

HEALTH BENEFITS OF TOCOTRIENOLS (SUPER VITAMIN E)

Western medicine is desperately searching for compounds that can help trigger the death signal in cancer cells, and the tocotrienol form of natural Vitamin E is the next superstar. Tocotrienol is called a 'Super Vitamin E' due to the superior biological activity of its unique triple unsaturated side chain molecule which is an isoprenoid called farnesol. This side chain enables it to attach itself to the inside of cell membranes and exert both anti-oxidant and cell-signaling properties. Tocotrienols possess a rather astounding ability. They are great protectors of healthy cells and never bother them. On the other hand they can tell when a cell has gone wrong, including cancer cell, and can facilitate its death.

1. CHOLESTEROL LOWERING EFFECTS :

- Inhibit cholesterol production in the liver, thereby lowering total blood cholesterol.
- Alpha Tocotrienols inhibit the biosynthesis of cholesterol.
- Tocotrienols have been shown to suppress cholesterol biosynthesis and reduce cholesterol level.
- Combination of gamma-tocotrienol and alpha-tocopherol is found as a potential hypolipidemic agent in hyperlipidemic humans at atherogenic risk.
- Tocotrienols inhibit cholesterol synthesis by suppressing HMG-CoA reductase.

2. INHIBITION OF PLATELET AGGREGATION :

- Tocotrienols have anti-aggregation effect on blood platelets which will inhibit the thrombosis process.

3. ANTI CANCER & TUMOR SUPPRESSIVE :

- Confer anti-cancer properties
- Inhibit tumour growth of certain cancers
- Alpha and Gamma-Tocotrienols have shown to prolong the life span of cancer infected mice.
- Tocotrienols inhibited tumour cell growth of HeLa and P388 cells in culture.
- Gamma Tocotrienols is 3 times more potent in inhibiting growth of human breast cancer cultured cells than Tamoxifen.

4. SUPER ANTIOXIDANT PROPERTIES :

- Alpha Tocotrienol showed better antioxidant activity than alpha tocopherol in rat liver microsomal membrane.
- Antioxidants such as palm tocotrienols caused regression in carotid artery stenosis.
- Palm oil vitamin E significantly protects against ischemia/reperfusion injury in the isolated perfused Langendorff heart.

5. OTHER BENEFITS :

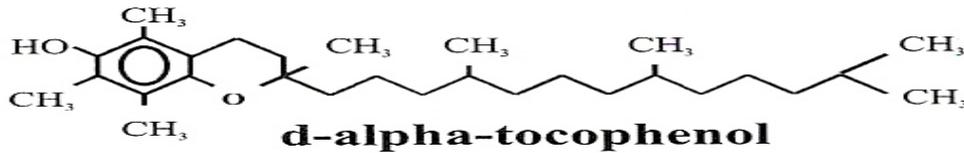
- Retards cellular aging due to oxidation.
- Supplies increased oxygen to prevent protein and lipid peroxidation.
- Prevents varicose veins.
- Alleviates fatigue.
- Prevents external scar formation.
- Accelerates healing of burns.
- Lower blood pressure.
- Aids in preventing miscarriages.
- Prevents deficiencies caused by excess polyunsaturated oils, chlorinated drinking water, hormone, contraceptives and menopause.

