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Zinc deficiency linked to immune system response, particularly in older adults

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Oysters are high in zinc. Credit: Oregon State University

Zinc, an important mineral in human health, appears to affect how the immune system responds to stimulation, especially inflammation, new research from Oregon State University shows.

Zinc deficiency could play a role in chronic diseases such as cardiovascular disease, cancer and diabetes that involve inflammation. Such diseases often show up in older adults, who are more at risk for zinc deficiency.

"When you take away zinc, the cells that control inflammation appear to activate and respond differently; this causes the cells to promote more inflammation," said Emily Ho, a professor and director of the Moore Family Center for Whole Grain Foods, Nutrition and Preventive Health in the OSU College of Public Health and Human Sciences, and lead author of the study.

Zinc is an essential micronutrient required for many biological processes, including growth and development, neurological function and immunity. It is naturally found in protein-rich foods such as meat and shellfish, with oysters among the highest in zinc content.

Approximately 12 percent of people in the U.S. do not consume enough zinc in their diets. Of those 65 and older, closer to 40 percent do not consume enough zinc, Ho said. Older adults tend to eat fewer zinc-rich foods and their bodies do not appear to use or absorb zinc as well, making them highly susceptible to zinc deficiency.

"It's a double-whammy for older individuals," said Ho, who also is a principal investigator with the Linus Pauling Institute.

In the study, researchers set out to better understand the relationship between zinc deficiency and inflammation. They conducted experiments that indicated zinc deficiency induced an increase in inflammatory response in cells. The researchers were able to show, for the first time, that reducing zinc caused improper immune cell activation and dysregulation of a cytokine IL-6, a protein that affects inflammation in the cell, Ho said.

Researchers also compared zinc levels in living mice, young and old. The older mice had low zinc levels that corresponded with increased chronic inflammation and decreased IL-6 methylation, which is an epigenetic mechanism that cells use to control gene expression. Decreased IL-6 methylation also was found in human immune cells from elderly people, Ho said.

Together, the studies suggest a potential link between zinc deficiency and increased inflammation that can occur with age, she said.

The findings were published recently in the journal *Molecular Nutrition & Food Research*. Co-authors are Carmen P. Wong and Nicole A. Rinaldi of the College of Public Health. The research was supported by the Oregon Agricultural Experiment Station, Bayer Consumer Care AG of Switzerland, and OSU.

Understanding the role of zinc in the body is important to determining whether dietary guidelines for zinc need to be adjusted. The recommended daily intake of zinc for adults is 8 milligrams for women and 11 milligrams for men, regardless of age. The guidelines may need to be adjusted for older adults to ensure they are getting enough zinc, Ho said.

There is no good clinical biomarker test to determine if people are getting enough zinc, so identifying zinc deficiency can be difficult. In addition, the body does not have much ability to store zinc, so regular intake is important, Ho said. Getting too much zinc can cause other problems, including interfering with other minerals. The current upper limit for zinc is 40 milligrams per day.

"We think zinc deficiency is probably a bigger problem than most people realize," she said. "Preventing that deficiency is important."

Understanding why older adults do not take in zinc as well is an important area for future research, Ho said. Additional research also is needed to better understand how zinc works in the body, she said.

More information: *Molecular Nutrition & Food Research*, onlinelibrary.wiley.com/doi/10 … r.201400761/abstract

Provided by Oregon State University