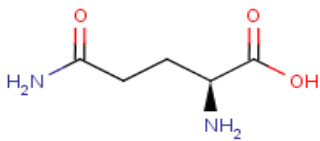


L-Glutamine 1,000 mg

TECHNICAL SUMMARY

L-glutamine, the most abundant amino acid in the body, is an important constituent of proteins and participates in many key metabolic processes.* Glutamine helps to regulate acid/base balance, maintains nitrogen balance, and acts as a nitrogen reservoir for the production of other amino acids.* It also serves as an important energy source for certain cell types, such as gut, immune, and kidney cells.* Glutamine is known to support gastrointestinal integrity, normal immune system function, and the preservation of muscle tissue.*

Structure Formula:



Chemical Name: (S)-2,5-Diamino-5-oxopentanoic acid

Allergen and Additive Disclosure: Not manufactured with wheat, gluten, soy, milk, egg, fish, shellfish or tree nut ingredients. Produced in a GMP facility that processes other ingredients containing these allergens.

Delivery Form: Vegetable capsules

ROLE AS A NUTRIENT/FUNCTION

Glutamine is present in abundance throughout the body and is used for the synthesis of proteins, peptides, citrulline, and nicotinamide adenine dinucleotide phosphate (NADP).* It is the principal carrier of nitrogen in the body and is an important energy source for many cells.* L-glutamine also has immunomodulatory properties and is the preferred source of energy for rapidly dividing cells, such as enterocytes.* It regulates gene expression and cell signaling, and is necessary for ammonia detoxification.*

NATUROKINETICS®

Liberation: Glutamine capsules pass a standard USP water disintegration test in less than 60 minutes.

Absorption: L-glutamine is absorbed rapidly, predominantly in the small intestine. The estimated uptake of glutamine after oral administration varies according to oral dose from 57 to 84%.

- In a pharmacokinetic study, six healthy male volunteers were randomly assigned to receive 0, 0.1, or 0.3 g/kg of glutamine. Plasma levels were assessed over a 4 hour period. Plasma glutamine concentration peaked at 30-45 minutes (T_{max}) with a steady decline to normal ranges in 90-120 minutes (low dose) and 180-240 minutes (high dose). Peak concentration (C_{max}) was 1,028+/-97 μ M and 1,328+/-99 μ M, respectively (Figure 1).
- In a pilot pharmacokinetic study performed with healthy adult volunteers, a single oral administration of five capsules of Extra Strength L- Glutamine 1,000 mg (P0094, Protocol For Life Balance®) resulted in T_{max} of 1 hour, and the plasma concentration of free

Supplement Facts

Serving Size 1 Veg Capsule

Amount Per Serving

L-Glutamine (Free-Form) 1 g (1,000 mg)**

** Daily Value not established.

Other ingredients: Hypromellose (cellulose capsule), Hydroxypropyl Cellulose, Stearic Acid (vegetable source), Magnesium Stearate (vegetable source) and Silicon Dioxide.

- Supports a Healthy Immune System*
- Promotes Gastrointestinal Health*

SUGGESTED USAGE: Take 1 capsule 1 to 3 times daily, or as directed by your healthcare practitioner.

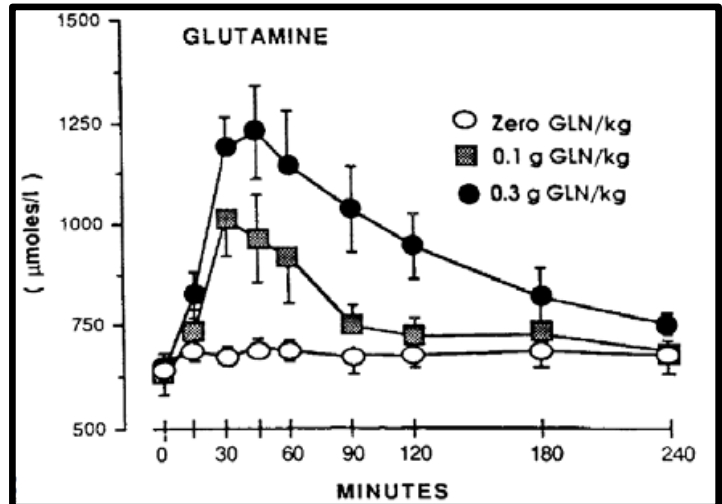


Figure 1. Whole blood glutamine concentrations following oral L-glutamine loading in healthy male volunteers.

