

## The Real of Vitamin E

Two issues come to mind when discussing the benefits from taking vitamin E supplements: Vitamin E is just a really good antioxidant, and artificial vitamin E works just as well as natural vitamin E. How much truth there is to either of these two issues raises the question of the worthiness of this vitamin to even have money spent on it. Is it just another antioxidant, and if so, why spend the extra money on the natural form when the fake stuff works just as well? Hopefully, this article may unfold some truths about this interesting little vitamin that may cause one to think differently about these common questions.

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### "WHAT IS VITAMIN E?"

Vitamin E is a class of phyto nutrients called *tocopherols and tocotrienols*. This class of compounds consists of four tocopherols and four tocotrienols, each existing in the alpha, beta, gamma and delta isoforms (*figure 1*). Research suggests that the alpha isoform of tocopherol is the most biologically active in higher mammals (Rigotti A, 2007). This is why Viva Vitamins' Complete E formula uses the alpha form of the tocopherols.

### VITAMIN E (The Antioxidant)

Vitamin E is universally known as a lipophilic antioxidant. We've all heard of the word antioxidant. But what does it mean? Oxidation is a result of an atom losing an electron from its outer valence shell. Since electron orbitals like to occupy two electrons, these oxidized atoms become unstable and get greedy for another electron. As it proceeds to steal an electron from a nearby molecule, that molecule gets oxidized and domino effect continues. Antioxidants have the unique ability to donate electrons to oxidized molecules without themselves having their stability jeopardized.

Vitamin E has an interesting way of doing this. The tocopherols nestle themselves snugly between two adjacent lipid species within lipid bilayers of cells, mixed micelles, liposomes, chylomicrons, lipoproteins, etc. There, they sort of "hang out" and wait to quench an electron-thirsty

oxidant. One of vitamin E's best friends is ascorbic acid (vitamin C). This is because ascorbic acid loves to donate electrons to oxidized vitamin E to keep it reduced ( $e^-$  saturated). Oxidation is one of the key factors in many age-related diseases.

### NATURAL E vs. ARTIFICIAL E

Why would I spend twice as much on natural vitamin E when synthetic E is the same thing? My body doesn't know the difference. Is this true? Does our body know the difference? In fact, it does. Natural vitamin E comes in the form of *d*-(*dextrorotatory*) alpha tocopherol. Synthetic E comes in the form of an equimolar racemate of the two forms "*d*" and "*l*"-(*levorotatory*) alpha tocopherol. This is because when vitamin E is synthesized in a lab TMHQ (trimethylhydroquinone) is combined with isophytol to form the resulting tocopherol molecule. Unfortunately, due to the nature of the reaction kinetics and attack geometry of these two molecules, half of the product results in the *d* isomer and the other the *l* isomer. Okay, so what's the problem? Well, bioavailability is the problem. Our bodies produce a globular protein called TBP (tocopherol-binding protein) that is responsible for carrying fat-soluble E through the bloodstream to the liver. We would think that our bodies wouldn't know the difference where the vitamin E was made as long as it looks and acts like real E. Well, it does. TBP is stereospecific for only four of the eight

RRR stereoisomers<sup>1</sup> (*dextro*-rotatory around the chiral center) and thus half of synthetic E gets left by the way side. Talk about getting half of what you pay for.

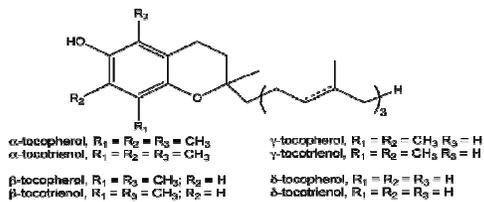


Figure 1. The eight stereoisomers of vitamin E.

### OTHER BENEFITS

Provided that vitamin E by itself is a pretty exemplary antioxidant, when combined with other antioxidants (selenium, CoQ10, alpha lipoic acid and mixed carotenoids) it supercharges the E and turns it into a powerhouse free radical-scavenging dynamo (M. Houston, 2005). This is why Viva Vitamins' Complete E comes with a combination of these important co members of the E antioxidant team. Vitamin E is also a novel candidate for the prevention of myriads of diseases (too many to name in this article), and does so by not only acting as a potent and efficient antioxidant, but by greatly reducing inflammation (Jiang Q, et al., 2008). So in short, this little vitamin may be doing a

lot more than what you think.

### Purpose:

Anyone wishing to maximize physical health, reduce oxidative stress, or lower the risk of various diseases, may want to look into this little wonder nutrient called vitamin E. We know that life is short. However, taking vitamin E (the right kind of vitamin E) may help extend the ride just a little bit longer. Antioxidants, along with exercise and proper diet, can prepare us for the life-long fight against oxidation. May vitamin E lead us there.

### References:

1. Merck Index, 11th Edition, 9931; *Relative bioactivity of dietary RRR- and all-rac-alpha-tocopheryl acetates in swine assessed with deuterium-labeled vitamin E1*. J Anim Sci 80:702-707, 2002.
- Rigotti A (2007). *Absorption, transport, and tissue delivery of vitamin E*. Mol. Aspects Med. 28 (5-6): 423-36.
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- Jiang Q, Yin X, Lill MA, Danielson ML, Freiser H, Huang J; *Long-chain carboxychromanols, metabolites of vitamin E, are potent inhibitors of cyclooxygenases*. Department of Foods and Nutrition, Interdepartmental Nutrition Program, Purdue University, West Lafayette, IN 47907, USA Proc Natl Acad Sci U S A, 2008 Dec 23;105(51):20464-9