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All About SUPPLEMENTS

Glutamine

This Amino Acid Helps to Preserve Muscle Mass While Bolstering Immune and Gastrointestinal Health

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Glutamine synthetase enzyme computer model. This ligase enzyme forms chemical bonds between molecules. The different colors show the different sub-units that comprise the protein.

Glutamine is an important amino acid that may help to maintain muscle, boost the immune system, support gastrointestinal health, and sustain healthy growth hormone levels.[1-5] Of the 20 amino acids needed for protein synthesis, glutamine is the most abundant, making up 50% of all amino acids in the blood and 60% of those in the body.[1] It is found in high concentrations in skeletal muscle, lung, liver, brain, and stomach tissue. The best dietary sources of glutamine include poultry, beef, fish, cabbage, beets, and dairy products.

Amino acids are generally divided into two categories: essential and non-essential. Essential amino acids cannot be synthesized in the body and must be obtained from dietary sources. By contrast, non-essential amino acids are formed in the body. Glutamine, however, is referred to as a "conditionally" essential amino acid because in certain circumstances, the body is unable to produce enough glutamine to meet its needs.[6] Studies have shown that prolonged exercise, surgery, burns, and infectious disease can deplete glutamine levels by as much as 50%.[2] Under these conditions, supplementation with glutamine becomes crucial.

MAINTAINING MUSCLE MASS

Maintaining skeletal muscle is essential to good health and weight management. An increase in muscle mass increases the basal metabolic rate, or amount of calories the body burns while at rest. Glutamine may help to maintain healthy muscle tissue in people who are susceptible to a loss of muscle mass. One study found that patients who had major surgery and were given glutamine did not lose muscle mass during the recuperative period, even though they were inactive.[7] The researchers concluded that glutamine supplementation counteracts the decline in muscle protein synthesis that occurs after surgery, while improving nitrogen retention. This research may prove especially useful to those on calorie-restricted diets, who often have difficulty maintaining muscle mass.

INCREASING GROWTH HORMONE

Produced by the pituitary gland, growth hormone supports health in a variety of ways. According to researchers, growth hormone levels begin falling around the age of 30 and continue to diminish over time, contributing to weight gain, reduced energy, and muscle loss.

Unfortunately, growth hormone injections require a prescription and are seldom covered by health insurance. The cost of supplementing with this revitalizing hormone can exceed $1,000 a month. However, in a study published in the *American Journal of Clinical Nutrition*, a relatively small amount of glutamine significantly increased growth hormone levels.[4] The study subjects were given either a placebo or 2 grams of glutamine to drink. At 30 and 60 minutes after supplementation, their blood samples were analyzed for plasma growth hormone levels. Those who consumed glutamine had markedly increased growth hormone levels, while the placebo group exhibited no change in growth hormone levels.

Another study adds to the evidence that that glutamine boosts growth hormone levels. In a randomized, double-blind, placebo-controlled trial of 42 healthy middle-aged and elderly adults, the subjects consumed either a placebo or 5 grams of a nutritional supplement composed mainly of glutamine, glycine, and niacin. The supplement was ingested twice daily for three weeks. At baseline and at the study's end, the investigators analyzed the participants' blood. Ingesting the supplement led to a 70% increase in serum growth hormone levels compared to placebo, leading the researchers to conclude that an oral mixture of glutamine, glycine, and niacin can enhance growth hormone secretion in healthy adults.[8]

BOOSTING IMMUNITY, ANTIOXIDANT STATUS

Because glutamine fuels white blood cells, it is essential in supporting the body's immune system and immune response. Trauma, surgery, viral infections, and chemotherapy have all been shown to deplete glutamine levels.[2] It has been suggested that diminished plasma glutamine levels may lead to suppressed immune function.[5]

