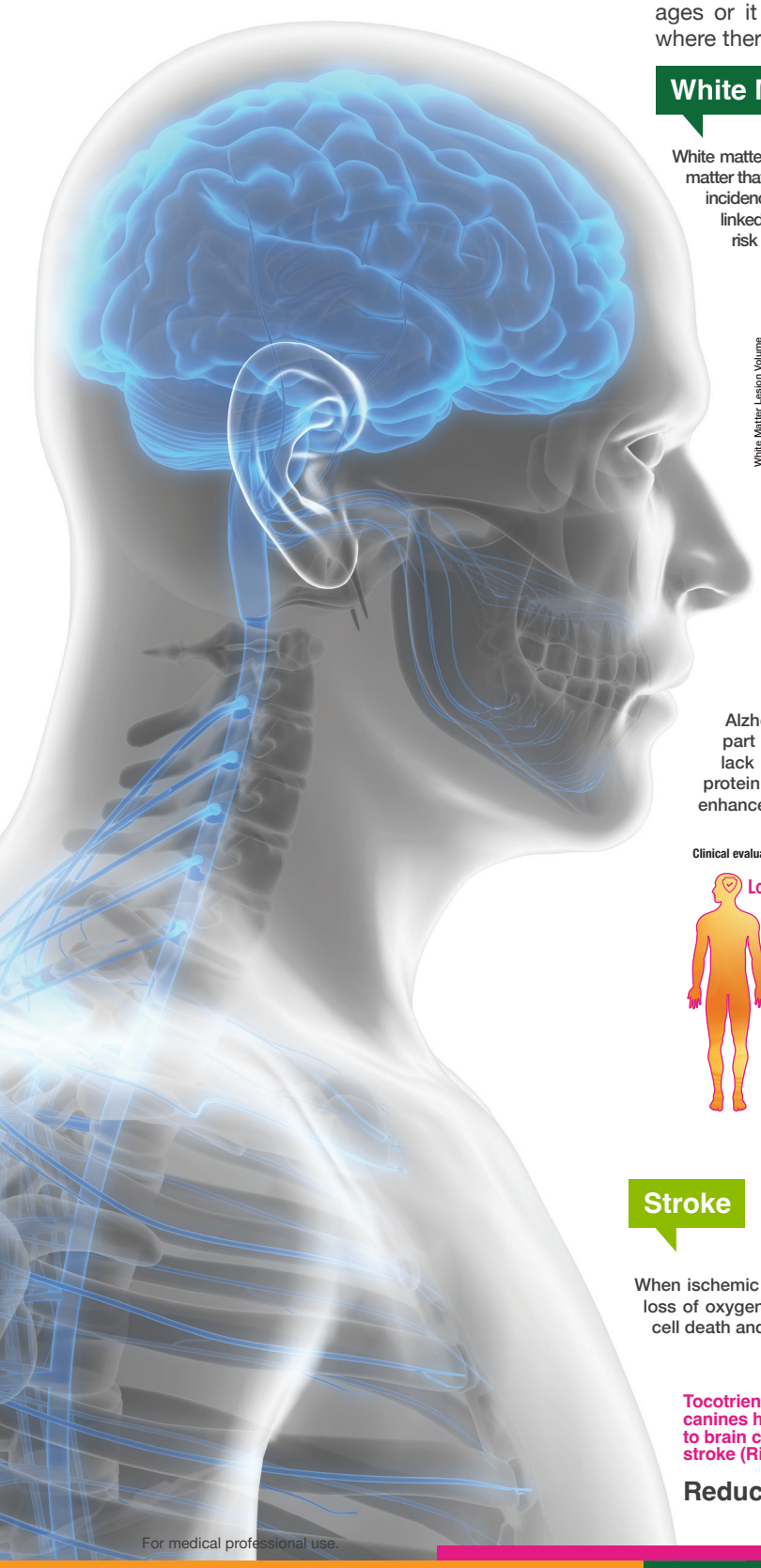
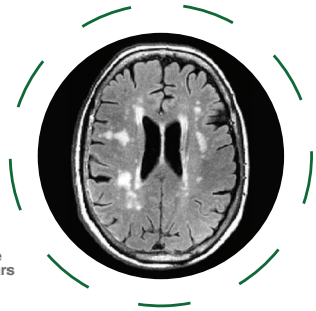
Food for Thought: Tocotrienols and Brain Health

Cognitive decline can happen gradually, as is the case when a person ages or it can happen suddenly as is the case with ischemic stroke where there is a sudden loss of oxygen to the brain.



