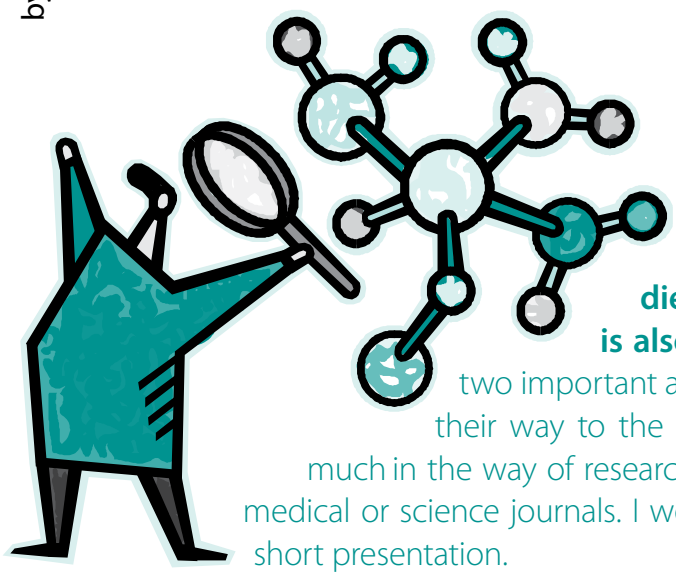
by Michael Smith PhD, MDSc.

The Triple Action Combination

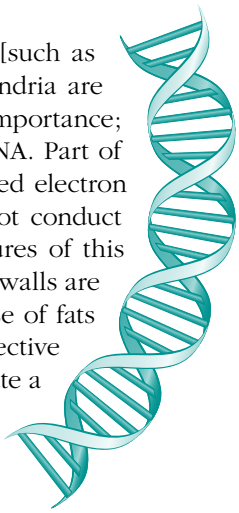
of CoEnzyme Q10, Vitamin E & Lecithin



We are so lucky to be alive in this exciting time of medical advancement. In the last two decades, there's been substantial progress in the understanding of the importance of two nutrients in particular; coenzyme Q10 and vitamin E. **Researchers have become convinced that the dietary form with which we consume these nutrients is also extremely critical**. After all, we have to first get these two important antioxidants into our bloodstream to enable them to make their way to the mitochondria where they play their most vital roles. So much in the way of research goes unannounced to those who don't have access to medical or science journals. I would like to reduce years of research on these two into a short presentation.

Mitochondria & Energy

Mitochondria are the subcellular organelles that synthesize adenosine triphosphate (ATP) from sugars [such as glucose, fructose, glycerol, sucrose] and fats [such as stearic and palmitic acids]. Hundreds of mitochondria are present in each liver cell and thousands in each involuntary muscle cell. ATP is a molecule of central importance; the energy "spark" for muscle contraction, enzyme reactions and a building block for both DNA and RNA. Part of the process for ATP synthesis occurs within the tiny walls of the mitochondria and this process is called electron transport. The mitochondria walls are very much like an insulator, in that the walls themselves do not conduct electrons but internal structures within the walls do, like metal wires. The exacting biochemical features of this electron transport process are still under investigation and an interesting field by itself. The mitochondria walls are made up of fat molecules, such as fatty acid diglycerides and triglycerides and even cholesterol. This use of fats is necessary because fats (lipids) do not conduct electricity and when aligned as a wall become an effective barrier separating water soluble enzymes from one another. Most enzymes are simply too large to penetrate a lipid wall. So the mitochondria wall serves a dual purpose of acting as a barrier and also as a conduit for electron transport by special enzymes that are water insoluble and anchored within this lipid membrane.



Recent research has shown that **CoQ10 levels are abnormal in people suffering FM** and supplementation with CoQ10 is recommended.

