BIOLOGICAL ACTIVITY:

(±)-Carnitine chloride exists in two isomers, known as D and L. L-carnitine plays an essential role in the β-oxidation of fatty acids and also shows antioxidant, and anti-inflammatory activities.

**In Vitro:** The main role of L-carnitine is to shuttle long-chain fatty acids across the inner mitochondrial membrane. After L-carnitine and acyl-CoA become acyl-carnitine by activation of carnitine palmitoyl transferase (CPT)-I, the transported acyl-carnitine is changed into acyl-CoA by CPT-II in the mitochondria matrix. Palmitoyl-CoA-induced mitochondrial respiration is increased by L-carnitine treatment, and then is accelerated by the presence of ADP. This acceleration is induced by treatment with L-carnitine in a concentration-dependent manner, and is saturated at 5 mM L-carnitine[1]. Pretreatment with L-carnitine augments Nrf2 nuclear translocation, DNA binding activity and heme oxygenase-1 (HO-1) expression in H₂O₂-treated HL7702 cells. L-carnitine protects HL7702 cells against H₂O₂-induced cell damage through Akt-mediated activation of Nrf2 signaling pathway[2].

**In Vivo:** L-carnitine is found to down-regulate the ubiquitin proteasome pathway and increase IGF-1 concentrations in animal models. L-carnitine administration for 2 weeks of hindlimb suspension alleviates the decrease in weight and fiber size in the soleus muscle. In addition, L-carnitine suppresses atrogin-1 mRNA expression, which has been reported to play a pivotal role in muscle atrophy[3]. Simultaneous treatment with L-carnitine attenuates the renal fibrosis (which correlated with a reduction of plasma TGF-β1 levels) and the pro-oxidative and proinflammatory status reported in L-NAME groups, with a concomitant increase in the expression of PPAR-γ[4].

**PROTOCOL** (Extracted from published papers and Only for reference)

**Kinase Assay:**[1] Mitochondria (0.6 mg protein/mL) are incubated in 2.5 mM Hepes (pH7.4) containing 225 mM mannitol, 75 mM sucrose and 100 μM ethylene glycol tetraacetic acid (EGTA) with or without 5 mM L-carnitine at 25°C. To measure oxygen uptake, 10 min after inorganic phosphate (Pi) 4 mM are added, the mitochondria are treated with palmitoyl-CoA (50 μM) and then ADP is added (200 μM). Oligomycin (5 μM) and rotenone (10 μM) are added 3-4 min after the ADP treatment. HPG (0-10 mM), which can specifically inhibit carnitine palmitoyl transferase (CPT)-I activity in the mitochondria, is added in the Hepes medium before incubation of the mitochondria[1].

**Animal Administration:**[3] Rat: After 1 week of acclimatization, rats are randomly assigned to a hindlimb suspension group, hindlimb suspension with L-carnitine administration group, and a pair-fed group. The L-carnitine group are administered a 1250 mg L-carnitine/kg dissolved in distilled water orally using a sonde. The body weight is measured every morning at 09:00 and L-carnitine solution is ingested every morning at 10:00. The experiment is conducted for 14 days[3].

References:


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