

Amino Complex



CLINICAL APPLICATIONS

- Supports muscle protein synthesis for lean body mass maintenance
- Supports muscle and connective tissue biosynthesis
- Supports sufficient dietary replenishment of quality amino acids
- Supports cellular energy production, gut bacteria metabolism and neurotransmitter production

MUSCULOSKELETAL HEALTH

Overview

Amino acids are building blocks for all body proteins and contribute to muscle protein synthesis, connective tissue synthesis and bone strength. Individually, amino acids function as precursors for heme, purines, pyrimidines, hormones and neurotransmitters, including production of biologically active peptides and short-chain fatty acids (SCFAs) in the gut. In addition, amino acids provide the body with nitrogen, which is essential for general growth and maintenance. Functionally, amino acids play key roles in almost every cellular process, as well as in gut bacteria metabolism and overall metabolism. The human body can produce 11 of the 20 amino acids needed (non-essential), but the remaining nine must be obtained from the diet, making them essential. The essential amino acids (EAAs) are arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, and valine. Tyrosine is considered non-essential because it requires only one step for conversion from phenylalanine. Failure to obtain enough of even one of the EAAs results in degradation of the body's proteins.^{1,2}

Most diets lack high-quality sources of protein, which is defined by the EAA content. Unlike carbohydrates and fatty acids, the human body doesn't store amino acids for later use, so the supply of EAAs needs to be replenished daily. During a fasted or ketogenic state, amino acids can be used via the Krebs cycle to contribute to energy production. Furthermore, when the body is stressed by intense training/competition, trauma, or foreign invaders, the entire amino acid supply can be further depleted, making some non-essential amino acids conditionally essential.

Amino Complex is a comprehensive formula containing all nine EAAs and key conditionally essential amino acids, which become essential in certain circumstances.¹⁻³

Muscle Protein Synthesis[†]

New research on muscle protein synthesis (MPS) has discovered that the quality of protein, not quantity, is the key for optimal muscle anabolism. MPS is not only important for athletes and high-activity individuals, but also for the aging population and those concerned with longevity. Past muscle research has indicated the importance of a group of EAAs, called the branch-chained amino acids (BCAAs [leucine, isoleucine and valine]) in stimulating MPS and muscle recovery. Most recently, it has been found that while BCAAs do in fact stimulate mTOR, the transcription factor for MPS, mostly due to high leucine content, the other EAAs are needed to maintain and supply enough raw material to carry out the anabolic process.⁵ Supplements with large quantities of non-essential amino acids, or just the branch chained amino acids, may be inadequate to maximize anabolic efficiency.

Beginning in the fourth decade of life, there is a natural and gradual decline in muscle mass (catabolism), strength and function because of the natural metabolic changes and a tendency for a more sedentary lifestyle. Studies using EAA supplementation in those with advanced age, bed rest and recovery from surgery have demonstrated important benefits. These benefits include stimulation of muscle protein synthesis, enhancements in muscle strength and improvements in

[†] 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.

functional parameters of the studied muscle(s). A high proportion of leucine is another factor that is required for optimal stimulation of muscle protein synthesis in the elderly.^{6,7}

EAA and Exercise Support †

The effectiveness of EAA intake is amplified by ingestion before exercise because of the increased delivery of amino acids to the muscles. Results from studies have shown that exercise and EAA intake have additive effects on muscle protein synthesis. Furthermore, BCAAs have been shown to accelerate post exercise muscle recovery. Research data shows that BCAA (e.g., leucine) supplementation before and after exercise helps decrease exercise-induced muscle damage, promotes muscle protein synthesis, and modulates exercise-related cytokine production.^{8,9}

Neurotransmitter Support†

Normal plasma amino acid levels are extremely susceptible to physiological state and show considerable variability. The plasma amino acid profile impacts the entry of individual amino acids into the tissues. Of particular importance is the effect of the plasma amino acid profile on the uptake of amino acids into the brain across the blood-brain barrier. As a result, alterations in the plasma amino acid profile can lead to changes in the amino-acid-dependent synthesis of neurotransmitters and other nitrogenous compounds in the brain.¹⁰⁻¹²

