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I-Carnitine and heart disease

Zhong-Yu Wang ¹, Ying-Yi Liu ², Guo-Hui Liu ¹, Hai-Bin Lu ³, Cui-Ying Mao ⁴

Affiliations

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Abstract

Cardiovascular disease (CVD) is a key cause of deaths worldwide, comprising 15-17% of healthcare expenditure in developed countries. Current records estimate an annual global average of 30 million cardiac dysfunction cases, with a predicted escalation by two-three folds for the next 20-30years. Although β -blockers and angiotensin-converting-enzymes are commonly prescribed to control CVD risk, hepatotoxicity and hematological changes are frequent adverse events associated with these drugs. Search for alternatives identified endogenous cofactor I-carnitine, which is capable of promoting mitochondrial β -oxidation towards a balanced cardiac energy metabolism. I-Carnitine facilitates transport of long-chain fatty acids into the mitochondrial matrix, triggering cardioprotective effects through reduced oxidative stress, inflammation and necrosis of cardiac myocytes. Additionally, I-carnitine regulates calcium influx, endothelial integrity, intracellular enzyme release and membrane phospholipid content for sustained cellular homeostasis. Carnitine depletion, characterized by reduced expression of "organic cation transporter-2" gene, is a metabolic and autosomal recessive disorder that also frequently associates with CVD. Hence, exogenous carnitine administration through dietary and intravenous routes serves as a suitable protective strategy against ventricular dysfunction, ischemia-reperfusion injury, cardiac arrhythmia and toxic myocardial injury that prominently mark CVD. Additionally, carnitine reduces hypertension, hyperlipidemia, diabetic ketoacidosis, hyperglycemia, insulin-dependent diabetes mellitus, insulin resistance, obesity, etc. that enhance cardiovascular pathology. These favorable effects of I-carnitine have been evident in infants, juvenile, young, adult and aged patients of sudden and chronic heart failure as well. This review describes the mechanism of action, metabolism and pharmacokinetics of I-carnitine. It specifically emphasizes upon the beneficial role of I-carnitine in cardiomyopathy.

Keywords: Arrhythmias; Ischemia; Myocardial injury; Ventricular dysfunction; I-Carnitine.

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