

Glutamine Pro

Cellular Support*

Clinical Applications

Supports Glutamine Replenishment During and After Metabolic Stress*

Supports Intestinal Health and Barrier Integrity*

Supports Healthy Immune Function*

Supports Muscle Mass Retention*

Supports Increased Glutathione Synthesis*

Glutamine Pro (glutamine) is the most abundant amino acid in the body and is necessary for the maintenance of many metabolic functions. Under situations of stress, physiological demands increase, triggering a need for glutamine supplementation. For ease of dosing, Dr. Gatcha's Glutamine Pro provides 4 grams of this amino acid per scoop to help replenish the body's stores and support glutamine's many functional roles.*

Discussion

Glutamine is the most abundant free amino acid in the body and is an energy substrate for most cells—especially enterocytes (intestinal epithelial cells) and immune cells. It is also an essential component for numerous metabolic functions, including acid-base (pH) homeostasis; nitrogen supply; neurotransmitter production; and synthesis of glutathione, glucose, proteins, and nucleic acids.^[1,2] Glutamine is primarily synthesized and stored in skeletal muscle. It is considered a conditionally essential amino acid because, under normal circumstances, the body can manufacture enough to sustain physiological demands. However, under metabolic stress—such as illness/disease, injury, infection, surgery, chemotherapy, prolonged exercise, or environmental stress—glutamine is released from body stores into the bloodstream and transported to tissues in deficit. Increased demands make exogenous glutamine sources (food, supplements) a necessity.*^[2]

Support During and Recovery After Stress States During stress states, the body's glutamine requirement exceeds supply, severely reducing both plasma and skeletal muscle pools of free glutamine.^[1] Without adequate glutamine to meet the needs of the intestine, immune system, and vital organs, a negative nitrogen balance and catabolism can result.^[3] Nitrogen is necessary to repair wounds and keep the vital organs functioning; approximately one third of this nitrogen comes from glutamine. Adequate nutrition, which includes glutamine, can help spare host energy reserves and impede recovery complications.^[4] In fact, it has been recommended that patients preparing for elective surgery ready themselves nutritionally, in part through glutamine supplementation, to optimize recovery.^[5] Research also suggests glutamine may help diminish risks associated with conventional therapeutics—such as high-dose chemotherapy and radiation—by supporting mucosal integrity, immune competence, and glutathione biosynthesis.*^[4,6,7]

Intestinal Health and Barrier Function The greatest amount of glutamine is used by enterocytes. As their preferred fuel source, glutamine is necessary for their maintenance and healthy turnover.

Supplementation may therefore enhance mucosal health.^[1,8] A healthy intestinal mucosa not only supports optimal nutrient absorption, but it also supports mucosal immune function and provides a barrier between bacteria and their products in the intestines and the bloodstream.^[1,9,10] Disruption of intestinal barrier function can lead to decreases in mucosal immune activity and increases in escaping toxins and bacteria, resulting in infections, illness, allergic reactions, skin conditions, and more. In various experimental models, glutamine administration has been shown to reduce epithelial cell death and

preserve or improve barrier function.^[11-13] For instance, in an animal model of chemotherapy-induced intestinal damage, glutamine decreased the severity of intestinal injury perhaps through improved intestinal cell turnover and enhanced antioxidant activity.*^[14]

Muscle Tissue Preservation Of the 20 amino acids required for protein synthesis, glutamine is the most abundant. It makes up 50% of all amino acids in the blood and 60% of those in the body. Not only is glutamine necessary to maintain positive nitrogen balance and protein synthesis, but also it has recently been shown to prevent muscle loss by influencing myostatin levels.^[15] Myostatin is a protein that inhibits muscle differentiation and growth. Its increased bioactivity has been observed in glucocorticoid-induced hypercatabolism and is associated with several pathologies characterized by marked skeletal muscle depletion.*^[15]

Glutamine is thought to have ergogenic effects through its influences on fluid and electrolyte uptake, glutamine pool repletion after intense training, stimulation of muscle glycogen synthesis, and ability to increase growth hormone levels.^[16-18] While ergogenic effects are supported from a biochemical standpoint, more definitive studies are needed.*

