Supplements to help manage Blood Sugar Health

Alpha-Lipoic Acid

COMMON NAME: Alpha-lipoic acid

SCIENTIFIC NAME: 1,2-dithiolan-3-pentanoic acid

RECOMMENDED WITH CAUTION

LEVELS OF EVIDENCE

1

Recommended:
Several well-designed studies in humans have shown positive benefit. Our team is confident about its therapeutic potential.

2

Recommended with Caution:
Preliminary studies suggest some benefit. Future trials are needed before we can make a stronger recommendation.

3

Not Recommended - Evidence:
Our team does not recommend this product because clinical trials to date suggest little or no benefit.

4

Not Recommended – High Risk:
Our team recommends against using this product because clinical trials to date suggest substantial risk greater than the benefit.

Evaluated Benefits

- Improved glucose tolerance
- Lowered blood glucose
- Reduced pain in diabetic peripheral neuropathy

Cleveland Clinic
Wellness

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Source

Alpha-lipoic acid was first isolated from bovine liver in 1951. ALA is found naturally in mitochondria. Alpha-lipoic acid is a medium-chain fatty acid biosynthesized by cleavage of linoleic acid. Humans can synthesize alpha-lipoic acid de novo from fatty acids and cysteine, but only in very small amounts. Therefore, alpha-lipoic acid needs to be absorbed from exogenous sources.

R-(+)- alpha lipoic acid is encountered in plants, such as spinach, broccoli, tomatoes, Brussels sprouts, potatoes, garden peas, and rice bran, as well as in the heart, liver, and kidneys of animals. Alpha-lipoic acid has a bioavailability of 30%. It is absorbed from the small intestine and distributed to the liver via the portal vein. It then reaches the other organs through the systemic circulation. It crosses the blood-brain barrier. It is encountered both in the intra- and extracellular space.

Indications/Population

- Patients with abnormalities of glucose metabolism
- Metabolic syndrome
- Type 2 diabetes

Mechanism of Action

Alpha-lipoic acid is a potent free-radical scavenger (it binds free radicals) that is absorbed from the diet, transported into cells, and reduced to dihydrolipoic acid (DHLA), which has even greater free-radical binding activity. Alpha-lipoic acid is a water-soluble free-radical scavenger with important effects in the treatment of insulin resistance. ALA can directly modulate glucose metabolism by acutely activating critical elements of the insulin signaling pathways. Treatment with alpha-lipoic acid elicits improvements in whole-body glucose tolerance and insulin sensitivity, as well as in insulin action on skeletal muscle glucose transport.

Alpha-lipoic acid reduction of triglyceride accumulation in skeletal muscle and improvement of insulin sensitivity is mediated by the activation of AMPK. Hypothalamic AMPK is an important central regulator of food intake, and alpha-lipoic acid exerts anorexic and antiobesity effects by suppressing hypothalamic AMPK activity.

Alpha-lipoic acid also exerts beneficial effects on vascular dysfunction and oxidative stress in diabetes. Alpha-lipoic acid has been shown to improve nitric oxide (NO)-mediated vasodilation in diabetes. In addition, reductions in plasma levels of IL-6 and plasminogen activator-1 suggest that the drug may improve endothelial dysfunction via anti-inflammatory and antithrombotic mechanisms.

In neuropathy, alpha-lipoic acid restores glutathione levels, prevents lipid peroxidation, increases the activity of antioxidant enzymes (such as superoxide dismutase and catalase in peripheral nerves), and increases blood flow, glucose uptake, and metabolism in peripheral nerves, along with nerve conduction velocity (NCV).

Alpha-lipoic acid corrects deficiencies of neuropeptide Y and substance P in the spinal cord and suppresses the activation of NF-kB in peripheral nerves. It also exerts a neuroprotective action against reperfusion injury, promotes adenosine triphosphate activity, reduces excess lipid oxidation, and ameliorates hyperalgesia.

Alpha-lipoic acid as an antioxidant is able to directly scavenge ROS; regenerate endogenous antioxidants, such as glutathione, and vitamins E and C; and possess metal chelating activity.

Side Effects

• Nausea, vomiting, abdominal discomfort, and diarrhea
• Rare events have included dizziness, vertigo, and nonspecific psychiatric complaints, notably anxiety and sleep disturbances.

Dosing

• 600 mg daily
• It is recommended that ALA be taken 30 minutes before or 2 hours after eating.

Drug Interactions/Cautions

ALA may rarely induce an insignificant reduction of thyroid hormones or severe laryngospasm.

References

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