Carnitine

**Function:**

L-carnitine is an amino acid derivative of the essential amino acids L-lysine and methionine. The conversion to carnitine requires niacin (B3), vitamins B6 and C, and iron. It is found in nearly all cells of the body but chiefly in the liver and kidney. Carnitine is essential for the transportation of long-chain fatty acids across the inner mitochondrial membranes in the mitochondria, where they are metabolized by beta-oxidation to produce biological energy in the form of adenosine triphosphate (ATP).

L-Carnitine also is required to remove short- and medium-chain fatty acids from the mitochondria. This removal optimizes energy production by maintaining coenzyme A at optimal levels for normal metabolism and energy production.

**Deficiency Symptoms:**

Deficiencies of carnitine may result from: 1) deficiencies of essential amino acids lysine and methionine, 2) deficiencies of cofactors (B3, C, B6 and iron), 3) defective gastrointestinal function, 4) increased requirement because of high-fat diet, metabolic stress or disease. The consequences of carnitine deficiency are impaired lipid metabolism and lipid accumulation in skeletal muscles, heart, and liver. Patients usually exhibit muscle weakness and fatigue.

Normal heart function depends on adequate concentrations of carnitine. While the normal heart stores more carnitine than required, if the heart does not have a good oxygen supply, carnitine levels quickly decrease. This lack of oxygen leads to decreased energy production and increased risk for angina and heart disease. Carnitine benefits blood lipids by lowering triglycerides and total cholesterol, while increasing HDL. L-acetylcarnitine (LAC) may be useful in the treatment of Alzheimer’s disease, senile depression and age-related memory loss.

**Repletion Information:**

There have been no reports of toxicity from L-carnitine supplementation. The biologically active form of carnitine is the L-isomer. DL-carnitine should be avoided. Usual dosages found in capsules and tablets range from 250 to 1000 mg in a variety of chemical formulations: L-acetylcarnitine, L-carnitine, and the HCl, tartrate and fumarate salts. Carnitine, Coenzyme Q10 and pantothenate (B5) appear to work synergistically.