References

1. Oliveira GP, Dias CM, et al. Understanding the mechanisms of glutamine action in critically ill patients. *An Acad Bras Cienc.* 2010 Jun;82(2):417-30. [PMID: 20563423]
2. Walsh NP, Blannin AK, Robson PJ, et al. Glutamine, exercise and immune function. Links and possible mechanisms. *Sports Med.* 1998 Sep;26(3):177-91. [PMID: 9802174]
3. Calder PC, Yaqoob P. Glutamine and the immune system. *Amino Acids.* 1999;17(3):227-41. [PMID: 10582122]
4. Kuhn KS, Muscaritoli M, Wischmeyer P, et al. Glutamine as indispensable nutrient in oncology: experimental and clinical evidence. *Eur J Nutr.* 2010 Jun;49(4):197-210. [PMID: 19936817]
5. Awad S, Lobo DN. What's new in perioperative nutritional support? *Curr Opin Anaesthesiol.* 2011 Mar 30. [Epub ahead of print] [PMID: 21451404]
6. Anderson PM, Schroeder G, Skubitz KM. Oral glutamine reduces the duration and severity of stomatitis after cytotoxic cancer chemotherapy. *Cancer.* 1998 Oct;83(7):1433-39. [PMID: 9762946]
7. Rocha BR, Gombar FM, Barcellos LM, et al. Glutamine supplementation prevents collagen expression damage in healthy urinary bladder caused by radiotherapy. *Nutrition.* 2010 Dec 15. [Epub ahead of print] [PMID: 21167680]
8. dos Santos RG, Viana ML, Generoso SV, et al. Glutamine supplementation decreases intestinal permeability and preserves gut mucosa integrity in an experimental mouse model. *JPEN J Parenter Enteral Nutr.* 2010 Jul-Aug;34(4):408-13. [PMID: 20631386]
9. Nose K, Yang H, Sun X, et al. Glutamine prevents total parenteral nutrition-associated changes to intraepithelial lymphocyte phenotype and function: a potential mechanism for the preservation of epithelial barrier function. *J Interferon Cytokine Res.* 2010 Feb;30(2):67-80. [PMID: 20028208]
10. Li N, Neu J. Glutamine deprivation alters intestinal tight junctions via a PI3-K/ Akt mediated pathway in Caco-2 cells. *J Nutr.* 2009 Apr;139(4):710-14. [PMID: 19211824]
11. Tian J, Hao L, Chandra P, et al. Dietary glutamine and oral antibiotics each improve indexes of gut barrier function in rat short bowel syndrome. *Am J Physiol Gastrointest Liver Physiol.* 2009 Feb;296(2):G348-55. [PMID: 19095767]
12. Vicario M, Amat C, Rivero M, et al. Dietary glutamine affects mucosal functions in rats with mild DSS-induced colitis. *J Nutr.* 2007 Aug;137(8):1931-37. [PMID: 17634266]
13. Gulgun M, Karaoglu A, Kesik V, et al. Effect of proanthocyanidin, arginine and glutamine supplementation on methotrexate-induced gastrointestinal toxicity in rats. *Methods Find Exp Clin Pharmacol.* 2010 Nov;32(9):657-61. [PMID: 21225016]
14. Tazuke Y, Maeda K, Wasa M, et al. Protective mechanism of glutamine on the expression of proliferating cell nuclear antigen after cisplatin-induced intestinal mucosal injury. *Pediatr Surg Int.* 2011 Feb;27(2):151-58. [PMID: 21080177]
15. Bonetto A, Penna F, Minero VG, et al. Glutamine prevents myostatin hyperexpression and protein hypercatabolism induced in C2C12 myotubes by tumor necrosis factor- α . *Amino Acids.* 2011 Feb;40(2):585-94. [PMID: 20623149]
16. Hoffman JR, Ratamess NA, Kang J, et al. Examination of the efficacy of acute L-alanyl-L-glutamine ingestion during hydration stress in endurance exercise. *J Int Soc Sports Nutr.* 2010 Feb 3;7:8. [PMID: 20181080]
17. Welbourne TC. Increased plasma bicarbonate and growth hormone after an oral glutamine load. *Am J Clin Nutr.* 1995 May;61(5):1058-61. [PMID: 7733028]
18. Antonio J, Street C. Glutamine: a potentially useful supplement for athletes. *Can J Appl Physiol.* 1999 Feb;24(1):1-14. [PMID: 9916176]

All Dr. Gatcha's Formulas Meet or Exceed cGMP Quality Standards.

*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.