

Power Up With CoQ10 And L-Carnitine

The power cells of the body are like batteries that can be powered up with the help of CoQ10 and carnitine supplements. There are a number of chemicals that are used by the body and that are fundamental to the correct metabolism of energy in the body. Before discussing some of these, however, it is necessary to understand how energy is created and used within the body.

There are two main ways that the body creates energy: anaerobically by conversion of adenosine diphosphate (ADP) and phosphates to adenosine triphosphate (ATP). This involves expenditure of energy, though the energy expended is less than that obtained from the ATP. It is similar to charging a battery. The discharged battery is the ADP that can be recharged to ATP by energy and phosphate. The charged battery, the ATP, expends its energy at the cellular level. The energy needed to recharge the ADP to ATP is provided by enzymes.

The second is the aerobic method that begins with glycolysis: the conversion of blood glucose to pyruvate. This takes nine steps to complete, and while it needs two molecule of ATP to complete, the end result is the production of four molecules of ATP. The second stage in this aerobic production of ATP is called the Krebs' Cycle, also termed the Citric Acid Cycle.

The pyruvate is oxidatively decarboxylated to form acetyl Coenzyme A (Acetyl CoA) which passes through the cycle. The acetyl CoA is used only to pass acetic acid between enzymes that allow the cycle to take place, and once it has done that it is regenerated back to acetyl CoA, and carries out the first stage of the cycle again. In steps 2 and 3, the citrate reacts with nicotinamide adenine dinucleotide (NAD) to form alpha ketoglutarate which is oxidized further by more CoA in step 4.

In step 5 the resultant succinyl CoA reacts with a free phosphate group releasing the CoA, and the phosphate is then bonded to a molecule of guanine diphosphate (GDP) forming the higher energy form, guanine triphosphate (GTP) that stores energy in the same way as ATP does, and that is used to produce ATP from ADP. Finally, the succinate is oxidized by flavine adenine dinucleotide (FAD) that eventually forms an oxaloacetate that reacts with CoA to begin the cycle all over again.

The result of the Krebs' Cycle is that the GTP donates a phosphate group to ADP to form ATP, and three molecules of NAD and one of FAD are reduced to form NADH and FADH. These donate their electrons to an electron transport system that forms a lot more molecules of ATP., and it is the latter that are the main product of the Krebs' Cycle, not the formation on one molecule of ATP from ADP.

So where do Coenzyme Q10 and carnitine fit into this cycle? Part of the Krebs' cycle involves the conversion of GDP to GTP. The resulting succinate is then converted to a fumarate by the action of L-carnitine fumarate. Carnitine is also necessary for the transportation of long chain fatty acids across the membrane of the mitochondria in the body cells. The energy creation processes take place within the mitochondria, and L-carnitine is the only natural material that is known to allow fats to cross the membrane so any deficiencies must be avoided.

If you feel weak and listless, it could be because you have insufficient L-carnitine in your diet, and you need a supplement. You could also be deficient in Coenzyme Q10 that facilitates the use of enzymes by the cells in the production of energy. It also helps to protect the mitochondrial membrane and cell walls from attack by free radicals, since it is a very powerful antioxidant. However, it is its part in the previously mentioned electron transport chain that makes CoQ10 so important to the processes the Krebs' Cycle whereby the oxidative phosphorylation of ADP to ATP needs the electrons delivered to exactly where they are used. CoQ10 ensures that this is done, and without it the whole process would fail.

In order for the process to proceed efficiently, there must be an excess of Coenzyme Q10 in the body. Just sufficient is not enough, and a deficiency could have a profound effect on the body. Examples of conditions that are associated with a deficiency of the coenzyme are Parkinson's disease, heart disease, gum disease and high blood pressure. That is not to infer that the deficiency causes these conditions, since they could equally well cause the deficiency, but those with such conditions have reduced energy supplies because of the CoQ10 deficiency. Coenzyme Q10 must have the electrons produced by the Krebs' Cycle in order to create energy, and the Krebs' Cycle needs L-carnitine to produce the fats for it to work properly.

A deficiency in L-carnitine is common in people suffering from heart disease and disorders of the cell mitochondria, and supplementation can restore correct mitochondrial activity. Both carnitine and CoQ10 work together to power up your body's energy cells. So what exactly is carnitine?

Carnitine is an amino acid that is manufactured in the liver and kidneys, and is also available from meat and milk. In addition to its ability to carry fats across membranes in the mitochondria, it is necessary for the proper functioning of brain cells, and also gives the body's cells in general the necessary energy to function as they should. It provides fatty acids to the heart which are the main energy source for the heart muscle. SA deficiency in carnitine causes the heart to use up the body's store of glycogen as an emergency energy source to ensure that it continues to function. Deficiencies of carnitine are not uncommon, and are associated with conditions such as renal failure, alcoholism, diabetes, cancer and Reye's

syndrome. Angina pectoris can also cause a reduction in carnitine levels. A carnitine supplement can help to improve the exercise capability of angina sufferers, and to improve the function of the heart.

Coenzyme Q10, commonly referred to as CoQ10, carries out a number of functions in the body, mostly in connection with its antioxidant properties, but it is its importance in the electron transport chain that is the critical one. Deficiencies of CoQ10 results in a number of conditions, though the most common is heart muscle disease, or cardiomyopathy. The heart muscle contains a particularly large number of mitochondria.

Without a doubt, the pairing of L-carnitine and CoQ10 is probably the most vital in human biochemistry since without them we would be devoid of the energy needed for life. Coenzyme Q10 and L-carnitine are considered food supplements and available at your local or internet health food stores.

About the Author

More information on [CoQ10](#) and L-Carnitine can be found at VitaNet, LLC Health Foods. [Http://vitanetonline.com/](http://vitanetonline.com/)

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