

# Lipoic Acid Supreme

Powerful antioxidant support for healthy blood sugar metabolism



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Lipoic Acid Supreme contains 300 mg of lipoic acid, along with 4 mg of pure biotin and 500 mg of taurine, and is formulated to help support blood sugar and insulin balance. Lipoic acid is a sulfur-containing compound that exhibits amphipathic antioxidant properties, making it effective in both water and lipid-based environments. This unique property allows it to quench free radicals in hydrophilic and lipophilic environments alike, such as cytosol, plasma membranes, serum, and lipoproteins.<sup>1,2</sup> Lipoic acid is best known for its antioxidant capacity, but this molecule has also been shown to have potent effects on blood glucose control via improved insulin secretion and sensitivity, along with contributing to metal detoxification.

## Benefits

- ▶ Powerful antioxidant properties (hepatoprotective, collagen-protective)
- ▶ Supports blood sugar metabolism and insulin sensitivity
- ▶ Aids with heavy metal detoxification

Mammalian tissues synthesize endogenous lipoic acid, but humans do so in very small amounts, and therefore, are better suited to absorb it from exogenous sources. Moreover, some health conditions may benefit from higher amounts via supplementation, and lipoic acid has demonstrated safety at relatively high doses.<sup>3,4</sup> The concentration of lipoic acid shown to exert pharmacological effects is greater than what is commonly bioavailable from foods. The richest dietary sources of lipoic acid are mammalian proteins with high metabolic activity, such as the heart, liver, and kidneys, all of which have a limited presence in the modern Western diet.<sup>1,2,5</sup>

## Antioxidant Function and Metal Detoxification

Lipoic acid (LA) exerts direct antioxidant effects on various forms of free radicals and also plays a role in regenerating other potent antioxidants. Its oxidized form (lipoic acid) and its reduced form, (dihydrolipoic acid or DHLA), have overlapping and independent scavenging actions on different free radicals. Both forms have been shown to scavenge hydroxyl and peroxy radicals, while LA is effective against singlet oxygen and DHLA has been shown to quench superoxide.<sup>5,6</sup> Moreover, lipoic acid is known as an “antioxidant of antioxidants”; when reduced to DHLA, it serves to regenerate vitamins E and C, glutathione, and coenzyme Q10.<sup>2,7</sup> Coupled together, oxidized and reduced lipoic acid have a greater redox potential than oxidized and reduced glutathione, leading some researchers to refer to lipoic acid as a “universal antioxidant.”<sup>2</sup>

An additional effect of lipoic acid’s antioxidant capacity is its role in binding free, redox-active metals that can induce oxidative damage. LA has been shown to bind copper, manganese, zinc, and lead; whereas DHLA is effective at binding copper, zinc, lead, mercury, cadmium and iron.<sup>2,7,8</sup>

Related to its role as a water- and lipid-soluble antioxidant, lipoic acid also serves as an important cofactor for mitochondrial enzymes involved in cellular metabolism and energy (ATP) production, specifically pyruvate dehydrogenase and  $\alpha$ -ketoglutarate dehydrogenase.<sup>1</sup>

## Influence on Blood Glucose, Insulin Sensitivity, and Diabetic Complications

Several studies have demonstrated that lipoic acid aids in glucoregulation by facilitating proper functioning of the insulin receptor and recruitment of insulin-sensitive and insulin-independent glucose transporters (GLUT-4 and GLUT-1, respectively) to muscle and adipose cell membranes.<sup>5,6</sup> A small study in which subjects with type-2 diabetes were given 600 mg of oral alpha-lipoic acid twice daily resulted in rates of insulin sensitivity and glucose disposal with no statistically significant difference from those of healthy, non-diabetic controls.<sup>9</sup> The capacity of lipoic acid to enhance glucose uptake in insulin resistant cells is increased when combined with exercise. A synergy exists between the two, which results in more efficient glucose handling than with either intervention alone.<sup>10</sup>

## Supplement Facts

Serving Size 1 capsule		
Amount Per Serving	% Daily Value	
Biotin	4 mg	1330%
Taurine	500 mg	*
Alpha Lipoic Acid	300 mg	*

\*Daily Value not established.

Other ingredients: Microcrystalline cellulose, stearates (vegetable source), silicon dioxide.



A downstream result of lipoic acid's favorable influence on blood glucose is its ameliorating effect on diabetic neuropathy. A study in which diabetic patients were given 600 mg of oral lipoic acid daily resulted in a significant improvement in total symptoms of polyneuropathy, including "stabbing pain, burning pain, paresthesia, and asleep numbness of the feet."<sup>11</sup> Multiple review studies affirm that alpha-lipoic acid is the most promising agent for relief of diabetic polyneuropathies.<sup>12,13</sup>

## Additional Highlights

**Taurine** is included in this formula because this sulfur amino acid has demonstrated antioxidant functions and may support healthy blood glucose control. A rat model study of diabetes showed that taurine was protective of beta cell function, which led to increased production of insulin, with subsequent lower levels of blood glucose and fructosamine.<sup>14</sup> Other animal studies suggest that taurine modulates glucagon secretion in addition to insulin secretion, thereby supporting overall healthy pancreatic function and dynamic endocrine response to changing blood glucose levels.<sup>15</sup> Taurine also influences peripheral insulin sensitivity by affecting phosphorylation and activation of the insulin receptor in skeletal muscle and liver tissue.<sup>16</sup> This nutrient is also an antioxidant, with ROS scavenging capacity and a protective effect against membrane lipid peroxidation.<sup>17,18</sup>

**Biotin** is an effective aid for glucoregulation and overall fuel partitioning. Lipoic acid increases the need for biotin by lowering levels of biotin-dependent enzymes; thus lipoic acid should always be taken with biotin. As a required cofactor for four carboxylase enzymes, this B vitamin plays an important role in the metabolism of carbohydrates, lipids, and amino acids, and thus, overall energy production.<sup>19</sup> A study showed that biotin supplementation led to impressive reductions in fasting blood glucose and HbA1c, as compared to placebo in type-1 diabetics.<sup>20</sup> In a rat model of diabetes, biotin modulated the expression of enzymes involved in gluconeogenesis and glycolysis, and may help to improve blood glucose regulation and glycemic response, independent of insulin activity.<sup>19</sup>

### Recommended Use:

- Take one capsule per day with a meal, or as directed by your health care practitioner.

## References

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