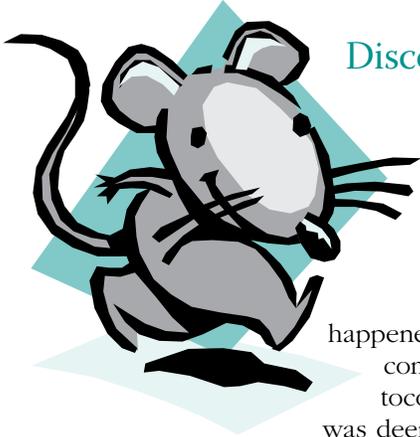


# Vitamin E Those Tocotrienols (We are Family)

by Margy Squires



Discovered in 1922, how did alpha tocopherol get coveted research and the vitamin E name? What about those tocotrienols?

**B**lame it on the rats. Two researchers at U-Cal Berkeley were helping female rats overcome a reproduction problem with stillbirths and incomplete pregnancies. Trying different foods, they found that wheat germ proved effective. Their curiosity led them to ‘factor x’, later named *alpha tocopherol* (Greek for “first” and “baby bringing”), with the suffix “ol” to denote its plant base. E just happened to be the next letter in the vitamin naming order. While most vitamins contain only one compound, other forms were discovered and subsequently named beta-, gamma- and delta-tocopherol. Each member was tested for its role in reproductive health but alpha tocopherol was deemed the most active and abundant form in the body. By 1950, four additional compounds were identified (the tocotrienols) and dismissed as “biologically inactive”. For all research purposes (and required daily value), alpha tocopherol became vitamin E.

What happened? The narrow definition that alpha tocopherol placed on vitamin E was that of supporting viable reproduction and the yardstick to measure its “potency”. Compared to alpha tocopherol, beta was half as potent, gamma a mere 10% and alpha tocotrienol 30%. The rest were deemed too insignificant to count.

Enter the Shute brothers to further muddle E’s identity. Evan Shute was a brilliant man who became a gynecologist at age 20. Although Shute used “vitamin E” for his female patients, his mom and barber suffered from heart troubles. He and his cardiologist brother met success; advocating E with a published paper and sharing the good news in a 1946 *Time* article. Medical peers did not appreciate the Shutes’ professed “cure” and medical journals refused to print any further findings. Shute’s work on E was published after his death by his son in 1978. No stranger to criticism and a rebel for vitamin C, Linus Pauling prefaced the book noting the “shocking bias of organized medicine against nutritional measures for achieving improved health”.

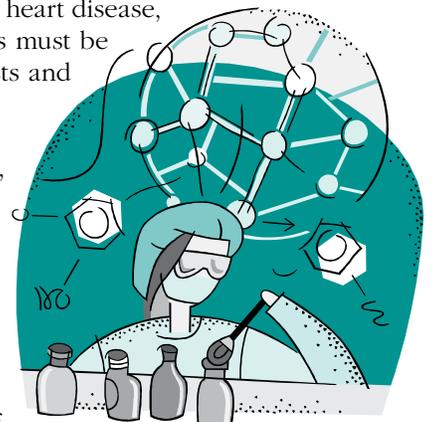
From 1940s to 1990s, controversy made many shy away until heart disease became the number one killer in America and E got a second scientific look. New technology and new interest in degenerative diseases, cancer, aging and the brain spawned a great deal of interest in antioxidants. While the role for vitamin E in treating disease was not quite established in stone, its ability as an antioxidant was never questioned.

## Going Cellular

According to the U.S. National Library of Medicine, antioxidants are “substances that may protect your cells against the effects of free radicals. Free radicals are molecules produced when your body breaks down food, or by environmental exposures like tobacco smoke and radiation. Free radicals can damage cells, and may play a role in heart disease, cancer and other diseases.” Since your body is made up of water and oil, antioxidants must be too. As an oil soluble vitamin, E could protect the fatty organs of the brain, liver, breasts and prostate, plus the lipid membranes of all cells.

Diet is one way to get E since only plants can synthesis it. Once E is extracted from foods, the liver packages it up inside lipoprotein bundles so it can travel the bloodstream (water and oil don’t mix!) You’ll recognize these very low density lipoproteins (VLDL), low density lipoproteins (LDL) and high density lipoproteins (HDL) as cholesterol. Without cholesterol, there is no vitamin E.

