Copyright ©2007 by Nutrition Information Services

A Biologically-Balanced Vitamin E Has Finally Emerged:

Natural Spectrum E-Complex Supports Your Health As Nature Intended

Mention the term "Vitamin E" and most people—including scientists and nutritionists—will think only of the form of vitamin E found most abundantly in our bodies, namely *alpha-tocopherol*.[1] Recent research, however, strongly indicates that the other seven forms of vitamin E play vital roles in maintaining good health.

Unfortunately, alpha-tocopherol is the only form of vitamin E measured when determining vitamin E status in Americans. Yet ***over 90% of adults*** do not consume adequate amounts of even this single form of the vitamin, according to official recommendations.[2] Clearly, foods alone do not provide the current recommended daily amounts of vitamin E for most Americans.[3]

...higher vitamin E levels were associated with a ***21% reduction in deaths from cancer****, a* ***19% reduction in deaths from cardiovascular disease*** *and a whopping* ***30% reduction in deaths from all other causes****.*[6]

Sound Science Contradicts Flawed Studies

Recent sensationalistic "news reports" incorrectly cast doubt on the safety of vitamin E supplementation, citing a meta-analysis that relied on deeply flawed studies.[4] In sharp contrast to this now-discredited study, a 2005 landmark study published in the prestigious *American Journal of Clinical Nutrition* showed that both alpha-tocopherol and Vitamin C are safe across a broad range of intakes.[5]

More recently, in November of 2006 the *American Journal of Clinical Nutrition* published the largest study of its kind in history to examine the relationship between blood serum levels of vitamin E (alpha-tocopherol) and mortality. This study included 29,092 subjects, with follow-ups continuing over a period of up to 19 years. For those in the groups with the highest blood levels of alpha-tocopherol, there was an **18% lower risk of deaths** from all causes.[6]

According to one of the world's leading experts on vitamin E, Dr. Maret Traber, vitamin E supplementation would likely benefit most adults. Taking vitamin E supplements makes good sense, explained Dr. Traber, because an alarming 93% of men and 96% of women fail to get adequate amounts of vitamin E from their diets.[7] Supplementing with the right ***forms*** of vitamin E, however, is of critical importance.

The greater part of scientific evidence and experience suggests that human health requires the interaction of a variety of natural vitamin E forms, rather than synthetic fractions of this nutrient.[1]

Be On Your Guard Against False Information

Considering the endless stream of seemingly contradictory health information, Americans can and must protect themselves. In order to help the public tell the difference between truth and media disinformation, John Abramson, M.D., an award-winning physician on the clinical faculty at Harvard Medical School, has written an easy-to-read book entitled ***Overdosed America - The Broken Promise of American Medicine***.

In his excellent book, Dr. Abramson reveals how big corporate interests and their media pals have routinely misrepresented statistical evidence, misled doctors, and compromised public health. Every American who cares about his or her health should read Dr. Abramson's book. It can be purchased through any major book seller.

A prime example of how statistical evidence can be misrepresented is through the inappropriate use of the "meta-analysis" to evaluate nutritional supplements. According to nutritionist Andrew Shao, Ph.D., of the Council for Responsible Nutrition, "…meta-analyses can be useful when the included studies are very similar in design and study population." He then described a recent, poorly-designed meta-analysis which "combined studies that differ vastly from each other in a number of important ways that compromise the results. This meta-analysis," he warned, "appears

(continued on page 2)

(continued from page 1)

to be a predetermined conclusion in search of a method to support it."

In the interests of accuracy, this *Natural Wellness Report* summarizes the basic science of vitamin E activity based on well-documented health reports and complete and detailed scientific journal references.

At least eight natural substances demonstrate vitamin E activity, and the human body appears to use them all for their unique biological and ***antioxidant*** *effects.*[1]

trans fats, the unhealthy man-made ingredients often found in processed foods.[4] Unfortunately, many of the so-called studies testing the effectiveness and safety of vitamin E have used unnatural forms of the nutrient, without differentiating them as such. When interpreting study results, it is important to avoid "lumping" both natural and synthetic forms of vitamin E together into a single basket.