GI Balance and Host Metabolism Support†

EAA's not only directly supply gut lining cells with energy but supply aromatic and branch-chained amino acids that are deaminated by gut bacteria which produce a group of metabolites called short-chain fatty acids (SCFAs), branch-chained fatty acids (BCFAs), and biogenic amines. These three classes of metabolites play significant roles in overall host energy homeostasis. SCFA production (acetate, propionate, butyrate) are essential for providing energy to the cells that line the small and large intestine. SCFAs, BCFAs (valerate, isobutyrate, isovalerate) and biogenic amines have also been associated with beneficial microbial balance, which not only affects bacterial metabolism directly but also modulates host metabolism.¹³

Essential Amino Acid Functions†

Leucine and valine are the other two BCAAs. Isoleucine is needed for hemoglobin formation and helps to maintain regular energy levels. It is also important for stabilizing and regulating normal blood sugar and energy levels. Leucine ties glycine for the position of the second-most common amino acid found in proteins. Leucine is necessary for the optimal growth of infants and for proper nitrogen balance in adults.¹⁴

Lysine is an essential amino acid which is a major building block for all protein and is needed for proper growth and bone development in children. Lysine helps the body absorb and conserve calcium and plays an important role in the formation of collagen.¹⁵

Methionine helps to initiate translation of messenger RNA by being the first amino acid incorporated into the N-terminal position of all proteins. Methionine supplies sulfur and other compounds required by the body for normal metabolism, detoxification and growth. Methionine reacts with adenosine triphosphate to form S-adenosyl methionine. S-adenosyl methionine is the principal methyl donor in the body and contributes to the synthesis of many important substances, including epinephrine and choline.¹⁵

Valine is a BCAA that is closely related to leucine and isoleucine both in structure and function. Valine is a constituent of fibrous protein in the body and has been found useful in muscle health, supporting mental health, supporting neuron function, and supporting the production of neurotransmitters that are used in the central nervous system for normal nerve signaling.^{14,15}

Arginine is often found at the active (or catalytic) site in proteins and enzymes due to its amine-containing side-chain. Arginine plays an important role in cell division, removing ammonia from the body, immune function, release of hormones, and the production of nitric oxide.¹⁹

Histidine is the direct precursor of histamine and is needed to help grow and repair body tissues and to maintain the myelin sheaths that protect nerve cells. It also helps manufacture red and white blood cells and helps to protect the body from heavy metal toxicity. Histamine also stimulates the secretion of the digestive enzyme gastrin.^{14,15}

Phenylalanine plays a key role in the biosynthesis of other amino acids and various neurotransmitters.¹⁵

Threonine is an important component in the formation of protein, collagen, elastin and tooth enamel. It is also important in neurotransmitter production and the health of the nervous system.^{15,16}

Conditionally Essential Amino Acid Functions†

Serine participates in the biosynthesis of purines and pyrimidines, and plays an important role in the structure and function of many enzymes. Serine serves a neuromodulatory role in the central nervous system with neurotransmitter production/function and nerve receptor modulation.¹⁰

† 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.

Glycine acts as a neurotransmitter in the body and can play both a stimulatory and depressant role in the brain based on the body's need. It has been studied for its benefits on sleep quality.¹⁸

Taurine acts as a cellular membrane stabilizer in the body and plays key roles as an antioxidant. It has been shown to reduce cramping and support normal stress and heart health.^{16,20}

Tryptophan, also known as 5-HTP, is the precursor to serotonin and is conditionally essential when levels are depleted due to stress. A small dose was added to this formula, as it plays a vital role in brain health;¹¹ however, a higher dose may be required at the practitioner's discretion based on the patient's individual needs.

Directions

3 or more capsules per day or as recommended by your health care professional.

Does Not Contain

Gluten, corn, yeast, artificial colors and flavors.

Cautions

If you are pregnant or nursing, consult your physician before taking this product.

Supplement Facts ^{V1}		
Serving Size 3 Capsules Servings Per Container 60		
3 capsules contain	Amount Per Serving	% Daily Value
L-Leucine USP	350 mg	*
L-Lysine Hydrochloride USP	300 mg	*
L-Isoleucine USP	200 mg	*
L-Methionine USP	200 mg	*
L-Valine USP	200 mg	*
L-Arginine USP	100 mg	*
L-Phenylalanine USP	100 mg	*
L-Threonine USP	100 mg	*
L-Histidine USP	50 mg	*
L-Serine USP	50 mg	*
Glycine USP	25 mg	*
Taurine	20 mg	*
L-Tryptophan USP	10 mg	*