DEFINITION OF TOCOTRIENOL

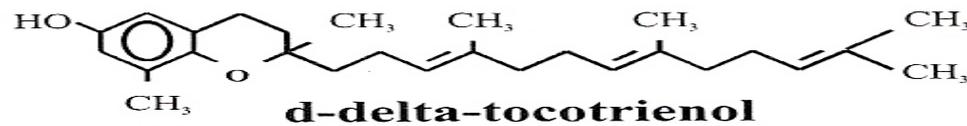
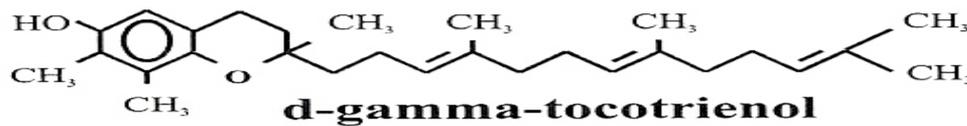
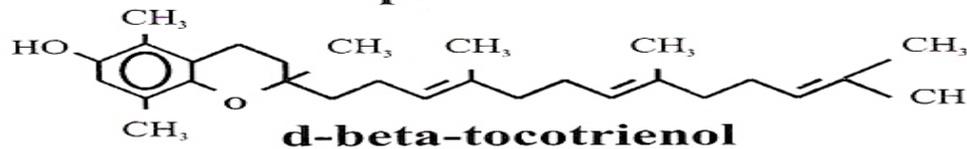
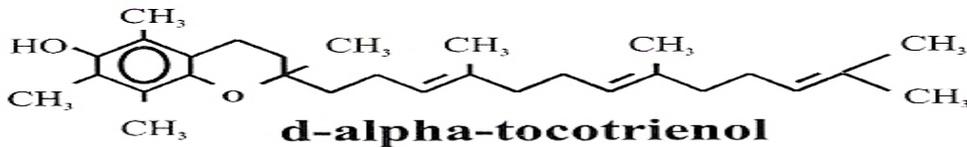
Vitamin E is one of the most important phytonutrients in edible oils. It consists of eight naturally occurring isomers, a family of four tocopherols (alpha, beta, gamma and delta) and four tocotrienols (alpha, beta, gamma and delta) homologues.

All the eight isomers share some important traits:

- The head, or chroman ring in technical term
- The tail, which is called the phytyl tail for tocopherols
- The active group on the head of the molecule, which is called the hydroxy group



TOCOPHEROL MOLECULE



TOCOTRIENOLS MOLECULE

	R1	R2	R3
alpha-tocopherol alpha-tocotrienol	CH3	CH3	CH3
beta-tocopherol beta-tocotrienol	CH3	H	CH3
gamma-tocopherol gamma-tocotrienol	H	CH3	CH3
delta-tocopherol delta-tocotrienol	H	H	CH3

The chroman ring has chemical groups which are called methyl groups attached to it. Alpha has all three available sites filled while beta and gamma have two methyl groups but in different positions. Whereas delta has only one.

The tocotrienol tail has three double bonds while the tocopherol tail has none. In the chemical parlance, bonds are the forces that keep atoms together. A single bond means the atoms share two electrons, a double bond means they share four electrons.

The structural name for **alpha-tocopherol** is **2,5,7,8-tetramethyl-2-(4',8',12'-trimethyltridecyl)-6-chromanol**.

The structural name for **alpha-tocotrienol** is **2,5,7,8-tetramethyl-2-(4',8',12'-trimethyltrideca-3',7',11'-trienyl)-6-chromanol**.

WellnessResources.com News and Views

Tocotrienols Kill Cancer Cells

Wednesday, April 08, 2009

Byron Richards, CCN

Researchers have demonstrated for the first time that gamma tocotrienol accumulates in cancer cells and delays tumor growth by promoting death signals to the cancer, based on new evidence from [animal and cell studies](#).

“These results, to our knowledge, are the first demonstration of specific accumulation of gamma-tocotrienol and delta-tocotrienol in tumors and suggest that tocotrienol accumulation is critical for the anti-tumor activities of tocotrienols,” wrote lead author Yuhei Hiura in the The Journal of Nutritional Biochemistry.

“Intriguingly, we found that tocotrienols were detected in tumor, but not in normal tissues,” wrote the researchers. Because tocotrienols did not activate specific components of the immune system the researchers believe that the “anti-tumor effect may be due to the direct effect of tocotrienols on tumor cells. In conclusion, our results suggested that accumulation is critical for the anti-tumor activity of tocotrienols.”

Tocotrienols possess a unique side chain molecule that enables it to attach itself to the inside of cell membranes and exert both anti-oxidant and cell-signaling properties – in a way that plain d-alpha tocopherol vitamin E simply cannot do. This is the first study to show that tocotrienols have an affinity for cancer cells, and their accumulation within them is a powerful tool of natural defense.

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Tocotrienols and Cancer Cells

Monday, June 30, 2008

Byron Richards, CCN

Western Medicine is desperately searching for compounds that can help trigger the death signal in cancer cells – and it appears they are now actively researching the natural toolbox as the tocotrienol form of vitamin E may be a superstar.