White Matter Lesions

White matter lesions (WML) are areas in white brain matter that appear hyperintense in MRI scans. The incidence of WML rises with age and they are linked to increased stroke risk and increased risk of developing dementia.



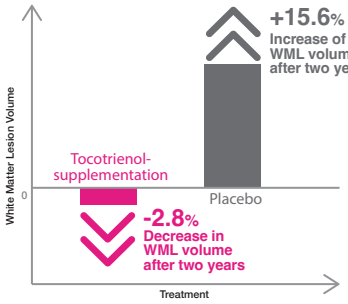
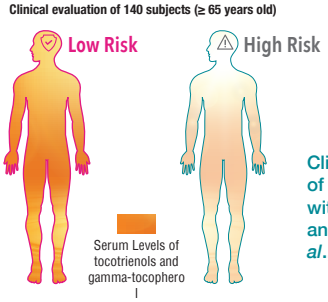


Figure 3: Changes in White Matter Lesion volume after two years of tocotrienol or placebo supplementation

Clinical studies have shown that supplementation with tocotrienols could reduce the progression of white matter lesions (Gopalan *et al*., 2014).

Alzheimer's Disease and Mild Cognitive Impairment

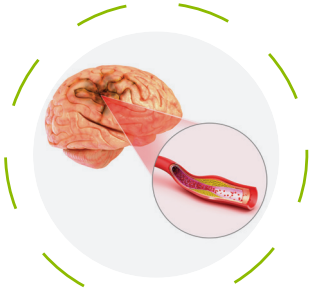
Alzheimer's Disease is caused in part by the overproduction and lack of clearance of amyloid β protein (Aβ), accompanied by enhanced neuroinflammation.



Clinical trials have shown that high serum levels of tocotrienols and γ-tocopherol are correlated with a lower risk of getting Alzheimer's Disease and mild cognitive impairment (Mangialasche *et al*., 2013).

Stroke

When ischemic stroke happens, the sudden loss of oxygen to the brain results in brain cell death and inflammation.



Tocotrienol-supplemented canines had less damage to brain cells caused by stroke (Rink *et al*., 2011).

40%

Reduced Stroke Damage

Tocotrienol supplementation could stimulate the remodeling of existing blood vessels to immediately expand to supply oxygen to regions of the brain that need it when stroke happens (Rink *et al*.,2011).

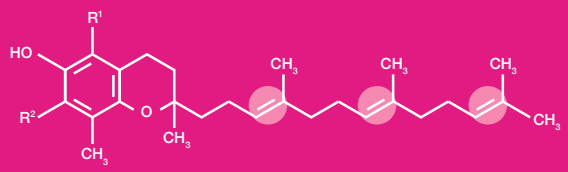
For medical professional use.

References:
1. Serbinova, E., Kagan, V., Han, D., and Packer, L. (1991). Free radical recycling and intramembrane mobility in the antioxidant properties of alpha-tocopherol and alpha-tocotrienol. Free Radical Biology and Medicine, 10: 263 – 275.
2. Gopalan, Y., Shuaib, I.L., Magosso, E., Ansari, M.A., Abu Bakar, M.R., Wong, J.W., Khan, N.A.K., Liong, W.C., Sundram, K., Ng, B.H., Karuthan, C., and Yuen, K.H., (2014). Clinical Investigation of the Protective Effects of Palm Vitamin E Tocotrienols on Brain White Matter. *Stroke*, 45:1422-1428.
3. Mangialasche, F., Solomon, A., Kareholt, I., Hooshmand, B., Cecchetti, R., Fratiglioni, L., Soininen, H., Laatikainen, T., Mecocci, P., and Kivipelto, M. (2013). Serum levels of Vitamin E forms and risk of cognitive impairment in a Finnish cohort of older adults. *Experimental Gerontology*, 48: 1428 – 1435.
4. Rink, C., Christoforidis, G., Khanna, S., Peterson, L., Patel, Y., Khanna, S., Abduljalil, A., Irfanoglu, O., Machiraju, R., Bergdall, V. K.,& Sen, C. K. (2011). Tocotrienol Vitamin E Protects against Preclinical Canine Ischemic Stroke by Inducing Arteriogenesis. *Journal of Cerebral Blood Flow and Metabolism*, 31 (11), 2218-2230.

