



## Carnilite capsule; Enhances body's ability to convert fat into energy

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### ABSTRACT

L-Carnitine is a vitamin-like nutrient essential for energy production and fat metabolism. It is used by athletes as an ergogenic aid. Supplementing diet with L-Carnitine increases maximal aerobic power, and promotes glycogen sparing in the course of prolonged exercise. Supplementation of L-Carnitine raises the performance of submaximal exercise and resistance to fatigue. L-Carnitine acts as a carrier in fatty acid transport and its supplementation increases the utilisation of free fatty acids for energy production in endurance trained athletes. Since, L-Carnitine involves in energy production and utilisation, it can be considered an *ergogenic aid* for athletes.

L-Carnitine supplementation may protect endurance athlete carbohydrate stores, which are at risk during periods of increased exercise. This article reviews the current available scientific literature regarding the effect of L-carnitine in energy production and utilization, performance of submaximal exercise and resistance to fatigue and for energy production in endurance.

### INTRODUCTION

L-Carnitine is a nitrogenous compound naturally found in human skeletal muscle, heart, liver, kidneys and plasma. An average human body contains 20-25g of L-Carnitine, of which over 95% is in skeletal muscles. Carnitine exists in two isomeric forms: L-Carnitine and D-Carnitine, of which L-Carnitine is the physiological active form [2].

L-Carnitine is a vitamin-like nutrient essential for energy production and fat metabolism. It is used by athletes as an ergogenic aid. Supplementing diet with L-Carnitine increases maximal aerobic power, and promotes glycogen sparing in the course of prolonged exercise [3, 4]. Supplementation of L-Carnitine raises the performance of submaximal exercise and resistance to fatigue.

L-Carnitine is present in foods, especially red meat and some dairy foods. Animal products are

generally rich sources of Carnitine, while plant foods contain considerably lower levels [4].

### L-Carnitine - Fate in Human Body

Carnitine is primarily synthesized from two essential amino acids, methionine and lysine in the liver and kidneys. Its formation requires the presence of co-factors such as, vitamin C, niacin, vitamin B<sub>6</sub> and iron<sup>4</sup>. In addition to endogenous synthesis, dietary intake of Carnitine serves to maintain tissue Carnitine stores. Meat, poultry, fish and dairy products are important sources of Carnitine.

In resting muscle, L-Carnitine is found to be approximately 80-90% as free L-Carnitine, whereas the rest is in esterified form. Carnitine also forms long and short chain acyl derivatives, with predominant short chain acyl derivative, acetyl-L-Carnitine (acylcarnitine). Carnitine is normally eliminated via urine as free Carnitine and acylcarnitines [5]. The

daily urinary excretion of Carnitine is 15-50mg. Carnitine and acylcarnitine due to their smaller molecular sizes are significantly removed from the blood during filtration in kidneys but approximately 90% is reabsorbed [6].

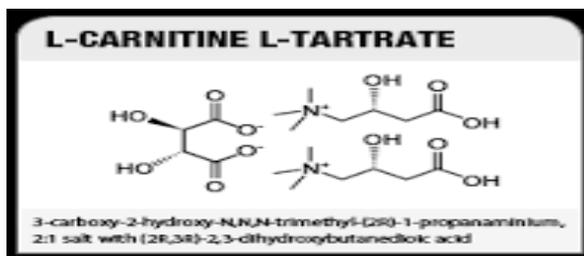
Carnitine exists as two distinct isomers, L-Carnitine (naturally occurring Carnitine) and D-Carnitine (synthetic Carnitine). L-Carnitine is the physiologically active form, while the non-physiological form, D-Carnitine, may replace the natural intracellular L-Carnitine. D-Carnitine depletes

endogenous L-Carnitine stores by competitive antagonism<sup>2,5</sup>. D-Carnitine or mixtures of D-Carnitine and L-Carnitine are to be avoided. Pure L-Carnitine or its salts should be only sources for Carnitine supplementation.

### Composition of Carnilite Capsule

#### Each Capsule Contains

L-Carnitine -L -Tartrate (carnipure) — 500 mg  
Eq to L-Carnitine -340 mg



### Biochemical Role of L-Carnitine in Carnilite Capsules

L-Carnitine possesses following different biochemical functions, which are very important for athletic performance.

#### Fat Transport and Mitochondrial -Oxidation of Long Chain Fatty Acids

The primary function of Carnitine in the body is to facilitate the burning of fatty acids for metabolic energy. L-Carnitine has been shown to have two metabolic functions, as follows [5-7]:

1. It transports long-chain fatty acids across the inner mitochondrial membrane to the mitochondrial matrix, where b-oxidation of fatty acids takes place.
2. It also transports the potentially toxic metabolites (by-products of lipid catabolism) from the mitochondrial matrix back into the cytoplasm, in the form of Carnitine esters.

L-Carnitine acts as a carrier in fatty acid transport and its supplementation increases the utilisation of free fatty acids for energy production in endurance trained athletes [8, 9]. Since, L-Carnitine involves in energy production and utilisation, it can be considered an *ergogenic aid* for athletes.

L-Carnitine supplementation may protect endurance athlete carbohydrate stores<sup>3</sup>, which are at risk during periods of increased exercise.

### Carbohydrate Metabolism

Although Carnitine is famous for its fat-burning properties, growing evidence indicates that it is also important in carbohydrate metabolism [3]. It is evident that there is a strong correlation between muscle Carnitine and the activity of the Krebs cycle, a pivotal cycle in carbohydrate metabolism [4]

Carnitine concentration in muscle is found to be directly proportional to muscle glycogen stores. Carnitine can act as *anti-catabolic agent* because of its 'Glycogen Sparing' effect to improve energy production from fats and effectively reduces the need to burn glycogen [3].