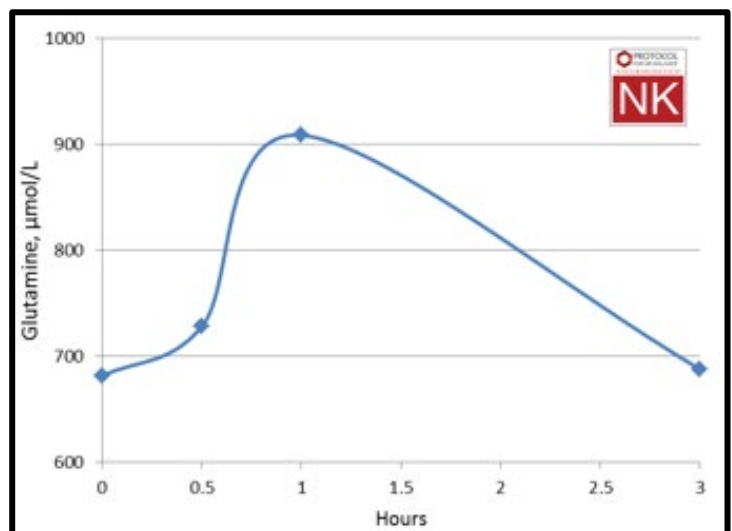


Figure 2. Average serum glutamine levels following a single administration of 5 g of L-glutamine (Protocol for Life Balance®, Product Code #P0094, 5 capsules) in healthy adult volunteers.

glutamine returned to the baseline 3 hours after administration (Figure 2).

Metabolism: L-glutamine can be directly utilized by enterocytes to produce amino acids (citrulline, arginine, ornithine, proline, alanine) and energy.* The end-products of glutamine metabolism in enterocytes include amino acids, lactic acid, NH₃ and CO₂.* Systemically absorbed glutamine can be incorporated into proteins and peptides, can become a precursor of glutamate or ammonia, or can be used in the production of energy or for gluconeogenesis in the liver and kidneys.*

Distribution: Glutamine produced by the body is stored in muscle tissue in large amounts. Glutamine is also produced by the body in lungs, liver, and adipose tissues. Glutamine provided by food/supplements and endogenous glutamine is used in the liver, gut, immune system, kidney, and central nervous system.

Elimination: In human pharmacokinetic trials, the average half-life (t_{1/2}) of glutamine is 110 minutes, with a predominant route of excretion via urine.

CLINICAL VALIDATION

- **Exercise Recovery, Immune System Support*** In a double-blind, crossover, placebo-controlled study, eight healthy and highly trained men performed 2 hours of cycle ergometry at 75% of peak O₂ uptake. They were supplemented with 3.5 g of glutamine, 13.7 g of glutamine-rich protein, or placebo at various intervals during and up to 2 hours after exercise. Compared to placebo, glutamine supplementation significantly attenuated the exercise-induced decrease in plasma glutamine levels.* Glutamine supplementation also demonstrated a significant increase in plasma IL-6 concentration (18-fold increase) compared to the placebo group immediately after exercise.*

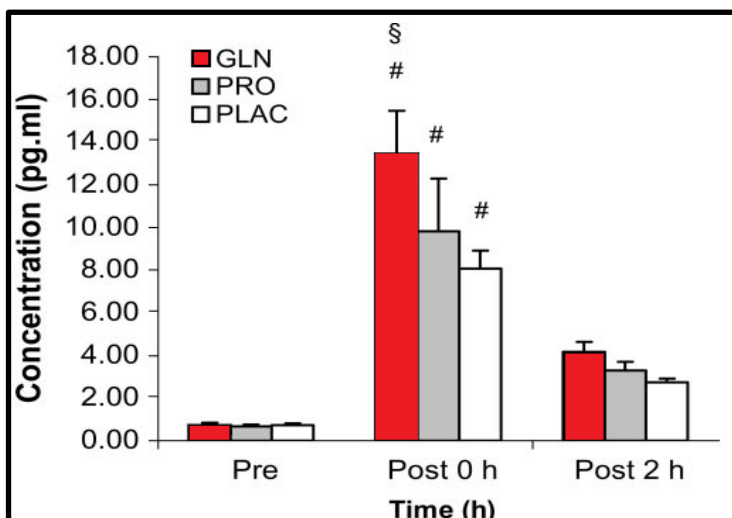


Figure 3. Plasma interleukin-6 (IL-6) concentration before exercise, immediately after exercise, and 2 h after exercise in groups supplemented with Glutamine (GLN), Protein (PRO), and Placebo (PLAC). Values are means ± SE. # significantly different from Pre and Post 2 h ($P < 0.001$); § significantly different from Pro and Plac ($P < 0.005$). Adapted from publication.

SAFETY INFORMATION

Tolerability: The average daily intake of glutamine from dietary protein is 3–6 g/day. Short-term glutamine supplementation is generally well tolerated at daily doses up to 50-60 g per day.

Contraindications: There are no known contraindications for the oral intake of glutamine, which is an amino acid present in food.

Caution: Individuals with liver conditions, bipolar and seizure disorders, and MSG hypersensitivity should take glutamine supplementation under the supervision of a healthcare practitioner, as increased glutamine intake may temporarily increase serum glutamate and ammonia levels.

INTERACTIONS

Drug Interactions: Glutamine may theoretically exhibit antagonistic effects against lactulose and anticonvulsant drugs such as Neurontin, Dilantin, and Tegretol.

Supplement Interactions: None known.

Interaction with Lab Tests: The metabolites of glutamine, ammonia and glutamate, may affect the outcome of diagnostic tests for serum ammonia levels and serum glutamate levels respectively, when taken in high doses.

STORAGE

Store in a cool, dry place in tightly sealed container.