

Zinc Deficiency Worsens Sepsis, Causes 'Catastrophic Malfunctioning' of Immune System, Increases Inflammation

By David Gutierrez, *Natural News*



Zinc appears to play a key role in modulating the body's response to severe infection, and deficiency may increase susceptibility to a lethal immune reaction, according to a study conducted by researchers from Ohio State University and published in the journal *PLOS ONE*.

"When the body detects an infection, zinc is recruited to help produce immune response proteins, and then it's used to stop their production," lead author Daren Knoell, PharmD, PhD, said. "But zinc deficiency during sepsis appears to cause a catastrophic malfunctioning of the system, resulting in a magnified and prolonged inflammatory response."

The study was funded by the National Heart, Lung, and Blood Institute and received biostatistics support from the Ohio State Center for Clinical and Translational Science.

Zinc prevents immune over-reaction

Sepsis is a body-wide inflammatory reaction in response to a severe infection and is one of the main causes of death in intensive care units in the United States. One-fifth of all cases result in death, because the overload of inflammatory chemicals produced by the immune system eventually causes organ failure.

Prior research by the same team found that, when zinc-deficient mice developed sepsis, they were three times more likely to die than non-deficient mice with the same condition. They also found that, when zinc-deficient mice received zinc supplements, their sepsis survival rate improved.

In another study, the researchers discovered that zinc helps regulate the activity of an immune protein called IKK-beta, part of the NF-kappaB immune-regulating pathway. In the presence of more zinc, the pathway successfully lowers levels of inflammation and cell

damage.

The new study expands upon this work.

"This research builds upon our past findings and further demonstrates that our immune system requires zinc to achieve a balanced and effective defense against overwhelming infection," Knoell said. "This new evidence provides further incentive to determine the extent to which zinc may be useful to prevent or treat sepsis, particularly in patients that may be zinc deficient."

Can zinc prevent Alzheimer's, heart disease?

In the new study, the researchers performed a genome-wide microarray analysis on DNA taken from the lung tissue of zinc-deficient mice with sepsis. They had to examine the entire genome because zinc plays so many roles in the body -- interacting with as many as 10,000 separate proteins -- and its specific effects can therefore be hard to pinpoint through larger-scale observation.

The researchers found that, when mice were suffering from sepsis, zinc deficiency caused changes in several different pathways, particularly the JAK-STAT3 pathway, which regulates the production of the inflammatory protein serum amyloid A (SAA). These changes prevented the body from being able to deactivate its inflammatory response, eventually leading to the destruction of healthy cells.

"Without zinc present in sufficient quantities, the JAK-STAT pathway keeps giving the genes the 'on' signal, and continues production of this inflammatory protein," Knoell said. "When we add zinc back into the equation, it stops JAK-STAT, SAA production and the acute response activity."

Knoell noted that SAA has also been linked with other inflammatory diseases, including cardiovascular and Alzheimer's disease.

"These findings not only provide some evidence for why zinc-based cold remedies may work, but also provide hints of how a zinc imbalance might also play a role in chronic diseases connected with inflammation," he said.

Unfortunately, doctors cannot prevent sepsis simply by supplementing deficient patients after they become sick. Instead, it is important that people get enough zinc in their diet and avoid deficiency in the first place.

"During illness, the body diverts zinc from the blood to the organs, so a deficiency is hard to detect, particularly in people who are already sick," Knoell said. "Without a way to better define the deficiency, we aren't able to define the ideal patient or a therapeutic dose of zinc."

Sources for this article include:

<http://www.newswise.com>

<http://www.plosone.org>

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