

Taurine

Multi-purpose amino acid



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Taurine is a sulfur-containing amino acid with activity across a broad range of tissues including the cardiovascular system, immune system, central nervous system, liver, reproductive system and skeletal muscle.¹ Although not incorporated into structural proteins, taurine is critical for numerous physiological processes. It is the most abundant free amino acid in the heart, retina, skeletal muscle, brain, and leukocytes, and is present in high concentrations in excitable tissues such as neurons, cardiac and skeletal muscles.^{2,3}

Endogenously, taurine is derived from cysteine so it is not technically an essential amino acid, but it is unknown whether endogenous synthesis is adequate to meet the full need for taurine so it is considered semi-essential.^{2,4} Certain circumstances may increase the body's demand for taurine, such as intense exercise and long-term stress, and taurine levels decline in several tissues during the aging process.⁴ Additionally, taurine is virtually absent from plant foods, so vegetarians and strict vegans may benefit from supplementing with taurine. Rich sources of taurine include beef, pork, dark meat poultry, seafood and shellfish, with small amounts occurring in dairy products.⁵

This product provides 1 gram of pure taurine powder per capsule, making it convenient for those who require higher amounts.

Cardiovascular function, fluid balance and blood pressure

Taurine has natural diuretic properties and osmolyte and may be beneficial for reducing water retention, including that which accompanies premenstrual syndrome or extended air travel. (Designs for Health's WaterEase™, which combines taurine and vitamin B6, may be especially good for this purpose.)* It may be helpful for any condition involving tissue swelling or fluid accumulation, such as hypertension, congestive heart failure or coronary heart disease.^{5,7,8} In fact, taurine is approved for the treatment of congestive heart failure in Japan.⁹ Inadequate taurine may impair energy metabolism and reduce ATP generation in the heart; taurine supplementation is believed to be beneficial in patients with heart failure owing to improved myocardial energy synthesis and calcium handling.^{4,10} A gradient of taurine content has been identified in the left ventricle with the highest concentration in the endocardium, which exhibits the greatest work load.³ Among subjects with heart failure who engaged in exercise, compared to placebo, two weeks of taurine supplementation resulted in significant improvements of various lipid markers such as triglyceride/HDL ratio and total cholesterol/HDL ratio, as well as C-reactive protein and platelet concentration.¹¹ Other RCTs support taurine supplementation being beneficial for patients with heart failure by improving functional capacity, myocardial oxygen consumption, and electrical activity and supporting capacity to exercise.^{12,13} (Doses used were typically 1500 mg/day, 500 mg TID.)

Regarding blood pressure (BP), a meta-analysis found that taurine supplementation at doses from 1-6 grams/day acutely or up to 12 weeks resulted in clinically relevant reductions with no adverse side-effects.¹⁴ In a double-blind placebo-controlled study in young adults with borderline hypertension, compared to placebo, subjects given 6 grams of taurine daily for one week had small but significant reductions in mean, systolic, and diastolic BP, and a greater reduction in plasma epinephrine.¹⁵ The decrease in epinephrine supports research findings that indicate one of taurine's mechanisms of action is modulating an overactive sympathetic nervous system.¹⁶ Taurine is a weak agonist of the GABA_A, glycine and NMDA receptors, so taurine may partially substitute for GABA and reduce nervous system excitability.^{9,17} Researchers have noted, "Interestingly, taurine satisfies many of the criteria considered essential for inclusion in the inventory of neurotransmitters, but evidence of a taurine-specific receptor has yet to be identified in the vertebrate nervous system."¹⁸

Benefits*:

- Supports healthy blood pressure within the normal range
- Helps the body release excess water
- Promotes energy generation in heart muscle cells and supports a healthy heart rhythm
- Supports normal skeletal muscle function
- Supports normal glucose metabolism and insulin sensitivity
- Required for bile synthesis—facilitates proper digestion of fats
- Boosts antioxidant defenses
- Supports healthy nerve function

In another study, pre-hypertensive subjects who received 1.6 grams of taurine daily for 12 weeks had small but significant reductions in systolic and diastolic blood pressure compared to placebo.¹⁹ Multiple mechanisms underlie taurine's efficacy for lowering blood pressure, including improved vasodilation and "reduced agonist-induced vascular reactivity through the inhibition of transient receptor potential channel subtype 3-mediated calcium influx."¹⁹ The latter is related to taurine attenuating the actions of angiotensin II on calcium ion transport. Researchers concluded that taurine could minimize the adverse actions of angiotensin II, such as "induction of cardiac hypertrophy, volume overload and myocardial remodeling."⁷

Supplement Facts

Serving Size 1 capsule

Amount Per Serving	% Daily Value
Taurine	1 g *

*Daily Value not established.

