Vitamin E identified as potential weapon against obesity

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A potential new way to fight obesity-related illness has been uncovered, thanks to serendipitous research led by investigators at the Case Western Reserve University School of Medicine.

The collaborators, from Case Western Reserve University, the Cleveland Clinic Foundation and Cornell University, discovered the essential nutrient vitamin E can alleviate symptoms of liver disease brought on by obesity. "The implications of our findings could have a direct impact on the lives of the approximately 63 million Americans who are at potential risk for developing obesity-related liver disease in their lifetimes," says Danny Manor, an associate professor at the Case Western Reserve University School of Medicine.

On Wednesday, April 24, Manor and colleague Varsha Thakur will present the group's findings at the annual meeting of the American Society for Biochemistry and Molecular Biology, held in conjunction with the Experimental Biology 2013 meeting in Boston.

As is often the case in science, Manor's research team at Case Western stumbled upon the findings entirely by accident. While studying the effect of vitamin E deficiency on the central nervous system, "we used liver tissue to practice our surgical techniques," recalled Manor, an associate professor of nutrition and pharmacology. To the team's surprise, they realized that the mice were in fact in the advanced stages of nonalcoholic steatohepatitis. Known as NASH for short, it's a common complication of obesity characterized by fat accumulation,

oxidative stress and inflammation in the liver. It is the most severe form of nonalcoholic fatty liver disease and is a major cause of tissue scarring known as cirrhosis that leads to liver failure and may progress to liver cancer.

An essential antioxidant, vitamin E had been shown by recent studies to alleviate some symptoms of NASH in human patients, suggesting that there is a link between adequate vitamin E levels and liver disease. To test this hypothesis, the team studied a mouse that was engineered to lack a protein that regulates the levels of vitamin E in the body. As expected, they observed increased oxidative stress, fat deposition and other signs of liver injury in the mice. Importantly, points out Manor, "supplementation with vitamin E averted the majority of NASH-related symptoms in these animals, confirming the relationship between vitamin E deficiency and liver disease."

The precise effects of vitamin E on health have previously been difficult to ascertain, though its antioxidative properties were suggested to offer some protection from a variety of well-known maladies, including heart disease, cancer and neurological diseases such as Alzheimer's and Lou Gehrig's disease (amyotrophic lateral sclerosis, or ALS).

"These findings may have a significant impact on public health," says Manor, "as the vast majority of adults in the United States do not consume the amount of vitamin E recommended by the National Institute of Medicine."

For adults, the recommended dietary allowance of vitamin E is 15 milligrams a day. Vegetable oils, nuts and seeds, leafy greens and fortified cereals commonly contain vitamin E.

"Simple and affordable dietary intervention may benefit people at risk for this debilitating disease," Manor says.

There is currently no treatment for NASH, making it one of the most common reasons for liver transplantation. Manor also points out that "NASH piggybacks on the two great epidemics of our time: obesity and Type 2 diabetes."

According to the Centers for Disease Control and Prevention, obesity affects more than one-third of adults and one-sixth of children in the U.S., while nearly one in 10 Americans today suffers from diabetes, rates that have been climbing over the past two decades. Thus, for Manor, the significance of his group's findings is not only the possibility that they will aid those who are currently sick but that they may also "affect many people who are presently healthy, but are at risk for becoming obese or diabetic in the future."

Moreover, Manor believes that his group's discovery will be key to determining the molecular details of NASH itself. "Right now, we really don't understand how NASH progresses from mild liver damage to severe liver failure," he said. "Our results will enable us to dissect the different steps in this progression, as well as study how oxidative stress affects liver function more generally, giving possible insights into other related disorders."

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