Have all those conventional treatments failed when it comes to tackling high cholesterol, stiff arteries, diabetes, cancer and other chronic ailments? If yes, then cheer up a bit because now you’ve got an “ace up your sleeve”!

Introduction

So what is that “Ace”? No, it is not those conventional chemotherapies, radiation or surgery. The "Ace up your sleeve" is just the correct Vitamin E! You are well aware of the benefits of vitamins in your daily life and you know they can work wonders in preventing and treating several diseases. Vitamins have already been observed to have anti-aging benefits, heart diseases, inflammation and lower the risk of cancer. But there’s a trick to taking your vitamins – and it’s one that too many people don’t know about.

Conventionally, people have been just popping multi-vitamins daily which is not enough to help you beat the odds against those deadly diseases. In fact, certain vitamins need to be combined with others in order to work better. On their own, they are not of much use. Well, this is not the same in case of all vitamins.

Some vitamins are sometimes isolated to unleash their full potential and this case is very much applicable to as I mentioned above, the “correct Vitamin E”. Well you surely haven’t heard of this unappreciated Vitamin E which has been identified for its beneficial effects against cardiovascular diseases and cancer. And guess what? You can give them both a tough fight with this “correct Vitamin E” the “Ace up your sleeve” – Tocotrienol!

Tocotrienol has been an unsung hero for several decades whose capabilities have been overshadowed by Tocopherol. But what’s Tocopherol? It may surprise you that Vitamin E is not just one Vitamin E but a family of different vitamins. In fact, there are two types of compounds within the Vitamin E family, called Tocopherols and Tocotrienols. Tocopherol is the Vitamin E which you have been consuming every day in your daily diet and multivitamins and it has also been observed that Tocopherols barely play any role against diseases like cancer and CVDs. Moreover, in several studies, Tocopherols have been observed to hinder the functioning of Tocotrienol against cancers and CVDs and even harm your body in certain ways!

The unappreciated Tocotrienol and the overestimated Tocopherol

Tocotrienol has been unappreciated for decades even after its discovery. Dr. Barrie Tan, who has been studying Vitamin E since 35 years, discovered Tocotrienols derived from the Annatto plant and also found that Annatto plant was the only one which contained 100% Tocotrienol and 0% Tocopherol unlike rice bran and palm oils which do have Tocotrienols but a very high percentage of Tocopherol. Tocopherols, on the other hand, can be found in sufficient quantity in your food and your daily diet and multivitamins are mainly composed of Alpha-Tocopherols.

Tocopherol has a structure composed of a head with an OH group and a saturated tail while Tocotrienol has three double bonds, is unsaturated and has a head smaller than Tocopherol. Tocopherol also is
larger in size and has a higher molecular weight than Tocotrienol due to which Tocopherols have very low mobility and are unable to target more cells. Tocotrienols, on the other hand, have very high anti-oxidant activities due to their small structure and less molecular weight which assists in their integration of the cell, unlike Tocopherols. Moreover, it has been found that Tocotrienols are approximately 50 times more potent than Tocopherols!

If you are like other people, then probably you too are consuming Tocopherols and not Tocotrienols in your supplements. Consumption of Tocopherols in supplements must be discouraged as research has shown that supplementing Alpha-Tocopherol interferes with the tissue delivery of certain Tocotrienols. And if you are concerned about cardiovascular studies, cancers and so on, you must keep reading this blog. And also, for several decades, the majority of research has been focused on Alpha-Tocopherol whereas only 3% of the study has been conducted on Tocotrienol. However clinical studies have significantly proven that Tocotrienols display stronger anti-oxidant, anti-inflammatory, and chemopreventive activities than Tocopherol based Vitamin E.