Other Ingredients: Cellulose (capsule), vegetable stearate.

Skeletal muscle

"There is clear evidence that a normal taurine level is important for the normal functioning of skeletal muscle. [...] In skeletal muscle its main roles are to facilitate Ca²⁺ dependent excitation-contraction processes, contribute to the regulation of cellular volume, and aid in antioxidant defense from stress responses."²⁰ "In skeletal muscle, taurine is involved in the control of ion channel function, membrane stability and calcium homeostasis."^{1,6} Rodent research showed that chronic taurine supplementation led to improvement in the electrical and contractile properties of skeletal muscle fibers in aging rats, potentially indicating that taurine may play a role in counteracting sarcopenia and supporting normal muscle function in the elderly.²¹

Taurine supplementation may also enhance athletic performance in both endurance exercise and shorter bouts of high intensity efforts.^{22,23} Animal research suggests that taurine may aid in recovery by promoting glycogen repletion.³

Blood glucose metabolism and insulin sensitivity

Taurine may be beneficial for smokers and individuals with diabetes. It "ameliorates impairment of vascular reactivity, intimal thickening, arteriosclerosis, endothelial apoptosis, oxidative stress and inflammation, associated primarily with diabetes and, to a lesser extent with obesity, hypertension and nicotine-induced vascular adverse events."²⁴ Cardiovascular disease is the leading cause of death in those with type 2 diabetes (T2D). *In vitro* research in human epithelial (HUVEC) cells showed that taurine protects against endothelial dysfunction induced by hyperglycemia and research in rodents indicates that taurine positively impacts diabetic nephropathy by reducing lipid peroxidation and decreasing accumulation of advanced glycation end products (AGEs) in the kidney.^{18,25} Mechanistically, taurine may be beneficial for ameliorating diabetic complications including nephropathy, neuropathy, retinopathy, cardiomyopathy, platelet aggregation, endothelial dysfunction and atherosclerosis.^{26,27}

Plasma and platelet taurine concentrations tend to be lower in individuals with diabetes compared to healthy controls.^{28,29} Taurine administration in a rodent model of T2D led to significant improvements in fasting glucose, insulin and HOMA-IR, indicating improved insulin sensitivity.³⁰ Taurine is believed to have insulin-mimetic effects and may also have an osmoregulatory role in α cells "and a modulatory role on release of insulin secretion from pancreatic β cells, hence helping in creating a hypoglycemic state."³¹

Role in the central nervous system

As mentioned earlier, researchers note that "taurine has fulfilled most if not all of the criteria to be accepted as a neurotransmitter in the mammalian CNS." Taurine's inhibitory effects in the central nervous system may make it useful in the management of epilepsy. Research in humans and animals has shown that taurine has anticonvulsant action, and some anticonvulsant medications (including valproic acid) may work by modulating taurine transport in the body.³³⁻³⁵ The central nervous system contains taurine synthesizing enzymes and taurine receptors. Taurine's anticonvulsant and inhibitory activity involves hyperpolarization of neuronal membranes and reducing glutamate-induced excitotoxicity in part by modulating intracellular calcium.^{32,36,37}

Recommended Use:

- Take one capsule per day, or as directed by a health care practitioner.
- Taurine supplementation is generally well tolerated. Most people may tolerate between 1 and 4 grams per day. However, patients taking medication for blood pressure or diabetes should be monitored closely, as taurine supplementation may alter or reduce the dosages needed.

For a list of references cited in this document, please visit:

<http://www.designsforhealth.com/techsheet-references/taurine-references.pdf>

Dosing recommendations are given for typical use based on an average 150 pound healthy adult. Healthcare practitioners are encouraged to use clinical judgement with case-specific dosing based on intended goals, subject body weight, medical history, and concomitant medication and supplement usage.

***These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease.**

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