

Study: Folate helps repair damage linked to aging and disease

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(PhysOrg.com) -- For more than half a century, scientists have known the importance of folate for good health, especially for expectant mothers. But now, researchers at the University of Florida have discovered an entirely new role the vitamin plays in maintaining health: it helps moderate oxidative stress, which is linked to aging and disease.

Moreover, the researchers found that [folate](#), through an intermediary [protein](#), plays this role in virtually every living thing on the planet.

This is more evidence that folate has likely been an important element to survival on Earth for billions of years, said Andrew Hanson, a biochemist with UF's Institute of Food and Agricultural Sciences.

"This heretofore hidden role has likely been with us since the dawn of life," said Hanson, who designed and led the study along with researchers Valérie de Crécy-Lagard, Jeffrey Waller and Jesse Gregory. "I think it illustrates just how much more biochemistry is left to learn about ourselves and the life around us."

The team's findings, published online this week in *Proceedings of the National Academy of Sciences*, represent the first new role for folate uncovered in more than a decade.

Since the 1960s, researchers have been studying how the water-soluble vitamin supports the healthy functioning of cells. They discovered that it's essential for cell division and replication, making it especially important for expectant mothers.

It's also important to proper replication of DNA and RNA — a lack of folate has been linked to genetic mutations that can lead to cancer.

Folate is commonly found in leafy green vegetables like spinach and turnip greens. Since 1998, the U.S. Food and Drug Administration has mandated that many foods, such as rice, flour and cornmeal, be enriched with a synthetic folate known as folic acid.

While folate deficiency is no longer a problem in the U.S., it remains widespread in developing nations and much of Europe, where enriching grain products is not widely practiced.

This new research, funded by the National Science Foundation and originally sparked by funding from the U.S. Department of Energy, links folate to the production or repair of compounds called iron-sulfur clusters through a recently discovered intermediary protein called COG0354.

These clusters are part of the mechanism cells use to produce energy and carry out other vital reactions. But they are also sensitive to a byproduct of the energy-producing process: highly reactive oxygen-based molecules, some of which are called free radicals.

The [oxidative stress](#) caused when these molecules pollute a cell has been linked to cell death and aging, as well as to conditions such as atherosclerosis, Parkinson's disease, heart disease, Alzheimer's, fragile X syndrome and many more.

Examining the folate-iron-sulfur cluster link required the team to pull experience from not only UF's microbiology and cell science and food science and human nutrition departments, but also the McKnight Brain Institute and the National High Magnetic Field Laboratory.

Expertise from the latter two institutions was needed because the researchers used nuclear magnetic resonance analysis to observe folate interacting with COG0354 protein — molecular-scale activity that could otherwise only have been shown indirectly, said Arthur Edison, the NHMFL’s director of chemistry and biology and an associate professor with UF’s biochemistry and molecular biology department.

The researchers have found that COG0354 is present in creatures from each of the six kingdoms of life, from mice and plants to one-cell organisms that may predate bacteria.

The findings will open new avenues of study into the overall mechanism of oxidative stress repair, and may someday lead to new medicines. For now, the researchers emphasize that this is another example of the vitamin’s importance in one’s diet.

Provided by University of Florida

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