Tocotrienols are a superior form of vitamin E due to the biological activity of their side chain molecule which is an isoprenoid called farnesol. Isoprenoids occur widely in fresh fruit, vegetables, and grains and are believed to be the reason diets rich in such foods are associated with lower cancer rates. Tocotrienols are a high source of isoprenoids – especially the unique one they possess – as farnesol is a direct communication molecule within cells. We are just beginning to understand the role of farnesol in human health and disease.

I have previously summarized the dramatic findings on the [tocotrienol form of vitamin E](#) for cardiovascular and immune support. While cancer researchers have been looking into combining tocotrienols with other cancer therapies for some time – this research is now heating up. Central to the issue is how to get cancer cells to die without killing the person. Most cancer drugs work on a principle of toxicity, and the hope is that the drugs will kill cancer before weakening the individual too much. This approach can be successful and has obvious limitations.

Tocotrienols possess a rather astounding ability. They are the great protectors of healthy cells and never bother them. On the other hand they can tell when a cell has gone wrong, including a cancer cell, and can facilitate its death. Last year this dramatic finding led US researchers to conclude that combining [tocotrienols with cancer drugs](#) for patients with drug-resistant forms of cancer offers tremendous hope for many individuals with different types of cancer.

A new study further backs up this new area of [tocotrienol research](#), a true bright spot of hope for many. While I like tocotrienols as a top cardiovascular support nutrient, it is nice to know they also help keep your cells in tip top working condition. Tocotrienols are a superior antioxidant and work synergistically with other antioxidants to protect your health.

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Tocotrienol build-up in tumours 'critical' for anti-cancer benefits: Study

By Stephen Daniells, 31-Mar-2009

Related topics: Vitamins & premixes, Cancer risk reduction

Tocotrienols, members of the vitamin E family, may exert their anti-cancer benefits by accumulating in cancer cells and delaying tumour growth, says a new study from Japan.

Both gamma- and delta-tocotrienols may accumulate in cancer cells, and promote the death of the tumours, according to data from *in vitro* and *in vivo* studies by researchers from Kyushu University.

The potential anti-cancer benefits of tocotrienols are not new, but the Japanese researcher claim that their study is the first to show accumulation of the compounds in cancer cells.

"These results, to our knowledge, are the first demonstration of specific accumulation of gamma-tocotrienol and delta-tocotrienol in tumours and suggest that tocotrienols accumulation is critical for the anti-tumour activities of tocotrienols," wrote lead author Yuhei Hiura in the *The Journal of Nutritional Biochemistry*.

The vitamin E family

There are eight forms of vitamin E: four tocopherols (alpha, beta, gamma, delta) and four tocotrienols (alpha, beta, gamma, delta). Alpha-tocopherol is the main source found in supplements and in the European diet, while gamma-tocopherol 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.

New study

The Japanese researchers studied the effects of gamma- and delta-tocotrienol on mouse cancer cells (murine hepatoma MH134) both *in vitro* and *in vivo*. For the cell study, the tumour cells were cultured in the tocotrienols, and they found that the delta-version inhibited cell growth more than the gamma-type. This was related to an induction of apoptosis (programmed cell death).

For the animal studies, the researchers used C3H/HeN mice and implanted the tumour cells. The animals were then fed a normal diet, or the diet supplemented with 0.1 per cent gamma-tocotrienol or 0.1 per cent delta-tocotrienol for four weeks.

At the end of the study, a significant delay in tumour growth was observed for both groups supplemented with the tocotrienols. No effects on body weight were recorded.

"Intriguingly, we found that tocotrienols was detected in tumour, but not in normal tissues," wrote the researchers.

In terms of the added that the tocotrienols had no effect on levels of immunoglobulin levels in the animals, suggesting that the tocotrienols' potential anti-cancer benefits were not related to immune function, *"and that the anti-tumour effect may be due to the direct effect of T3 on tumour cells"*, they said.

"In conclusion, our results suggested that accumulation is critical for the anti-tumour activity of tocotrienols."

Source: *The Journal of Nutritional Biochemistry*

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"Specific accumulation of γ - and δ -tocotrienols in tumor and their antitumor effect in vivo"

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