Importance of Vitamin E Confirmed by Large 19-Year Study

As mentioned previously, the largest study in history (29,092 subjects with follow-ups continuing over a period of up to 19 years) has shown the importance of vitamin E's health protective effects. For those in the groups with the highest blood levels of alpha-tocopherol, there was an 18% lower risk of deaths from all causes. This study also found that higher vitamin E levels were associated with a **21% reduction in deaths from cancer**, a **19% reduction in deaths from cardiovascular disease** and a whopping **30% reduction in deaths from all other causes**.[6]

The authors of this landmark study state:

As the primary fat-soluble antioxidant that protects lipids from peroxidation, alpha-tocopherol is able to ***scavenge mutagenic free radicals*** *and* ***inhibit the oxidation of LDL cholesterol****, and these abilities have important implications for the* ***prevention of carcinogenesis and atherosclerosis****. Alpha-tocopherol also has several important functions that are independent of its antioxidant activity, including modulation of gene expression, enhancement of immune responses, and suppression of tumor angiogenesis.*[6]

Natural versus Synthetic Vitamin E:

Most so-called vitamin E products actually contain a synthetic "mixture," only one-eighth of which is the naturally-occurring, biologically active form of alpha-tocopherol.[8] The other seven-eighths are "counterfeit" vitamin E, made up of stereoisomers which do not exist in nature except in chemical synthesis. (Stereoisomers have the same atomic connectivity as natural forms, but have different three-dimensional shapes.)

Furthermore, natural vitamin E forms have properties which enable the body to utilize them more efficiently than synthetic vitamin E. In fact, using unnatural, synthetic forms of vitamin E has been compared to eating

Vitamin E Works Best as a "Family" Unit

At least eight natural substances demonstrate vitamin E activity, and the human body appears to use them all for their unique biological and **antioxidant** effects.[1] Each has a special talent in the body, much as different family members have varying gifts and abilities.

The vitamin E forms are divided into the subgroups ***tocopherols*** and ***tocotrienols***.[1] Interestingly, the human body preferentially chooses and retains the natural form of alpha-tocopherol,[9] which helps explain why so much attention has focused on this form of vitamin E. Yet recent scientific studies suggest that taking an alpha-tocopherol supplement only, to the exclusion of the other vitamin E family members, is an ill-advised departure from nature's wisdom.[1,10,11]

In fact, neglecting to "balance" your vitamin E intake with a natural spectrum of tocopherols and tocotrienols is like eating an unbalanced diet that focuses on only one food group. Although such a diet would be better than starvation, a person who eats foods from all groups is much more likely to enjoy good health.

Vitamin E "Cousins" Similar, Yet Different

Each vitamer or form of Vitamin E includes both a "head and tail" structure. The ***tocopherol*** and ***tocotrienol*** forms have subtle differences in the makeup of their tails. The tocotrienols, the less-familiar form, have an unsaturated tail structure that allows them to move more easily in cell membranes than their tocopherol cousins. This gives them some unique biological and therapeutic properties.[12]

Both tocopherols and tocotrienols have ***alpha, beta, gamma*** and ***delta*** sub-forms distinguished by chemical variations in their head structures.[13] Each of these variants also has unique properties and functions in the body.

Other Forms of Vitamin E Offer Vital Benefits

Although alpha-tocopherol has value, recent developments warrant a serious consideration of the other forms of vitamin E and their associated benefits.[1] Current developments in vitamin E research clearly indicate that individual members of the vitamin E family are unique in their biological functions and complement each other. Although alpha-tocopherol is an important member of the vitamin E family, it should not be over-emphasized since other members are also important.

For instance, gamma-tocopherol, alpha-tocotrienol and delta-tocotrienol have emerged as vitamin E molecules with functions in health and disease that are clearly distinct from that of alpha-tocopherol.[1,10]

Gamma-tocopherol and its major metabolite have been shown to possess **anti-inflammatory** activity. Because inflammation plays a key role in the initiation and development of atherosclerosis, gamma- may offer special advantages over alpha-tocopherol.[14] Also, due to a subtle difference in chemical structure, gamma-tocopherol is able to effectively scavenge a highly reactive nitrogen species[15] known to cause damage to blood vessels, skin, heart, lung, kidney, and brain.

Besides these important findings with gamma-tocopherol, investigators have also found that other tocopherols in addition to alpha-tocopherol may be important in helping protect against **Alzheimer's**.[16]

Tocotrienols Help Nerves, Inhibit Cancer and Lipids

Tocotrienols possess powerful **neuroprotective**, **anti-cancer** and **lipid-lowering** properties often not exhibited by tocopherols.[1] Studies using animal models have shown that alpha-tocotrienol blocks glutamate-induced cell death and stroke-induced neurodegeneration.[17] Alpha-tocotrienol is potently neuroprotective and, on a concentration basis, has **the most potent of all biological functions exhibited by any natural vitamin E molecule**.[18]

Tocotrienols can be obtained from various sources including annatto bean and palm fruit. It just makes sense to use natural sources because scientists only understand the "tip of the iceberg" of the intricate interactions of food chemistry with body chemistry. In addition to demonstrating **cholesterol- and triglyceride-lowering** properties, palm-source tocotrienols, when fed to animals, resulted in **98% smaller atherosclerotic lesions**. Researchers say this dramatic inhibition of atherosclerosis cannot be attributed to antioxidant effects alone.[19]

Tocotrienols Protect Cardiovascular Health

Heart disease patients have been found to have higher circulating levels of soluble *adhesion molecules* that stick to cell walls.[20] Researchers have sought ways of lowering the production of these molecules in order to reduce the risk of developing heart disease. With this in mind, Japanese researchers discovered that tocotrienols have a **"profound inhibitory effect"** on the adherence of monocytes to human endothelial cells,[21] with delta-tocotrienol exerting the most profound protective effect. Special extracts from annatto bean provide a rich source of delta tocotrienol.