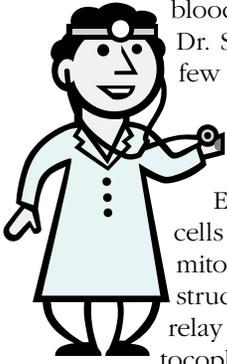
Getting back to the heart, early research implicates cholesterol in cardiovascular disease for causing blockages that raise the risk of infarction or stroke. However, a combination of oxidative stressors — free radical damage to LDL, injury to endothelial (inner) lining of



*Continued*

## Vitamin E

*continued*



blood vessels and inflammation — factor in. So Dr. Shute was on the right path, just missing a few vital family members.

On a cellular level, antioxidants need to be in position *before* the fighting starts. E fortifies the membrane integrity. Healthy cells need strong membranes to protect DNA, mitochondria and other vital parts related to its structure and function, ability to provide energy, relay proper cell signaling and so on. Both the tocopherol and tocotrienols have a head and tail portion (much like a tadpole). The tocotrienol tail (without going in to the complex biology) allows it greater freedom of movement within the membrane to fight and quench free radical activity, thus offering a higher antioxidant protection from the cells on up to body wide. While this article cannot go into everything the individual compounds do, the *Tocotrienol Complex Benefits* chart will help you see at a glance why they deserve the family name.

Remember your oil and water body? Like the E family, the antioxidants are a network of protection for each other as well and include vitamins, enzymes, CoQ10 and glutathione. When E gets into a free radical fight, water soluble vitamin C and alpha lipoic help recycle E for another day (and vice versa). It's an elaborate and wonderful system!

### Do You Get Enough?

Low fat diets, disorders of the GI tract and certain medications can affect the availability and absorption of E. Given its pathway, vitamin E also requires a healthy liver that alcohol, medications, toxins and infections can compromise.

Food sources for tocopherols are wheat germ, palm and nut oils. Tocotrienols are mostly in grain plants like rice bran. According to the Office of Dietary Supplements fact sheet on vitamin E intake and status, three national surveys found “diets of most Americans provide less than the RDA levels of vitamin E”. Given a daily value of 22 IU (alpha tocopherol only) for adults, it seems supplements are a better choice. Since there is no daily value for the tocotrienols (yet), you can match what's found in natural food sources by taking a “biologically balanced” vitamin E complex for the highest antioxidant protection. You'll find an ounce of prevention is worth a “whole lot of cure”.



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## Tocotrienol Complex Benefits\*

Tocotrienol benefits observed in research on cells, animal models & humans

### Antioxidant

- ◆ Higher intermembrane presence & mobility protects against peroxidation 40-60x better than tocopherols (TCPs)
- ◆ Protects cell structure (DNA, mitochondria, etc)
- ◆ Aids liver detox processes (cytochrome P-450)
- ◆ Scavenges, quenches & recycles free radicals
- ◆ Raises overall immune function

### Anti-Cancer

- ◆ Inhibits growth of cancer cell & certain tumors
- ◆ Protects breast, gastric, prostate & skin tissue
- ◆ Suppresses pathway used to mutate cells to cancer 5x better than TCPs
- ◆ Stimulates cancer cell apoptosis (death)
- ◆ Works synergistically with Tamoxifen

### Anti-inflammatory

- ◆ Reduces inflammatory cytokines & COX-2
- ◆ Inhibits reactive oxygen species (ROS)
- ◆ Helps prevent auto-immune diseases like arthritis

### Heart Health

- ◆ Inhibits cholesterol-making HMG CoA reductase enzyme
- ◆ Lowers total & LDL cholesterol
- ◆ Increases plasma CoQ10 levels
- ◆ Supports normal C-reactive protein
- ◆ Helps stabilize BP via control of nitric oxide pathways
- ◆ Protects against mitochondria DNA mutations
- ◆ Lowers lipid & protein oxidation in vessel walls
- ◆ Supports endothelial functions
- ◆ Protects LDL against oxidation & risk of plaques
- ◆ Reverses plaque risk of heart disease & stroke
- ◆ Protects against heart ischemic injury
- ◆ Protects against mitochondria DNA mutations
- ◆ Works synergistically with statins & aspirin

### Nerves & Brain

- ◆ Crosses the blood-brain barrier to protect neuron cells
- ◆ Reduces glutamate-induced cell death (seen in Parkinson's, Alzheimer's)
- ◆ Reduces effect of methyl mercury poisoning
- ◆ Protects against stroke-induced neurodegeneration
- ◆ Works with insulin against neuropathy pain

### Other

- ◆ Aids reproductive health (women & men)
- ◆ Delays onset of type 2 diabetes & metabolic syndrome
- ◆ Reduces the risk of cataracts & macular degeneration
- ◆ Accelerates healing of burns & scars
- ◆ Slows down oxidative aging process

*\*For information purposes;  
not intended to diagnose, treat, cure or prevent any disease.*