

Some Additional Diabetes and Carnitine and Alpha Lipoic Acid Research

The protective effects of α -lipoic acid on kidneys in Type 2 diabetic Goto-Kakisaki rats via reducing oxidative stress. [Int J Mol Sci.](#) **2013** Mar 26;14(4):6746-56.

Conclusion: α -lipoic acid can protect renal function in diabetic rats via its antioxidant activity.

A combination of nutriment improves mitochondrial biogenesis and function in skeletal muscle of type 2 diabetic Goto-Kakizaki rats. [PLoS One.](#) 2008 Jun 4;3(6):e2328. Recent evidence indicates that insulin resistance in skeletal muscle may be related to reduced mitochondrial number and oxidation capacity. However, it is not known whether increasing mitochondrial number and function improves insulin resistance. **In the present study, we investigated the effects of a combination of nutrients on insulin resistance and mitochondrial biogenesis/function in skeletal muscle of type 2 diabetic Goto-Kakizaki rats.** We demonstrated that defect of glucose and lipid metabolism is associated with low mitochondrial content and reduced mitochondrial enzyme activity in skeletal muscle of the diabetic Goto-Kakizaki rats. The treatment of combination of R-ALPHA LIPOIC ACID, ACETYL-L-CARNITINE, NICOTINAMIDE [CB note: related to niacin, vitamin B3], and BIOTIN effectively improved glucose tolerance, decreased the basal insulin secretion and the level of circulating free fatty acid (FFA), and prevented the reduction of mitochondrial biogenesis in skeletal muscle. The nutrients treatment also significantly increased mRNA levels of genes involved in lipid metabolism, including peroxisome proliferator-activated receptor-alpha (Ppar alpha), peroxisome proliferator-activated receptor-delta (Ppar delta), and carnitine palmitoyl transferase-1 (Mcpt-1) and activity of mitochondrial complex I and II in skeletal muscle. **All of these effects of mitochondrial nutrients are comparable to that of the antidiabetic drug, pioglitazone. In addition, the treatment with nutrients, unlike pioglitazone, did not cause body weight gain.**
CONCLUSIONS/SIGNIFICANCE: These data suggest that a combination of mitochondrial targeting nutrients may improve skeletal mitochondrial dysfunction and exert hypoglycemic effects, without causing weight gain.

Painful diabetic neuropathy management. [Int J Evid Based Healthc.](#) **2013**

Mar;11(1):77-9. Diabetic neuropathy is the most common complication of diabetes as it affects a significant number of patients. ... Other treatment modalities such as the use of alpha-lipoic acid as an antioxidant and evening primrose oil* have also been trialled with evidence of **improvement in neuropathic pain.**

Whither pathogenetic treatments for diabetic polyneuropathy? Diabetes [Metab Res Rev.](#) **2013** Feb Diabetic distal symmetric polyneuropathy (DSPN) occurs in around one-third of patients with diabetes and is associated with significant morbidity and increased mortality. ... However, some pathogenetic therapies have shown **clinically relevant improvements in neuropathic endpoints in randomised controlled trials, in particular α -lipoic acid and Actovegin.**

Decreased O-GlcNAcylation of the key proteins in kinase and redox signalling pathways is a novel mechanism of the beneficial effect of α -lipoic acid in diabetic liver. [Br J Nutr.](#) **2013** Jan 14:1-12 From our findings, it is apparent that there are promising results from many studies on the potential benefit of NHPs in the treatment of diabetes. Nonetheless, many of the herbs and single nutraceuticals still require further studies in order to confirm safety, dosage and potential interactions with standard conventional therapies. **Soluble fibre, alpha lipoic acid, milk thistle, prickly pear cactus and pycnogenol appear to be the most beneficial in the treatment of diabetes.**

Alpha-lipoic acid upregulates antioxidant enzyme gene expression and enzymatic activity in diabetic rat kidneys through an O-GlcNAc-dependent mechanism. [Eur J Nutr.](#) **2012** Oct 12. The combined hyperglycemia lowering and antioxidant actions of α -lipoic acid (LA) contribute to its usefulness in preventing renal injury and other diabetic complications. ... **CONCLUSION: α -Lipoic acid administration activates a coordinated cytoprotective response against diabetes-induced oxidative injury in kidney tissue** through an O-GlcNAc-dependent mechanism.