New Findings:

The new findings suggest that tocotrienols have a very different protective action on the heart than alpha-tocopherol. To add to their other unique benefits, tocotrienols have **forty to sixty times higher antioxidant activity** than tocopherols,[22] and, due to their greater recycling efficiency, tocotrienols have **more staying power**. Furthermore, it's important to note that tocotrienols, and *not* tocopherols, were shown to extend the mean lifespan of *C. elegans*, a well-recognized model for studying aging and lifespan.[23]

What makes tocotrienols so special?

Leading researchers have discovered that tocotrienols have greater mobility and distribute more evenly throughout biological membranes,[12] whereas tocopherols tend to cluster in islands. This means that tocotrienols can get into tight spots that the tocopherols cannot.

Getting the Most from Your Vitamin E Supplement

It's human nature to seek a single "magic bullet." The fact remains, however, that **antioxidants do not act in isolation**. They form an intricate network[24] and function interdependently. For example, when alpha-toco-

(continued on page 4)

(continued from page 3)

pherol disarms a free radical, it becomes a weak free radical itself. Before it can become harmful to the body, other network antioxidants (alpha lipoic acid, Vitamin C, and Coenzyme Q10) quickly recycle the oxidized (used up) form of alpha-tocopherol and restore its antioxidant power.[25]

That's the way it works in the body, but some test tube research has excluded the network antioxidants that occur naturally. Not surprisingly, such studies showed LDL cholesterol being oxidized or damaged faster when enriched with alpha-tocopherol,[26] and the results have been used to cast doubt on vitamin E supplements. Because this is not the way vitamin E works in the body, this is not sound science.

The intricate interactions of bodily systems can be hard to reproduce in test tube studies, but scientists have made some progress. For example, they have learned that alpha lipoic acid protects and recycles all forms of vitamin E through a mutually beneficial inter- action with Vitamin C.[27,28]

Furthermore, the restorative ability of the antioxidant defense network has been confirmed within living organisms.[29] This regeneration of vitamin E by key network antioxidants greatly extends its activity and protects it from oxidation.

Check Labels for Vitamin E Sub-Forms:

Informed consumers will select their supplements on the basis of scientific facts, which strongly indicate the following:

1) Recommended daily amounts of Vitamin E are **not** easily obtainable from foods alone;

2) Unique and complementary benefits are associated with the other seven long-overlooked "cousins" in the Vitamin E family;

3) A balanced, natural spectrum Vitamin E supplement, with **both tocopherols and tocotrienols**, may offer significant advantages over more limited forms of this essential nutrient;

4) Prudent consumers will avoid genetically modified supplement sources;

5) For maximum benefit, natural spectrum Vitamin E should be taken with the co-antioxidants Vitamin C, CoQ10, and alpha lipoic acid.