* Daily Value not established

ID# 330180 180 Capsules

References

1. Berg JM, Tymoczko JL, Stryer L. New York: W H Freeman; 2002 Biochemistry. 5th Edition. NIH Books ID NBK22459
2. M O Dayhoff. The Chemistry of Amino Acids. Biochemistry, University of Arizona 2003. http://www.biology.arizona.edu/biochemistry/problem_sets/aa/aa.html
3. Hans C. Dreyer et al. Essential Amino Acid Supplementation in Patients Following Total Knee Arthroplasty J Clin Invest. 2013;123(11):4654–4666. doi:10.1172/JCI70160.
4. Kevin D. Tipton, PhD. Branched-Chain Amino Acid Supplementation To Support Muscle Anabolism Following Exercise. Sports Science Exchange (2017) Vol. 28, No. 170,1-6
5. Zhong Z et al. L-Glycine: a novel anti-inflammatory, immunomodulatory, and cytoprotective agent. Curr Opin Clin Nutr Metab Care. 2003 Mar;6(2):229-40.
6. T Ispoglou, H White, T Preston, etl. Double-blind, placebo-controlled pilot trial of L-Leucine-enriched amino-acid mixtures on body composition and physical performance in men and women aged 65–75 years. European Journal of Clinical Nutrition (2016) 70, 182-188; doi: 10.1038/ejcn.2015.91
7. Pasiakos SM, McClung HL, McClung Jp, et al. Leucine-enriched essential amino acid supplementation during moderate steady state exercise enhances post-exercise muscle protein synthesis. Am J Clin Nutr. 2011 Sep;94(3):809-18. Doi: 10.30945/ajcn.111.017061. Epub 2011 Jul 20.
8. Melvin Williams. Dietary Supplements and Sports Performance: Amino Acids. Journal of the International Society of Sports Nutrition. 2(2): 63-67, 2005
9. T. A. Churchward-Venne et al. Supplementation of a suboptimal protein dose with leucine or essential amino acids: effects on myofibrillar protein synthesis at rest and following resistance exercise in men. J Physiol 590.11 (2012) pp 2751–2765
10. L. Tabatabaie, L.W. Klomp, R. Berger, T.J. de Koning. L-Serine synthesis in the central nervous system: A review on serine deficiency disorders. Mol Genetics and Metabolism, March 2010, Vol. 99, Issue 3, pg 256-262

† 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.

11. Siegel GJ, Agranoff BW, et al., editors. Philadelphia: Lippincott-Raven; Basic Neurochemistry: Molecular, Cellular and Medical Aspects. 2005. Blood-Brain Barrier
12. Ydkoff M et al. Brain Amino Acid Requirements and Toxicity: The Example of Leucine. The Journal of Nutrition, Volume 135, Issue 6, 1 June 2005, Pages 1531S–1538S,
13. Evelien P.J.G. Neis, Cornelis H.C. Dejong, and Sander S. Rensen. The Role of Microbial Amino Acid Metabolism in Host Metabolism. *Nutrients* 2015, 7, 2930-2946; doi:10.3390/nu7042930
14. Nagai R, Taniguchi N. Amino acids and proteins. In: Baynes JW, Dominiczak MH, eds. *Medical Biochemistry*. 4th ed. Philadelphia, PA: Elsevier Saunders; 2014: chap 2. Essential Amino Acids. Medline Plus: Essential Amino Acids
15. van Vliet et al. Single amino acid supplementation in aminoacidopathies: a systematic review *Orphanet Journal of Rare Diseases* 2014,9:7
16. De Luca et al. Taurine: the appeal of a safe amino acid for skeletal muscle disorders. *J Transl Med* (2015) 13:243
17. De Luca A, Pierno S, Camerino D C. Taurine: the appeal of a safe amino acid for skeletal muscle disorders. *J Transl Med*. 2015; 13:243 Epub 2015 Jul 25. Doi: 10.1186/s12967-015-0610-1
18. Zhong Z et al. L-Glycine: a novel anti-inflammatory, immunomodulatory, and cytoprotective agent. *Curr Opin Clin Nutr Metab Care*. 2003 Mar;6(2):229-40
19. L-Arginine Review from Mayo Clinic via Natural Standard Database. Accessed 3/18/18:
20. Ripps H, Shen W. Review: Taurine: A “very essential” amino acid. *Mol Vis*. 2012; 18: 2673–2686. Published online 2012 Nov 12.