



MED WATCH: L-CARNITINE (LEVOCARNITINE)

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Carnitine is found in the muscles of the body at high levels, which is important for the supply of energy to body muscles. Carnitine transports long-chain fatty acids into the mitochondria where they are oxidized to provide energy. Production of the energy also requires vitamins B2, B3, B12, and biotin. Carnitine also aids in removing short and medium chain fatty acids that accumulate in the mitochondria as the result of abnormal metabolism. L-Carnitine helps normalize the redox state of the brain, and facilitates liver urea synthesis.

The main symptoms of carnitine deficiency are high triglycerides and muscular fatigue. It is likely that the phenomenon known as futile cycling (of free fatty acids), which occurs in HIV disease, is either caused or at least exacerbated by carnitine deficiency. Futile cycling is the cyclical reformation of fat from free fatty acids with subsequent breakdown back to free fatty acids—thus fats are recycled burning up protein in the process. In HIV disease, the result is unusually high usage of protein to provide energy and relatively high storage of fat leading to loss of muscle mass.



WHAT DO PEOPLE WITH HIV USE THIS SUPPLEMENT FOR? To protect and enhance immune cell function: Carnitine supplements may affect immune cell function and numbers. After test-tube studies suggested that carnitine might reduce levels of apoptosis (cell death) in HIV-positive individuals, a small trial of intravenous carnitine involving 11 HIV-positive men was conducted. The study showed dramatic improvements in CD4 T-cells after four months of daily six gram injections. Participants began the study with CD4 T-cell counts between 200 and 500, although all had experienced a decline in their CD4 T-cell count during the previous 12 months. Participants had no symptoms of HIV and had chosen not to take antiretroviral drugs. Increases in CD4 T-cells appeared to be due to a decrease in cell apoptosis.

To decrease blood levels of triglycerides and cholesterol:

After 12 weeks of treatment with L-carnitine there was a drop in both total cholesterol (from a median of 250 mg/dl to 219 mg/dl) and low density lipoprotein cholesterol (from a median of 177 mg/dl to 132 mg/dl) levels.

Interestingly, the researchers noted that the cholesterol-lowering effect of L-carnitine is not seen in HIV-negative patients with lipid disorders.

Peripheral neuropathy: This is a common side effect of the HIV drugs Videx {didanosine} (ddI), Hivid {zalcitadine} (ddC), and Zerit {stavudine} (d4T). Symptoms of peripheral neuropathy include numbness, burning, and tingling in the hands and feet. In severe cases, peripheral neuropathy can become debilitating. Research has demonstrated that subjects who developed peripheral neuropathy while staying on the above medications had acetyl-carnitine deficiency. Carnitine deficiency may impact on energy and lipid metabolism, causing mitochondrial and immune dysfunction. The role of acetyl-carnitine for the metabolism and function of the peripheral nerves supports the view that the acetyl-carnitine deficiency found in HIV-positive individuals may contribute to the neurotoxicity of ddI, ddC, and d4T, even though the interference with mitochondrial DNA synthesis is regarded as the main cause of their toxicity.

Editors Note: This information gives an overview of carnitine and its use in people living with

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HIV disease. In a future issue of the HIV Nutrition Update we will publish a more comprehensive research article on carnitine.

Products Available: Carnitor, L-Carnitine, VitaCarn

Pharmacologic Classification: amino acid derivative

Therapeutic Classification: nutritional supplement

Dosage: Carnitor- available in 330mg tablets. L-Carnitine- available without a prescription in 250mg and 500mg tablets. Oral Solution: 100mg/ml in 118-ml multiple dose bottles. For oral solution, initially, 1 gram/day (10ml/day) then increase slowly to 3 grams/day (30ml/day) as needed and tolerated. Injection: 1 gram/15ml.

Indications For Use:

1. Primary systemic carnitine deficiency: Treatment in adults, 990mg L-Carnitine by mouth 2-3 times a day.
2. Acute or chronic treatment in people with inborn errors of metabolism that results in secondary carnitine deficiency.
3. Dietary supplement for renal patients: Adults 500-1500mg by mouth daily or as directed by MD/RD.

Pharmacodynamics: Levocarnitine is a naturally occurring substance needed to maintain energy metabolism. It facilitates transport of long chain fatty acids into cellular mitochondria. The fatty acids are then used to produce energy.

Pharmacokinetics:

Absorption: peak concentration occurs in approximately 3 hours.

Distribution: not bound to plasma proteins or albumin.

Metabolism: the major metabolites of levocarnitine are trimethylamine N-oxide, primarily found in the urine and gamma butyrobetaine, primarily found in feces.

Excretion: Levocarnitine is eliminated primarily in the urine.

Adverse Reactions: Gastrointestinal effects- nausea, vomiting, cramps, and diarrhea. Overdose precautions- increased doses may cause diarrhea.

Special Considerations:

1. A plasma carnitine level should be obtained before beginning therapy with weekly or monthly monitoring. Free plasma carnitine level should be between 35-60 micromoles/L.
2. Renal dialysis patients have a limited intake of this essential nutrient, thus, a dietary supplement of this nutrient may become necessary.

3. Instruct patients to drink oral solutions of levocarnitine slowly because gastrointestinal reactions may result from too rapid consumption.

Sources

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