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# Metabolic syndrome leads one in three Americans to need more vitamin E

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New research shows that the estimated one-third of Americans who have a cluster of health problems that add up to metabolic syndrome don't absorb dietary vitamin E as effectively as healthy people.

The same study also had good news for the whole population: Cow's milk with or without fat promotes absorption of the natural form of vitamin E found in foods.

People in the study who drank milk along with the natural form of vitamin E absorbed between 26.1 and 29.5 percent of the vitamin, depending on their health status. Participants with metabolic syndrome absorbed less vitamin E than healthy people in the study, which concerns researchers because these individuals probably receive less of the beneficial antioxidant properties of vitamin E.

Previous research has shown that on average, humans absorb about 10 percent of a dose of the most common vitamin E supplement if it is eaten without any fat. The percentage of vitamin E absorbed after it is consumed refers to its bioavailability, or how much of a given dose reaches the bloodstream. Its bioavailability is influenced by processes that regulate fat absorption and the delivery of fat to the bloodstream.

Metabolic syndrome is defined as the presence of at least three of five factors that increase the risk for heart disease and diabetes - excess belly fat, elevated blood pressure, low "good" cholesterol, and high levels of blood glucose and triglycerides. An estimated 35 percent of Americans

have metabolic syndrome.

"The fact that people with metabolic syndrome had lower bioavailability of vitamin E was expected, but it had never been studied before and therefore we've had no guidance to make recommendations for that population," said Richard Bruno, professor of human nutrition at The Ohio State University and lead author of the study.

"This work tells us that at least one-third of Americans have higher vitamin E requirements than healthy people," Bruno said. "Dietary requirements of nutrients are generally defined only in the context of what a healthy person needs, but considering that two-thirds of Americans are overweight or obese, a healthy person might not be representative of our society."

The research, funded by the National Dairy Council, is published online in the *American Journal of Clinical Nutrition*.

Because obesity is the hallmark of metabolic syndrome, weight loss would be the most logical way to create better conditions in the body for vitamin E absorption, Bruno said. Most successful dieters cut calories by cutting fat, but fat-containing foods tend to be among the best dietary sources of vitamin E.

"People with metabolic syndrome could benefit from guidance to help them restrict calorie intake without sabotaging their vitamin E intake," he said.

Alpha-tocopherol, a natural form of vitamin E in food and the only form essential to human health, is an antioxidant that prevents fats from becoming rancid in the body. The recommended daily intake is 15 milligrams, and most Americans consume about half that amount.

Bruno's previous work had suggested that the fat in cream cheese could promote absorption of vitamin E when provided as alpha-tocopheryl acetate, the form commonly found in dietary supplements. In this new study of 10 healthy participants and 10 people with metabolic syndrome, he sought to determine to what extent milk fat might function as a vehicle to improve vitamin E bioavailability regardless of health status when provided as alpha-tocopherol, the form naturally found in food.

"It was an effort to mimic what most Americans do in the morning: Grab something to drink and take their vitamin pills," he said. "Even though the amount of milk fat made no difference in the effect, the bioavailability of vitamin E when taken with a glass of milk was nearly three times higher than expected based on prior studies.

"Milk doesn't have any appreciable vitamin E content, so to promote absorption, it needs to be paired with food containing vitamin E to help facilitate its bioavailability."

The most serious neurological effects caused by vitamin E deficiency are rare, but Bruno said a significant proportion of Americans are living at "suboptimal status" when it comes to fully benefiting from vitamin E's antioxidant properties.

The researchers used a supplement containing the natural form of alpha-tocopherol, which is abundant in certain vegetable oils, nuts and seeds. The common vitamin E supplement found in grocery stores contains a chemically modified form of the vitamin - alpha-tocopheryl acetate - meaning these findings might not apply to the average vitamin E supplement unless a consumer specifically uses a supplement containing alpha-tocopherol.

Though the study didn't specify how metabolic syndrome risk factors blunt vitamin E absorption, levels of proteins in the blood that carry fat

gave the researchers some clues. Two lipoproteins in particular stood out: one generated by the small intestine and another in the liver that secretes fat and vitamin E into the blood. In study participants with metabolic syndrome, vitamin E enrichment in both lipoproteins was lower than in healthy people.

"This could imply that people with metabolic syndrome either have impairment of absorption of vitamin E at the small intestine or because of an inability for vitamin E to get out of the liver," Bruno said. "We don't know which - it could be either one or both acting together."

Bruno is now working to determine a precise recommendation for the increased vitamin E needs for people with metabolic syndrome.

Provided by The Ohio State University