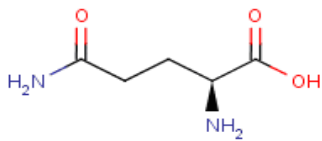


## L-Glutamine 1,000 mg

### 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:** 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 μM and 1,328±/99 μM, 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 Capsule

### Amount Per Serving

L-Glutamine (Free-Form)	1 g (1,000 mg)*
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\* Daily Value not established.

Other ingredients: Bovine Gelatin (capsule), Cellulose, Stearic Acid (vegetable source), Magnesium Stearate (vegetable source) and Silica.

- 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.

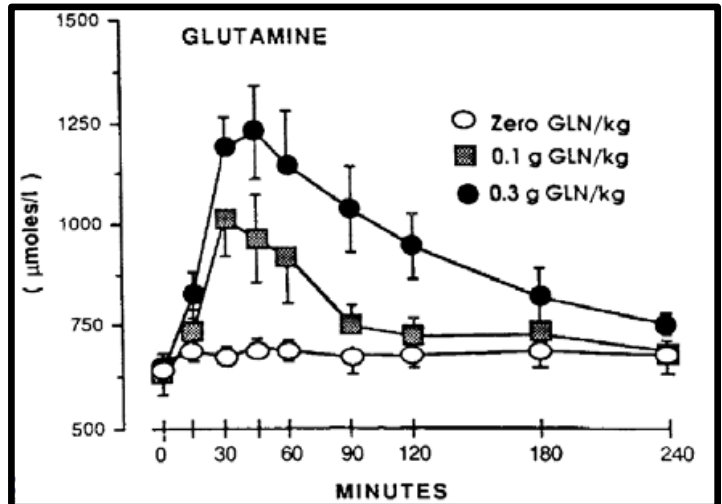


Figure 1. Whole blood glutamine concentrations following oral L-glutamine loading in healthy male volunteers.

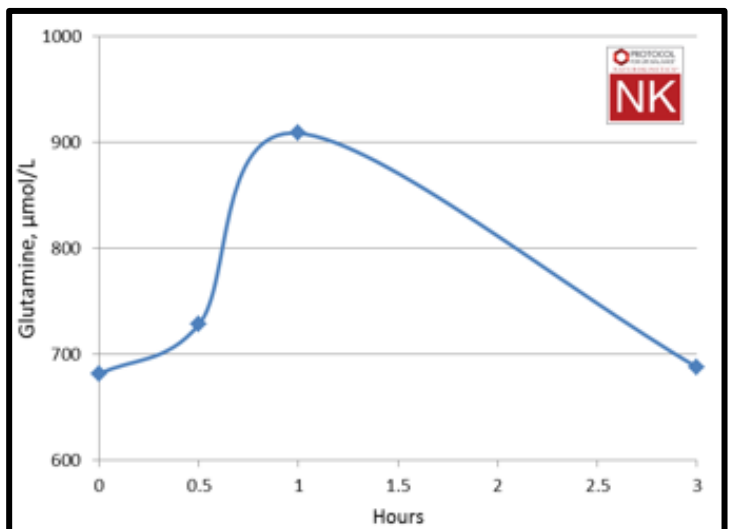


Figure 2. Average serum glutamine levels following a single administration of 5 g of L-glutamine (Protocol for Life Balance®, Product Code #P0094, 5 capsules) in healthy adult volunteers.

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, NH<sub>3</sub> and CO<sub>2</sub>.<sup>\*</sup> 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 kidneys/liver.<sup>\*</sup>

**Distribution:** Glutamine produced by the body is stored in muscle tissue in large amounts. Glutamine is also produced by the body in lung, 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, 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 O<sub>2</sub> uptake. They were supplemented with 3.5 g of glutamine, 13.7 g of glutamine-rich protein, or placebo at intervals during and 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.

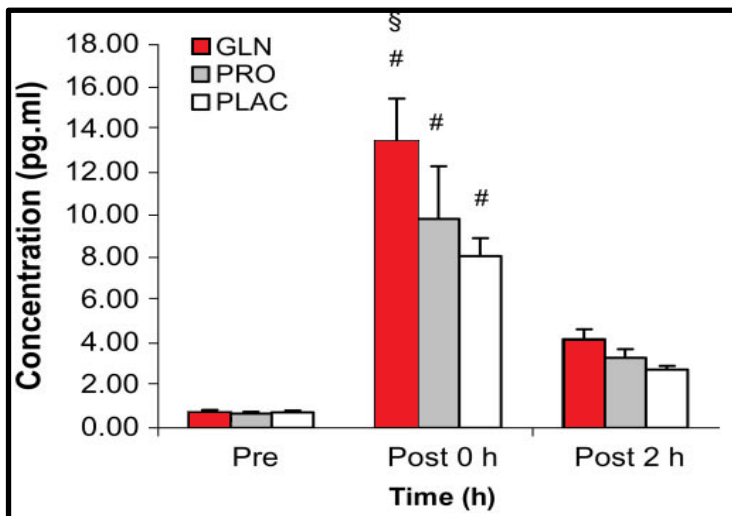


Figure 3. Plasma interleukin-6 (IL-6) concentration before exercise, immediately after exercise, and 2 h after exercise in groups supplemented with Glutamine (GLN), Protein (PRO), and Placebo (PLAC). Values are means  $\pm$  SE. # significantly different from Pre and Post 2 h ( $P < 0.001$ ); § significantly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