Improvement of visual functions and fundus alterations in early age-related macular degeneration treated with a combination of acetyl-L-carnitine, n-3 fatty acids, and coenzyme Q10. [Ophthalmologica.](#) **2005** May-Jun;219(3):154-66. The aim of this randomized, double-blind, placebo-controlled clinical trial was to determine the efficacy of a combination of **acetyl-L-carnitine, n-3 fatty acids, and coenzyme Q10** (Phototrop) on the visual functions and fundus alterations in early age-related macular degeneration (AMD). One hundred and six patients with a clinical diagnosis of early AMD were randomized to the treated or control groups. The primary efficacy variable was the change in the visual field mean defect (VFMD) from baseline to 12 months of treatment, with secondary efficacy parameters: visual acuity (Snellen chart and ETDRS chart), foveal sensitivity as measured by perimetry, and fundus alterations as evaluated according to the criteria of the International Classification and Grading System for AMD. The mean change in all four parameters of visual functions showed **significant improvement in the treated group** by the end of the study period. In addition, in the treated group only 1 out of 48 cases (2%) while in the placebo group 9 out of 53 (17%) showed clinically significant (>2.0 dB) worsening in VFMD ($p = 0.006$, odds ratio: 10.93).

Decrease in drusen-covered area of treated eyes was also statistically significant as compared to placebo when either the most affected eyes ($p = 0.045$) or the less affected eyes ($p = 0.017$) were considered.

These findings strongly suggested that an appropriate combination of compounds which affect mitochondrial lipid metabolism, may improve and subsequently stabilize visual functions, and it may also improve fundus alterations in patients affected by early AMD.

[Eur J Clin Invest.](#) 2010 Jul 29.

Effects of acetyl-L-carnitine and oxfenicine on aorta stiffness in diabetic rats.

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Background We compared the haemodynamic and metabolic effects of acetyl-L-carnitine (one of the carnitine derivatives) and of oxfenicine (a carnitine palmitoyltransferase-1 inhibitor) in streptozotocin-induced diabetes in male Wistar rats. **Materials and methods** Diabetes was induced by a single tail vein injection of 55 mg kg⁻¹ streptozotocin. The diabetic animals daily treated with either acetyl-L-carnitine (150 mg kg⁻¹) in drinking water or oxfenicine (150 mg kg⁻¹) by oral gavage for 8 weeks, were compared with the untreated age-matched diabetic controls. Arterial wave reflection was derived using the impulse response function of the filtered aortic input impedance spectra. Thiobarbituric acid reactive substances (TBARS) measurement was used to estimate malondialdehyde (MDA) content. **Results** Oxfenicine, but not acetyl-L-carnitine, increased total peripheral resistance in diabetes, which paralleled its elevation in plasma levels of free fatty acids. By contrast, acetyl-L-carnitine, but not oxfenicine, resulted in a significant increase in wave transit time and a decrease in wave reflection factor, suggesting that acetyl-L-carnitine may attenuate the diabetes-induced deterioration in systolic loading condition for the left ventricle. This was in parallel with its lowering of MDA/TBARS content in plasma and aortic walls in diabetes. Acetyl-L-carnitine therapy also prevented the diabetes-related cardiac hypertrophy, as evidenced by the reduction in ratio of the left ventricular weight to body weight. **Conclusion** **Acetyl-L-carnitine, but not oxfenicine, attenuates aortic stiffening and cardiac hypertrophy, possibly through its decrease of lipid oxidation-derived MDA/TBARS in the rats with insulin deficiency.**