

All B Vitamins Must Be Coenzymated Before The Body Can Use Them

The fact that B vitamins have had to be coenzymated before they can be used by your body has been known for some time, but it is only over the past few years that they have been made commercially available in that form. Before we discuss the B vitamins in their coenzyme form it might be appropriate to discuss what coenzymes are and how they differ from ordinary enzymes.

An enzyme is like an organic catalyst: it takes part in biochemical reactions by allowing such reactions to take place, but itself remaining unchanged. All enzymes are proteins formed in your body from amino acids and other protein material. A coenzyme, on the other hand, is somewhat like an enzyme for the enzymes, in that it is needed for the enzyme to do its job. Without a coenzyme, many enzymes could not promote the biochemical reaction it is responsible for.

The B vitamins are all water soluble, which means that they are readily excreted and it is not impossible that if you take a B vitamin supplement, the whole lot will be immediately excreted in your urine if not used by your body. Whether they are or not it is a fact that your body can quickly become depleted of the B vitamin group, especially if you drink a lot. Alcoholics in particular are frequently vitamin B deficient. Although the liver can store unused vitamin B, they are only very small quantities and insufficient to prevent a deficiency.

A deficiency in the B vitamins can cause a wide range of unpleasant conditions that are rapidly remedied with supplements. Pellagra is due largely to a deficiency in Vitamin B3, and causes hair loss, horrible skin lesions and many other side effects that you don't want to know about. Vitamin B12 deficiency can cause loss of memory, and is common in alcoholics and some vegetarians (vitamin B12 is animal derived). Other symptoms of a general B vitamin deficiency include exhaustion, heart palpitations, fibrillation, anxiety, restlessness, attention deficit disorder and many, many more.

It is not pleasant so you make sure that take enough vitamin B in your diet: dietary sources are far superior to pills although supplements will help you get over the symptoms of the deficiency until your diet takes over. Supplementation is also a good way to maintain a regular supply of vitamin B complex irrespective of your diet. The effects of a deficiency are so bad that a regular supplement is well worth taking.

However, back to coenzymes and why they are needed for the metabolism of B vitamins in your body. Most B vitamins are, in fact, coenzymes themselves. Keep in mind that the definition of a vitamin is an organic substance that is essential for the normal health of your body. If you lack even one vitamin, your health will suffer and eventually you will be likely to die. That describes all of the B vitamins perfectly, and they also just happen to be coenzymes. This is not coincidence, of course, and their biochemistry must have been recognized before the concept of coenzymes was formulated.

The B vitamins proper consist of eight distinct proteins: B1 (thiamine), B2 (riboflavin), B3 (niacin), B6 (pyridoxine), B9 (folic acid), B12 (cyanocobalamin), and biotin and pantothenic acid. They are all essential components in human and animal metabolism, and most are also coenzymes.

Every cell in your body depends on B vitamins for its existence, which is why pregnant women should include a good supply of them in their diet, especially folic acid (B9). They are essential for the cellular development of the fetus. Folic acid is necessary for the synthesis of nucleic acids that allow cell growth and the production of red blood cells. However, not one can be placed in importance above any other since they are all essential.

With respect to the coenzyme factor, the vitamin B coenzymes are responsible for many of the biochemical reactions upon which life depends. Coenzyme B-12 for example is essential for two types of reaction that it catalyzes, one being a hydrogen atom exchange with alcohol and amine functional groups, the other being connected with methyl group transfer between molecules.

In humans, the first of these is responsible for an essential step that results in energy being metabolized from fats and proteins in the mitochondria and the second for DNA production in cells that is indirectly responsible for growth. Each of these is why a vitamin B-12 deficiency leads to excessive fatigue and also a lack of fetal growth (although folic acid can make up for the latter deficiency).

Thiamine (Vitamin B1) is a coenzyme for the metabolism of carbohydrates to energy. In the body it is present in the form of thiamine diphosphate, a coenzyme that assists in the decarboxylation of pyruvate as part of the citric acid cycle, otherwise known as the Krebs Cycle, that takes place in the mitochondria and is responsible for the generation of energy through aerobic respiration.

Another coenzyme that is involved in the Krebs Cycle is formed in the body from Vitamin B3, or niacin. This coenzyme, nicotinamide adenine dinucleotide, has a redox potential and can store energy for use later on. Vitamin B5 can be converted in the body to Coenzyme A that not only breaks proteins down into individual amino acids, but also takes part in the first part of the Krebs Cycle. There is a common pattern emerging here where the

B vitamins have an important part to play in the generation of energy from fats and carbohydrates.

Similarly, Vitamin B6 is present in the body as the coenzyme Pyridoxal 5'-phosphate that helps to break down the body's emergency energy store, glycogen, into energy when needed.

In these ways, and more, the coenzymes created in the body from the B vitamins help many of the reactions of life to take place, and without these coenzymes life could not exist. Hence the importance of the B vitamins themselves, and any deficiency could be disastrous to the metabolic processes that generate energy and keep you alive. It is not just the energy needed for exercise and normal human activity that will be compromised, but also that which keeps the heart beating and your diaphragm moving to allow you to breath.

Without a doubt, a Vitamin B supplement is one of the most valuable of all the vitamin supplements, and they are available in many forms. You might also find some of the B vitamins in their coenzyme form, though some of them may be unstable. However, whatever form they are taken in, Vitamin B complex should be one of the first on your vitamin supplement shopping list.

About the Author

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