Cardiovascular benefits of Tocotrienols – A new beginning for your heart

For several years, antioxidants have been associated with both the reduction in cardiovascular diseases and the inhibition of cancer. In 2001, researchers tested Tocotrienols for their ability in reducing plaque buildup in arteries. This four-year study from Elmhurst Medical Center in Queens, New York, involved 50 participants who had the plaque in their carotid arteries, the major arteries that carry blood to the brain. Among the participants who took 240 mg of Tocotrienols a day along with 60 mg of Alpha-Tocopherol, an amazing 88% experienced either no increase in plaque or even reduction in plaque. But, the participants taking a placebo, 80% of them experienced a worsening in their condition.

In a study conducted in 2015, several people with high cholesterol took supplements ranging from 125-750 mg/day of Tocotrienols for 4 weeks. It was observed that on average, total cholesterol levels were lowered by 15 percent LDL cholesterol dropped by 18% and triglycerides decreased by 14%. The levels of inflammatory chemicals associated with cardiovascular diseases, called cytokines, were also reduced – and by a whopping 64%! Other kinds of research have also shown that when Tocotrienols were combined with plant-derived anti-oxidant polyphenols, Delta-Tocotrienol (One of the four forms of Tocotrienols) reduced inflammation and lowered lipids associated with atherosclerosis.
Scientists from the University of Missouri – Kansas City reported that Tocotrienol doses ranging from 125 – 750 mg/day combined with the healthy diet decreased lipid levels significantly after only 4 weeks.

Other features of Tocotrienol observed were

- **Cholesterol reduction** is a significant feature of Tocotrienols by suppression of HMGR (3-hydroxy3methyl-glutaryl-CoA reductase) the enzyme/protein responsible for the body’s cholesterol production.

- **Cytokines** associated with cardiovascular diseases were down-regulated by Tocotrienols according to the study done at the University of Missouri – Kansas City.

- **MicroRNAs** which are usually down-regulated in hyper-cholesterolemic individuals are up-regulated by Tocotrienol treatment as per the study.

- **Cellular adhesion molecule expression** has been observed to be reduced by Tocotrienols.

- **Monocytic cell adherence** has also been found to be reduced by Tocotrienol in multiple kinds of research.

- ‘**Velcro effect**”, a process which initiates plaque formation in arterial walls has also been observed to be reduced by Tocotrienol.

- **Lipid peroxides** in blood vessels and blood pressure have been observed to be lowered by Tocotrienols which improves total antioxidant status thus preventing hypertension.

- **Carotid Arteriosclerosis** has been observed to be reduced by Tocotrienol in several studies.

**Fight your cancer more effectively with Tocotrienol**

*Tocotrienols* have been observed to have several anti-cancer benefits. They have been observed to reduce inflammation which is quite important since inflammation encourages tumor growth. Also, Tocotrienols have been observed to reduce chronic inflammation by decreasing an inflammatory protein connected with cancer called NF-kB, as well as other biomarkers. To know further about the anti-cancer activities of Tocotrienol, you must know terms related to cancer first and the effects of Tocotrienol related to them.

- **Angiogenesis** or formation of blood vessels in cancer cells promotes cancer cell growth to a very great extent. Tocotrienol is a master of anti-angiogenesis.

- **Apoptosis** or programmed cell death is the process of elimination and death of cancer cells. Tocotrienol induces apoptosis in cancer cells by increasing endoplasmic reticulum stress and autophagy thus helping in killing cancer cells.

- **Cell Proliferation** is the process by which cancer cells copy their DNA and divide into two cancer cells during mitosis and rapidly multiply into more cancer cells. According to several kinds of research, it has been proven that alpha, gamma, and delta Tocotrienols suppress the proliferation of cancer cells.

- **Chemoprevention** and anti-cancer activities are some characteristic qualities of Tocotrienol.

- **Chemosensitization** is the combination of Tocotrienol with several chemotherapeutic
drugs such as celecoxib, statins or dietary components such as curcumin, polyphenols, etc. which effectively sensitize the cancer cells.

- **Stem cells** of the remaining 1% cancer cells which are never affected by chemotherapy and radiation and are traveling throughout the body which is also the main reason of reoccurrence of cancer even after those conventional treatments, has shown to be eliminated by Tocotrienol in the research.