References

1. Tocotrienols: Vitamin E beyond tocopherols, Sen CK, Khanna S, Roy S, *Life Sci*, 27; 78(18):2088- 98, 2006.
2. Current status of vitamin E nutriture, Ahuja JK, Goldman JD, and Moshfegh AJ, 1031:387-90, *Ann N Y Acad Sci*, Dec 2004.
3. The maximal amount of dietary alpha tocopherol intake in U.S. adults (NHANES 2001-2002), Gao X, Wilde PE, Lichtenstein AH, Bermudez OI, and Tucker KL, *J Nutr*, 136(4):1021-6, Apr 2006.
4. Meta-Analysis, Metaphysics and Mythology – Scientific and Clinical Perspective on the Controversies Regarding Vitamin E for the Prevention and Treatment of Disease in Humans, Houston MC, MD, *JANA*, Vol 8, No 1, pp 4-7, 2005.
5. Vitamins E and C are safe across a broad range of intakes, Hathcock JN, et al, *Am J Clin Nutr*, 81(4):736-45, Apr 2005.
6. Higher baseline serum concentrations of vitamin E are associated with lower total and cause-specific mortality in the Alpha-Tocopherol, Beta-Carotene Cancer Prevention Study, Wright ME, et al., *Am J Clin Nutr*, 84(5):1200-7, Nov 2006.
7. How much vitamin E? ... Just enough!, Traber MG, *Am J Clin Nutr*, 84(5):959-60, Nov 2006.
8. Comparative effects of RRR-alpha- and RRR-gamma-tocopherol on proliferation and apoptosis in human colon cancer cell lines, Campbell SE, et al., *BMC Cancer*, 6:13, Jan 17, 2006.
9. Overview: New Roles for a Familiar Nutrient, Hopkin K, *Ann NY Acad Sci*, 1031(1) pp 455-60, 2004.
10. Gamma-tocopherol—an underestimated vitamin?, Wagner KH, Kamal-Eldin A, and Elmadfa I, *Ann Nutr Metab*, 48(3):169-88, Jul 12, 2004.
11. The therapeutic impacts of tocotrienols in type 2 diabetic patients with hyperlipidemia, Baliarsingh S, Beg ZH, and Ahmad J, *Atherosclerosis*, Oct; 182(2):367-74, 2005.
12. Postprandial levels of the natural vitamin E tocotrienol in human circulation, Khosla P, et al, *Antioxid Redox Signal*, 8(5-6):1059-68, May-June 2006.
13. Metabolic redesign of vitamin E biosynthesis in plants for tocotrienol production and increased antioxidant content, Cahoon EB, et al, *Nat Biotechnol*, Sep; 21(9):1082-7, 2003.
14. Does Gamma-Tocopherol Play a Role in the Primary Prevention of Heart Disease and Cancer? A Review, Dietrich M, Traber MG, Jacques PF, Cross CE, Hu Y, Block G, *J Am Coll Nutr*, 25(4):292-9, Aug 2006.
15. Gamma-tocopherol traps mutagenic electrophiles such as NO(X) and complements alpha-tocopherol: physiological implications, Christen S, et al, *Proc Natl Acad Sci*, 94(7):3217-22, Apr 1, 1997.
16. Relation of the tocopherol forms to incident Alzheimer disease and to cognitive change, Morris MC, et al, *Am J Clin Nutr*, 81(2):508-14, Feb 2005.
17. Neuroprotective properties of the natural vitamin E alpha-tocotrienol, Khanna S et al, *Stroke*, 36(10):2258-64, Oct 2005.
18. Characterization of the potent neuroprotective properties of the natural vitamin E-tocotrienol, Khanna S et al, 98(5):1474-86, *J Neurochem*, Sep 2006.
19. Palm tocotrienols protect ApoE +/- mice from diet-induced atheroma formation, Black TM, Wang P, Maeda N, and Coleman RA, *J Nutr*, 130(10):2420-6, Oct 2000.
20. Inflammatory Biomarkers in Acute Coronary Syndromes, Armstrong EJ, *Circulation*, 113: e152-e155, 2006.
21. Tocotrienols reduce 25-hydroxycholesterol-induced monocyte-endothelial cell interaction by inhibiting the surface expression of adhesion molecules, Naito Y et al, *Atherosclerosis*, 180 (1):19-25, May 2005.
22. Free radical recycling and intramembrane mobility in the antioxidant properties of alpha-tocopherol and alpha-tocotrienol, Serbinova E, Kagan V, Han D, and Packer L, *Free Radic Biol Med*, 10(5):263-75, 1991.
23. Effects of tocotrienols on life span and protein carbonylation in Caenorhabditis elegans, Adachi H, and Ishii N, *J Gerontol A Biol Sci Med Sci*, 55(6):B280-5, Jun 2000.
24. Effect of vitamin E on glutathione-dependent enzymes, van Haaften RI, Haenen GR, Evelo CT, and Bast A, *Drug Metab Rev*, 35(2 3):215-53; May-Aug, 2003.
25. Surh Y and Packer L, eds, *Oxidative Stress, Inflammation, and Health*, New York: CRC Press, 2005.
26. Coantioxidants make alpha tocopherol an efficient antioxidant for low-density lipoprotein, Thomas SR, Neuzil J, Mohr D, and Stocker R, *Am J Clin Nutr*, 62(6 Suppl):1357S-1364S, Dec 1995.
27. Recycling of vitamin E in human low density lipoproteins, Kagan VE, Serbinova EA, Forte T, Scita G, and Packer L, *J Lipid Res*, 33(3):385-97, Mar 1992.
28. Endogenous ascorbate regenerates vitamin E in the retina directly and in combination with exogenous dihydrolipoic acid, Stoyanovsky DA, et al, *Curr Eye Res*, 14(3):181-9, 1995.
29. Evaluation of the dietary effects of coenzyme Q in vivo by the oxidative stress marker, hydroxy-otadecadienoic acid and its stereoisomer ratio, Yoshida Y, Hayakawa M, Habuchi Y, and Niki E, *Biochim Biophys Acta*, Jun 27, 2006.

NW022807

Notice: The information herein is intended for educational purposes only. It is not intended to diagnose, prescribe, treat or prevent any disease or endorse any brand or product. For medical advice, consult a health care professional.