### Lactate Clearance

Intensive, acute exercise leads to lactate accumulation and an associated drop in serum pH. High levels of lactic acid increase the acidity of blood and tissues, lead to fatigue and decrease in ATP production. L-Carnitine inhibits key anaerobic enzyme phosphofructokinase (PFK), reducing the maximum rate of glycolysis. L-Carnitine reduces the acetyl CoA/CoA quotient and as a consequence, less lactate is formed. Supplementation may be useful in intense physical exercise to improve performance by clearing extra lactic acid from blood and tissues [10-11].

### Peripheral Blood Supply

L-Carnitine shows a demonstrable increase in peripheral blood supply and capillary dilatation. This

can lead to more oxygen absorption and substrate turn over, especially during intense exercise [7].

### **Branched Chain Amino Acid (BCAA) Metabolism**

Carnitine levels are linked to the metabolism of BCAAs, considered the most important amino acids for sports performance [12]. In skeletal muscles BCAAs are partially metabolised to branched chain keto acids (BCKA's), which subsequently are linked up to Carnitine and released into general circulation. These BCKA Carnitine complexes are taken up by the liver for further oxidation to yield energy (Gluconeogenesis) [4].

### **Ammonia Detoxification**

Ammonia, a by-product of protein degradation, is a recognised factor in exercise-induced fatigue, and is toxic at low amounts. Carnitine works to lower ammonia levels by increasing its incorporation into urea, which is subsequently excreted in the urine [13]. Carnitine supplementation may have a protective effect against ammonia poisoning caused due to intense work-outs [12].

L-Carnitine also protects the immune system and stabilises membrane during intense physical exercise [7]. More recently, studies have shown that Carnitine and its acyl esters are radical scavengers and iron-chelators, and act as antioxidants [14].

### **Why CARNILITYE CAPSULE Supplementation Important?**

Although, Carnitine is both biosynthesized and supplied in the diet, there is a need for supplementary Carnitine in some conditions:

In competitive athletes, intensive endurance efforts (cycling stage races, repeated long-distance runs, etc.) cause a clearly detectable L-Carnitine deficiency in the muscles. Supplementation can have a positive effect on athletic exercise capacity [15] and can help to maintain fitness, enhance detoxification and aid faster recovery.

An unbalanced diet with a low intake of L-Carnitine and/or of one of its precursors often leads to a deficiency in L-Carnitine. It is evident that some vegetarian competitive athletes are Carnitine deficient.

To produce L-Carnitine endogenously, lysine, methionine, niacin, vitamin B6, Vitamin C and iron are required. L-Lysine is the backbone of Carnitine and diets low in lysine can lead to Carnitine

deficiency [16]. In addition, methionine, vitamin C and iron deficiency can cause significant drop in Carnitine levels in the body.

Individuals with different physiological conditions (fasting, malnutrition, obesity, infertility in males, dialysis patients, muscle diseases, and hospitalised patients receiving total parental nutrition), may need supplementary L-Carnitine.

### **What are the Benefits of CARNILITYE CAPSULE?**

L-Carnitine acts as an ergogenic and anti-catabolic agent for sports performance. Its supplementation can be benefited as follows:

- Increased utilisation of free fatty acids for energy for increase muscle and heart energy in endurance sports (ergogenic aid)
- Increased 'Glycogen Sparing' effect in endurance athletes, may provide protection for muscle glycogen stores, which are at risk during periods of increased exercise (anti-catabolic)
- Reduced lactic acid concentration in muscle leads to a delay in the onset of muscular fatigue and cramps
- Increased peripheral blood supply provides more oxygen absorption and leads to more energy production in aerobic exercise
- Increased BCAA metabolism to yield more energy and production of glucose
- Enhanced removal of ammonia and its detoxification
- Increased protection to immune system and improved membrane stability during intense physical exercise.

More recently, studies have shown that Carnitine and its acyl are radical scavengers and iron-chelators, and hence act as antioxidants.

L-Carnitine supplementation may improve mental and physical performance and can be used to achieve optimum health. Currently, L-Carnitine does not appear on the International Olympic Committee (IOC) banned substances list as it is naturally occurring constituent of a normal diet.

### **Safety of Carnilitye Capsule**

L-Carnitine is completely safe, with the possible exception of mild diarrhoea at very high doses [4, 7]. As a vitaminoid, L-Carnitine is practically non-toxic and produces no side effects even after the intake of large doses (up to 15g). L-Carnitine causes neither physical nor psychological dependency even after

long-term use. Supplementation may be discontinued or resumed at any time. There is no evidential published data on any intolerance and adverse side effects of L-Carnitine. D-Carnitine or mixtures of D-Carnitine and L-Carnitine are to be avoided.

### **Suggested Use**

Take one CARNILITYE CAPSULE three times daily or as recommended by your health-care or performance professional.

### **Warnings**

#### **Allergy warning**

This product is contraindicated in an individual with a history of hypersensitivity to any of its ingredients.

#### **Pregnancy**

If pregnant, consult your health-care practitioner before using this product.

### **Interactions**

There are no known adverse interactions or contraindications at publication date.

### **SUMMARY & CONCLUSION**

L-carnitine is necessary for fat to be metabolized and used for energy. L-carnitine has also been shown to improve athletic performance, including running speed, decrease oxygen consumption, heart rate, and lactic acid, and increase muscle recovery. L-carnitine also promotes appetite control and supports cardiovascular, reproductive, and muscle health. L-Carnitine acts as a carrier in fatty acid transport and its supplementation increases the utilisation of free fatty acids for energy production in endurance. Since, L-Carnitine involves in energy production and utilisation, it can be considered an ergogenic acid for endurance in sports performance.

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