Tocotrienols, The Extraordinary Vitamin E

Vitamin E is not just a single molecule, but a family of eight fat-soluble substances that are sub-divided into two classes of structurally-similar molecules. These two classes are tocopherol and tocotrienol, each of which have four structurally and chemically diverse molecules termed as alpha (α), beta (β), delta (δ), and gamma (γ) respectively.

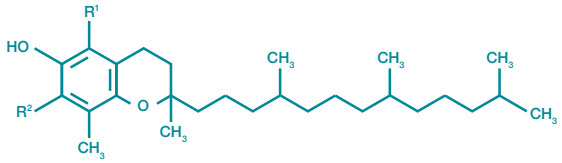
Tocotrienols have up to **60X more antioxidative potency** compared to α-Tocopherol, and have **unique anti-inflammatory properties** not seen in α-Tocopherol[1].



TOCOTRIENOLS

Tocotrienols have unsaturated isoprenoid side chains with three double bonds. This unique property gives it better flexibility with a higher efficiency of penetrating into the cell membrane. Tocotrienols are potent ANTIOXIDANTS* with unique ANTI-INFLAMMATORY properties.

α : $R' = CH_3$, $R'' = CH_3$
β : $R' = CH_3$, $R'' = H$
γ : $R' = H$, $R'' = CH_3$
δ : $R' = H$, $R'' = H$



TOCOPHEROLS

Tocopherols, in contrast, have saturated side chains. They also function as antioxidants, but this chemical structure gives them a lower antioxidative capacity as compared to tocotrienols.

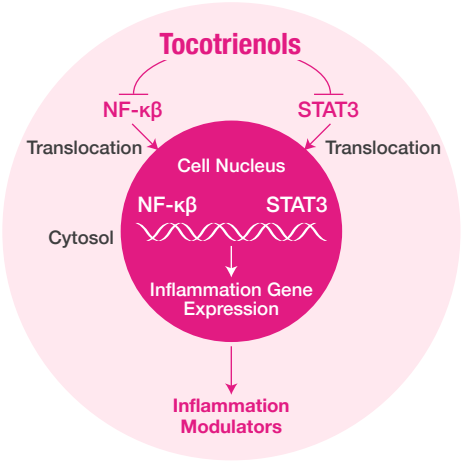
α : $R' = CH_3$, $R'' = CH_3$
β : $R' = CH_3$, $R'' = H$
γ : $R' = H$, $R'' = CH_3$
δ : $R' = H$, $R'' = H$

Tocotrienols have Unique Properties that Positively Impact Different Areas of the Body

Tocotrienols are naturally sourced from plant species like oil palm, rice and Annatto seed.

Each analogue of tocotrienol are functionally unique, with α-, β-, δ-, and γ-tocotrienol each exerting different beneficial effects on health and disease that are separate from the biological functions of α-tocopherol.

Potent Anti-Inflammatory Agent



Tocotrienols have pronounced and potent effects on NF-κβ (key master regulator of inflammation) and STAT3 (master inflammatory transcriptional factor) to reduce inflammation[2,3,4].

Reference:
1. Serbinova, E., Kagan, V., Han, D., and Packer, L. (1991). Free radical recycling and intramembrane mobility in the antioxidant properties of alpha-tocopherol and alpha-tocotrienol. Free Radical Biology and Medicine, 10: 263 – 275.
2. Guang et al. (2015). Am J Transl Res;7(9): 1612-1620
3. Ng et al. (2012). Food Chemistry; 134: 920–925
4. Aggarwal et al. (2010). Biochem Pharmacol.; 80(11): 1613–1631.

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