Total parenteral nutrition is the intravenous administration of nutrients to critically ill patients. Until recently, however, commercial total parenteral nutrition solutions did not contain glutamine. This can result in atrophy of the gut mucosa and compromised integrity of the gastrointestinal tract.[2] In one study, glutamine was added to the total parenteral nutrition of patients following bone marrow transplantation. The results indicated lower incidence of infection and shorter hospital stays compared to patients who received glutamine-free parenteral nutrition.[9]

Endurance athletes also have decreased plasma glutamine concentrations after prolonged, strenuous exercise.[2,10] Post-exercise glutamine depletion and associated immunosuppression may render the athlete more susceptible to infection. In one study, a group of 151 elite runners and rowers were given two drinks containing either glutamine or a placebo immediately after and two hours after exercise. Over the following seven days, the percentage of infection-free patients was significantly higher in the glutamine group (81%) than in the placebo group (49%).[10]

Glutamine also plays an important role in the body's antioxidant systems. In combination with L-cysteine and glycine, glutamine promotes glutathione synthesis in the liver. Glutathione neutralizes damaging free radicals and recharges oxidized vitamin C.[11] Optimal amounts of glutathione are also necessary to support the immune system and liver function.[12]

AIDING DIGESTIVE HEALTH

A healthy gastrointestinal tract is a vital component of overall well-being. In fact, the gastrointestinal tract lining serves as a first line of defense against disease-causing microorganisms. Enterocytes, which are epithelial cells lining the small intestine, use glutamine as their primary metabolic fuel.[13] Glutamine is thus essential in maintaining the structural integrity of the intestinal lining. Insufficient glutamine may lead to a loss of gut mucosal integrity, which can allow toxins and infectious agents to be absorbed.[14,15] This condition, known as increased intestinal permeability, may be associated with health problems such as allergies, skin disorders, and Crohn's disease.[2,16-18] By helping guard against increased intestinal permeability, glutamine may have applications in the management of these and other conditions.[19]

Insufficient levels of glutamine can also lead to atrophy of the villi in the small intestine. Resembling small fingers, the villi serve to increase the gastrointestinal tract's absorptive surface area. Supplementing with glutamine can help increase villous height, thus helping to maximize the surface area available for nutrient absorption.[2]

Celiac disease, which is caused by the body's abnormal immune response to gluten protein from wheat, barley, or rye, is associated with villous atrophy. While avoiding gluten protein is essential to managing celiac disease, glutamine's ability to support the intestinal lining and increase villous height suggests that it may help speed the recovery of the mucosal lining.[20,21]

Crohn's disease is a chronic inflammatory condition that can affect the small and large intestines, as well as other tissues of the body. A study comparing Crohn's disease patients with healthy control subjects found that Crohn's sufferers have an abnormally higher incidence of intestinal hyperpermeability. The investigators speculated that increased intestinal permeability could play a role in the genesis of Crohn's disease. Further research is needed to clarify the relationship between Crohn's and intestinal hyperpermeability, and whether glutamine may be an effective therapeutic tool in managing the condition.[18]

Altered intestinal permeability may also be involved in the causation of skin conditions and food allergies. In one study, individuals with intestinal hyperpermeability were more susceptible to experimentally induced chronic urticaria (an allergic skin condition marked by itching and hives) compared to healthy control subjects.[16] Intestinal hyperpermeability has also been associated with multiple food intolerance and atopic dermatitis in infants and young children.[17]

By supporting the structural integrity of the gastrointestinal lining, glutamine may offer relief for a number of gastrointestinal conditions, as well as support for certain skin and allergic conditions.

SUMMARY

Because glutamine can be synthesized in the human body, its use as a nutritional supplement has long been overlooked. However, factors as varied as viral infections, surgery, burns, infectious disease, and even prolonged exercise can significantly deplete levels of this multifunctional amino acid.[2] In these instances in which the body is under marked stress, supplementation with glutamine becomes essential. An impressive body of research supports glutamine's efficacy in helping to maintain muscle mass, revitalize the immune system, promote gastrointestinal health, and support healthy antioxidant levels.

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