike. The future clinical implications for zinc in treating diabetes and diabetes complications is very exciting [3,5], as well as showing great promise for future success. I look forward to keeping you updated on this new research field's progress.

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