



Acetyl-L-Carnitine™ Capsule

DESCRIPTION: Acetyl-L-carnitine delivers 500 mg in the easily digestible, neutral form and the large quantity necessary for those on modern diets not delivering the copious amounts of L-carnitine required for health.

FORMULATION: Each capsule contains 500 mg of acetyl-L-carnitine, with small amounts of cellulose, silica and magnesium stearate; excipients to retard moisture spoilage.

INDICATIONS: A generous amount of L-carnitine is required for health and proper growth. While deficiency of L-carnitine is not a common diagnosis, the proper daily intake for optimal health is not known. Common indications of carnitine deficiency are

1. systematic muscle weakness, *myopathy* along with some chronic pain. This is sometimes genetic in origin but can be brought about by malnutrition¹ or simply old age².
2. slow recovery from *exercise stress*³.
3. *hyperthyroidism* which includes developing osteoporosis⁴ and age related bone loss⁴.
4. some forms of chronic *diabetic neuropathy*⁵, where patients are deficient in L-carnitine.
5. carnitine insufficiency is a contributing factor to muscle weakness during *renal dialysis*⁶ and deficiency is sometimes brought about by liver disease.
6. *vegetarian diets*; L-carnitine is found in only low amounts in most fruits and vegetables.

FEATURES: each capsule provides 500 mg (RDI is unknown) of acetyl-L-carnitine. This form of carnitine has been shown effective at traversing the intestinal barrier into the bloodstream and to arrive in effective amounts within the inner matrix of the mitochondria. The mitochondria is the important, sub-cellular organelle of energy production, as ATP, and exchange (GTP) from lipids.

DIRECTIONS: one to four capsules daily, with or between meals. Store in a dry cool place, keep out of reach of children.

BACKGROUND: Lipids are the main source of sustained energy for both heart and skeletal muscle and fatty acids from lipids are the main source of energy for muscles. The reason for this seems to be the energy per gram of lipid is about twice that of polysaccharides and unlike oligosaccharides, lipids are easily stored without the accompanying, hydrating water, making lipids the efficient fuel of choice by a factor of 4 or more. Lipid oxidation to CO₂ and H₂O occurs within the inner mitochondrial matrix, which is a well-protected space packed with many different enzymes critical for ATP biosynthesis. Unfortunately, this organelle is also the primary target for destruction by undesirable H₂O₂ and superoxide ion, though some age-related and self-abuse damage can be reversed by liberal intake of L-carnitine and α -lipoic acid⁷.

During energy production from lipids, phosphatidyl diacylglycerides and triacylglycerides are first cleaved by a series of reactions into the component fatty acids, then transported through the cell cytosol to the mitochondrial outer membrane. Next, the enzyme carnitine palmitoyltransferase I (CPT I) binds L-carnitine to the fatty acid to make a neutral acylcarnitine and this neutral molecule is allowed transport into the mitochondrial matrix. After transport, the acyl (fatty acid) group from acylcarnitine is transferred to a free coenzyme A (Co A) with liberation of free carnitine. The enzyme responsible for this action is called carnitine palmitoyltransferase II (CPT II). Finally, the Co A-fatty acid molecule is usually "burned" in a series of reactions called β -oxidation. The free L-carnitine may be allowed back into the cytosol to repeat the fatty acid transport or it may be taken by a

hungry nerve cell and used in the biosynthesis of acetylcholine – a neurotransmitter – in this case it is lost from the carnitine- β -oxidation transport cycle.

Utilization of the carnitine- β -oxidation pathway is highly desirable in our modern society, for the tightly controlled biosynthesis of ATP from lipid oxidation is an absolute requirement for continued health. Not only, but carnitine driven β -oxidation is the primary path for riding the body of excess calories. Because this oxidative pathway is so important the body probably needs several grams of acetyl-L-carnitine, daily. For instance, the important nutrients coenzyme Q10 and α -lipoic acid are also important components of the mitochondria and depletion of either of these or L-carnitine leads to irreversible damage to this organelle.

Diet supplementation with L-carnitine is important - People on strict vegetarian diets may not be able to ingest an adequate amount of L-carnitine, for only a few fruits & veggies contain significant amounts. This compounds the problems of sedentary folks on fruit and vegetable diets, for the muscles of obese individuals have drastically reduced ability to oxidize fatty acids which is partly due to both low levels of L-carnitine and low activities of CTP I and II in these muscles⁸. It is well known, from several independent human studies, that obesity is a strong correlate with type II diabetes. Supplementing the diet with L-carnitine can help avoid type II diabetes, Parkinson's and a range of cardiovascular diseases.

Probably the most exciting development in L-carnitine supplementation is the effect this ingredient has on muscle strength. This is supported by clinical findings of L-carnitine supplements delaying or even preventing cardiovascular disease⁸ and also reducing hospital time for diabetics. Early intervention with 1.5 to 3 grams of L-carnitine, daily, significantly reduces diabetic neuropathy⁵. Bone re-adsorption is inhibited and bone growth stimulated by L-carnitine⁴. At high concentrations L-carnitine suppresses the release of tumor necrosis factor α (TNF- α) and interleukin-12, both factors signaling for osteo-bone cell senescence and death. It even reduces the binding of dexamethasone to bone cells, thus reducing the seriousness of a side-effect of this important drug.

References

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