- **Tumor nutrition** can also be obstructed by Tocotrienol as they may well work on dual antitumor mechanisms that include the removal of the vital nutrient to tumor lifeline.

Several studies have been conducted on Tocotrienol to observe its anti-cancer effects and one such study ‘miR-429 mediates Delta-Tocotrienol induced apoptosis in triple-negative breast cancer (TNBC) cells by targeting XIAP’ was conducted where the effects of Delta-Tocotrienol on exponentially growing TNBC cells, MDA_MB-231 and MDAMB-468 cells, also known as human triple negative breast cancer cells were treated in the presence of Delta-Tocotrienol for 24 hours, and the cell viability rate was measured using an MTT assay. It was observed that treatment with Delta-Tocotrienol inhibited the proliferation of MDA-MB-231 and MDA-MB-468 cells in a dose-dependent manner.

- In one other study, ‘First Evidence That Gamma-Tocotrienol Inhibits the Growth of Human Gastric Cancer and Chemosensitizes it to Capecitabine in a Xenograft Mouse Model through the Modulation of NF-kB Pathway’ where it was observed that Tocotrienol could potentiate the effects of capecitabine through suppression of NF-kB-regulated markers of proliferation, invasion, angiogenesis, and metastasis.

- **Annatto based Tocotrienol** (Eannatto) which has been observed to possess anti-cancer activities in another study, ‘Down-regulation of telomerase activity in DLD-1 human colorectal adenocarcinoma cells by Tocotrienol’ was conducted in which it was also observed that Tocotrienol inhibited telomerase activity of DLD-1 human colorectal adenocarcinoma cells in time- and dose-dependent manner. Interestingly Delta-Tocotrienol was observed to exhibit the highest inhibitory activity.

- In **Prostate Cancer**, Delta and Gamma-Tocotrienols, in particular, were shown to inhibit several types of prostate cancer cell lines. While Delta-Tocotrienol most effectively induced cell death of prostate cancer cells and activated programmed cell death while disrupting NF-kB signaling, Gamma-Tocotrienol also suppressed prostate cancer in vitro and in vivo.

- Anti-cancer activities of Tocotrienols have been observed in several kinds of research against all sorts of cancers like lung cancer, liver cancer, ovarian cancer, prostate cancer, glioblastoma and so on.

![Tocotrienol sources & Composition](image-url)
Other benefits of Tocotrienol

- Delta-Tocotrienol has been observed to improve Fatty Liver in Non-Alcoholic Fatty Liver disease which is usually associated with obesity and metabolic syndrome.
- Tocotrienols have also been observed to suppress diseases like Hepatitis C.
- Tocotrienols have also been observed to delay Cataract Progression and Cataractogenesis.
- Tocotrienols have also been observed to suppress Alzheimer’s disease.
- Tocotrienols have also been observed to mineralize bones and it has also been shown in several kinds of research that animals with Tocotrienol handled stress and load at fractures site. Tocotrienol was also shown to prevent fracture recurrence. They also restored callus stiffness to normal levels.

Conclusion

You must not make this common mistake of consuming Vitamin-E which is “incomplete”. Americans consume about 70% of their vitamin E as Gamma-Tocopherols due to their abundance in corn- and soy-based foods and several vegetable oils in their diets. Henceforth supplementation of Tocopherols is a serious mistake which you must not make. Tocotrienol is rare and almost all foods lack the required quantity of Tocotrienol except Annatto which is one of the highest food sources of Tocotrienols. Owing to such qualities against deadly diseases like CVD and cancer, Tocotrienol supplementation is just as it not only helps you prevent them but also helps in suppressing them.

References

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Tocotrienols: Vitamin E for Cardiovascular benefits after all by Barrie Tan, Ph.D., and Anne M. Trias, MS.

Delta-tocotrienol inhibits non-small-cell lung cancer cell invasion via the inhibition of NF-κB, uPA activator, and MMP-9.