CoQ10

One special small biochemical which plays an important role conducting electrons in this membrane is coenzyme Q10 (CoQ10). It received this unusual name for two reasons. First, the discoverers knew that CoQ10 acted like an enzyme, and enzymes are all large molecules responsible for mitochondria function but the removal of this small molecule brought electron transport to a complete stop. So it must act with enzymes, hence coenzyme. Second, the structure contains 10 units related to the molecular building block isoprene—just like vitamin E that contains 3 of these units. So the designation 10 is also highly descriptive. Recent research has shown that CoQ10 levels are abnormal in people suffering FM and supplementation with CoQ10 is recommended.

Continued

The Triple Action Combination
continued

CoQ10 & E

The active portion of CoQ10 is a quinine structure similar to the active portion of vitamin E. In fact, these two molecules are quite similar, have a ring section that performs the electron transfer or antioxidant functions. The solubility of both molecules are similar. Each has a long tail of several isoprene units, making it soluble in fat but not soluble in water. Both CoQ10 and vitamin E are considered food soluble but water insoluble vitamins. They both are nontoxic, even at the upper limits of normal intake. Interestingly, diets high in CoQ10 help retain active vitamin E_1. Recent research, primarily done in Japan, points to the vital importance of CoQ10 in maintaining healthy heart muscle$_2$. In some cases damaged hearts have been at least partly healed when subjects were given CoQ10 supplements. While CoQ10 is found rather abundantly in leafy green plants, many people are deficient in this nutrient despite claims to a good diet. Researchers have known for many years that vitamin E protects membranes—such as the mitochondrial membrane—from free radical damage.

Research within this past year has shown that vitamin E is critical for protection of the mitochondria from peroxides synthesized haphazardly, within the mitochondria itself. Vitamin E is the specific agent required by the mitochondria for this protection. Turns out that hydrogen peroxide is sometimes synthesized by mistake within the mitochondria as this organelle burns sugars into water and carbon dioxide. Our cells have met this challenge by designing a biochemical system utilizing vitamin E as the hero antioxidant. Interesting — at least to some of us!

Enter Lecithin

We now know several specific reasons why we all require CoQ10 and vitamin E to survive, so do we simply take a tablet or capsule of each and forget our peroxide problems? Life is never so simple. We can never be certain that food soluble molecules are properly absorbed by our guts, unless we are in Sumo training (and eating everything). An aside: I love to watch Sumo wrestling highlights while I run treadmill, "One more mile! This won't happen to me!" The best way to help the absorption of CoQ10 and vitamin E is to combine these together with a small amount of fat, such as a diglyceride. One diglyceride commonly added to nutritional supplements is lecithin. Lecithin also contains the water soluble group choline, which itself is required to maintain cell membrane integrity. The two fatty acids of lecithin are the lipids that help disperse CoQ10 and vitamin E, so these two nutrients can be efficiently transported into the blood stream from the gut. Even in plasma, lipids are required to transport CoQ10 and vitamin E to the target cells.

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3 To Tango

The structures and physical properties of the two nutrients, CoQ10 and vitamin E, are similar. This means that the processes of digestion and transport in plasma are quite similar—both require the accompliment of fatty acid lipids to find the way. The active centers of these two molecules are dissimilar enough that our cells use these powerful antioxidants in specific and different manners. Proper digestion with a meal and with a lipid carrier such as lecithin is the best way we can help ourselves to deliver these nutrients to our cells. So, it takes three to tango after all.

Resources

1. Ibrihim, WH, et al. "Dietary coenzyme Q10 and vitamin E alter the status of these compounds in rat tissues and mitochondria". *Journal of Nutrition* 30(9): 2343-8 (2000).
2. Packer, L. *The Antioxidant Miracle.* John Wiley and Sons, Inc., NY (1999).
3. Cordero, MD et al. "Coenzyme Q10 distribution in blood is altered in patients with fibromyalgia". *Clinical Biochemistry* (7-8):723 (2009).

Michael Smith PhD MDSc, Advanced studies in biochemistry, physiology and medicine. Dr. Smith has co-authored more than 30 scientific and medical articles in journals and lectured extensively. He has designed many new diagnostic tests for clinical use. Dr. Smith became interested in nutritional supplements after reading Linus Pauling and while doing research on oxygen and carbon monoxide toxicities.

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