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Tocotrienol: The vitamin E of the new millennium

Tell us about Vitamin E, particularly tocotrienol.

Vitamin E is a family of compounds with two main groups, tocopherols and tocotrienols. The common vitamin E supplement in the pharmacies are either as natural (d-alpha-tocopherol), or synthetic (di-alpha-tocopherol) or mixed tocopherols. They come in soft gel capsules, commonly recommended for individuals with joint pain, muscle weakness, cardiovascular risk factors, skin problems, and age-related conditions.

Tocotrienols are rare because there are not many natural sources for tocotrienols. Palm oil's vitamin E contains is 70% of tocotrienols, making it the most abundant source of tocotrienols, followed by rice bran oil, wheat germ oil and annatto [1]. Our body cannot produce vitamin E and it has to be obtained from the diet or supplements. In most cases, our diet is rich in tocopherols (such as nuts, animal fats, grains) but lacks tocotrienols.

What are the benefits of tocotrienol and are these supported by research?

Vitamin E is a fat-soluble antioxidant, commonly known to protect the body from oxidative damage caused by free radicals. Tocotrienols are 40 times more potent as antioxidant compared to tocopherols. In humans, a few biomarkers can be used to measure oxidative stress. Clinical studies showed significant reduction of these biomarkers after supplementation of tocotrienols for three months [2].

Age-related decline in brain function is also closely related to oxidative damage. In a study involving more than 200 elderly adults, presence of tocotrienols in the body lowered the risk of cognitive impairment and Alzheimer's disease [3].

In a separate study involving 120 patients with stroke-related brain injury, daily tocotrienols supplementation suppressed the progression of injury. In the group that did not take tocotrienols, the injury has progressed with more than 20% increase in lesion size within 2 years, while those taking tocotrienols recorded negligible changes in lesion size [4]. Tocotrienols protected neural cells from oxidation-induced death.

As we age, the capacity to scavenge free radicals is reduced, resulting in the loss of balance with overproduction of free radicals. This pro-oxidation environment promotes inflammation. Persistent inflammation leads to tissue deterioration, hypertension, and arterial stiffness to name a few. The anti-inflammatory effect of tocotrienols was well documented and supported by fundamental studies over the past two decades [5]. To date, more than 100 clinical studies on tocotrienols have been conducted globally, driving the science behind successful market growth.

What are the safety endorsement received by tocotrienol?

In 2010, tocotrienols obtained approval for Generally Recognized as Safe (GRAS) status from US Food and Drug Administration. Soon after, palm-tocotrienols was registered in the Malaysia Food Regulation as a permitted food additive. Since then, a variety of food products enriched with tocotrienols were marketed for their enhanced health benefits including health drinks, cereals and dairy products. To date, more than five brands have registered tocotrienols as supplements under Malaysian National Pharmaceutical Regulatory Agency, and many more are available in the US, Europe and Australia.

References

1. Fu, J.-Y., et al., *Tocotrienols: from bench to bedside*, in *Vitamin E: chemistry and nutritional benefits*, E. Niki, Editor. 2019, Royal Society of Chemistry. p. 12-26.
2. Khor, B.-H., et al., *Effects of tocotrienols supplementation on markers of inflammation and oxidative stress: A systematic review and meta-analysis of randomized controlled trials*. PLOS ONE, 2021. **16**(7): p. e0255205.
3. Mangialasche, F., et al., *Serum levels of vitamin E forms and risk of cognitive impairment in a Finnish cohort of older adults*. Experimental Gerontology, 2013. **48**: p. 1428–1435.
4. Gopalan, Y., et al., *Clinical investigation of the protective effects of palm vitamin E tocotrienols on brain white matter*. Stroke, 2014. **45**(5): p. 1422-8.
5. Nesaretnam, K. and P. Meganathan, *Tocotrienols: inflammation and cancer*. Annals of the New York Academy of Sciences, 2011. **1229**(1): p. 18-22.