Tocotrienol Fact Sheet

To first understand about tocotrienols, there must be some distinctions made between tocotrienols and tocopherols.

While d-alpha tocopherol is the compound most often referred to as vitamin E, the term “vitamin E” actually applies to a family of eight compounds. The seven other compounds with vitamin E activity are: d-tocopherols (gamma-tocopherol, beta-tocopherol and delta-tocopherol) and d-tocotrienols (alpha-tocotrienol, gamma-tocotrienol, beta-tocotrienol and delta-tocotrienol). Emerging research has showed added benefit to incorporating all the tocopherols plus tocotrienols.

Tocotrienols and tocopherols have very similar structures. The difference is that tocopherols have a longer and saturated side chain, whereas, tocotrienols have a shorter, unsaturated side chain. This shorter tail may enable the tocotrienols to perform functions and effect structures in different ways than tocopherols. Like tocopherols, tocotrienols are potent antioxidants against lipid peroxidation (the damaging of fats by oxidation). However, tocotrienols are particularly potent antioxidants because they have a high degree of mobility in cell membranes due to the shorter tail, and thus may be capable of coming in contact with free radicals more rapidly. Human studies indicate that, in addition to their antioxidant function, tocotrienols have other important functions, especially in maintaining a healthy cardiovascular system.

Tocotrienols appear to act on a specific enzyme called 3-hydroxy-3methylglutaryl-coenzyme A reductase (HMG CoA) involved in cholesterol production in the liver. Tocotrienols suppress the production of this enzyme, which may result in less cholesterol being manufactured by liver cells. One theory is that the shorter tocotrienol tail can loosen up the cell membrane, thus increasing membrane fluidity. It is thought that tocotrienols can also loosen up the cholesterol that forms to create hard plaques in the arteries, thus reducing or removing the plaque. While alpha-tocopherol is important in preventing arterial plaque formation, it is not capable of removing it, like the tocotrienols have been shown to do.

Sources & Absorption

The best dietary sources are rice bran and palm oil. Tocotrienols are also found in smaller quantities in wheat, barley, and oat bran. Unfortunately, most products that are potentially rich in tocotrienols have been processed or altered so that the tocotrienols are removed. There is a product called Organic Vegetable Shortening made by Spectrum that is pure palm oil. However, it would be virtually impossible to consume enough food to provide preventative or therapeutic quantities of tocotrienols. Supplemental sources of tocotrienols are derived from rice bran oil and palm oil distillates.

Tocotrienols, like tocopherols, are fat soluble, which means they need fat in the diet for absorption and transportation in the body. Low cholesterol levels, cholesterol-lowering medications, and fat-blocking substances (such as olestra™/olean™ or chitosan) can prevent the absorption or transport of the fat-soluble nutrients, including the tocols. Someone with low cholesterol levels has fewer carriers for fat-soluble nutrients.

Difference between Tocotrienols and Cholesterol Lowering Drugs

The largest source of cholesterol in the body is from liver synthesis, not from dietary consumption. The rate-controlling enzyme in the liver for making cholesterol is HMG CoA reductase. The statin cholesterol-lowering drugs, such as Zocor™ and red yeast extracts reduce cholesterol levels by competitively blocking the receptor sites on HMG CoA reductase so that it does not make cholesterol out of saturated fats. This triggers an adaptive response in the body that yields a 200-fold increase in

CF193 – Updated 6/03
HMG CoA reductase levels within a few hours. Tocotrienols (rice bran oil source) on the other hand, are theorized to work by increasing the rate of natural degradation of HMG CoA reductase. The resulting decrease in quantity results in a decrease in cholesterol synthesis.

**Suggested Dosage**

The typical recommendation is 140 to 360 mg daily; most studies have used 200 mg daily.

**Are there any side effects or interactions?** No significant adverse effects have been reported with tocotrienols.\(^7\)

**Cautions**

Any substance that can interfere with HMG CoA reductase should be used cautiously. HMG CoA reductase is not just the rate-limiting enzyme for cholesterol production, but also for steroid hormone and COQ\(_{10}\) production. People with low cholesterol levels should probably not take tocotrienols. When supplementing with tocotrienols, it would be a good idea to take additional COQ\(_{10}\). Furthermore, the studies that showed cardiovascular benefit when supplementing with tocotrienols (rice bran oil source) also used a low fat diet. Keep in mind, the most important fats to eliminate from the diet are damaged fats, as found in heated safflower, sunflower, and corn oil, and hydrogenated fats found in margarine, fried foods, and most processed foods. Emphasize extra virgin olive oil and healthy, stable saturated fats found in coconut oil, grass-fed organic meats, organic poultry, fresh cold-water fish, free-range/organic eggs, and fermented dairy products.

**What is on the Shelves?**

Three tocotrienol products are *Nature’s Plus* Tocotrienol Complex, *Twin Lab* Tocotrienols, and *Carlson* Tocotrienols. Various products also contain a mixture of both tocotrienols and tocopherols. There are no synthetic tocotrienols on the market. Tocotrienol products are either extracted from palm fruit (*Elaeis guineensis*) or rice bran.

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