

Tocotrienol intake helps bioactive concentrations

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Tocotrienols, the least studied form of vitamin E, can achieve levels in the blood that may give protection against a wide range of diseases such as cancer and stroke, says a new study from the US. Previous studies have suggested that delivery of this form of vitamin E is not efficient in the human body and, because of this, proposed health benefits from lab experiments may not be replicable in humans. But news that absorption of tocotrienols may result in bioactive blood concentrations could be welcomed by tocotrienol supplement makers whose form of vitamin E is currently less well known and less studied than the tocopherol form of the vitamin. There are eight forms of vitamin E: four tocopherols (alpha, beta, gamma, delta) and four tocotrienols (alpha, beta, gamma, delta). Alpha-tocopherol (alpha-Toc) is the main source found in supplements and in the European diet, while gamma-tocopherol (gamma-Toc) is the most common form in the American diet. Tocotrienols (TCT) are only minor components in plants, although several sources with relatively high levels include palm oil, cereal grains and rice bran. While the majority of research on vitamin E has focused on alpha-Toc, studies into tocotrienols account for less than one per cent of all research into vitamin E. Previous studies have suggested that tocotrienol cannot be carried to the organs because it is not transported well by the tocopherol transfer protein (TTP). However, new research published in the journal *Antioxidants and Redox Signalling* (Vol. 8, pp. 1059-1068) reports that tocotrienol may be efficiently delivered to organs and could therefore offer the health benefits suggested by in vitro and in vivo studies. "Our results demonstrate that TCT is efficiently delivered to the bloodstream despite the fact that the transfer protein has a lower affinity for TCT than it has for TCP," said Chandan Sen from the Ohio State University and senior author of the study. The researchers recruited women with normal cholesterol levels (average age 23.5) and gave them a fat-rich strawberry smoothie containing 400mg of vitamin E containing 77 mg alpha-tocotrienol, 96 mg delta-tocotrienol, and 3mg gamma-tocotrienol, plus tocopherols. The vitamin E was provided by Malaysian firm Carotech. Since vitamin E is a fat-soluble vitamin, the researchers chose to deliver the micronutrient in a fat-loaded meal in order to improve absorption. Blood measurements in the post-prandial period showed that maximal alpha-tocotrienol levels averaged almost 3 micromoles in blood plasma, 1.7 micromoles in low density lipoproteins, and 0.5 micromoles in high density lipoproteins. "This work presents first evidence demonstrating the post-absorptive fate of tocotrienol isomers and their association with lipoprotein subfractions in humans," wrote lead author Pramod Khosla from Wayne State University. These concentrations, say the researchers, are sufficient to support the proposed neuro-protective functions of tocotrienol. "We have determined that when administered orally, tocotrienol can reach concentrations needed to serve these protective functions," said Sen. "It is a regular dietary ingredient in Asia, so it can safely be a part of a daily diet within prepared foods or as a supplement in the United States. Can it be therapeutically used to prevent stroke? Results from animal studies are encouraging, but it is still too soon to tell for humans," he said. The researchers noted that significantly more studies were needed, especially for the mechanisms involved and the outcomes of such doses. The work follows on from previous research by the same group, who have reported that tocotrienol supplementation to the diets of rats led to increased brain levels of tocotrienols, and this group showed more protection against stroke-induced injury compared to unsupplemented controls (*Stroke*, Vol. 36, pp. e144-152). The neuroprotective effect was associated with suppression of stroke-associated c-Src activation, which is a key mechanism that contributes to neurodegeneration, said the researchers. The End.