

REPORT

Optimizing Muscle Health With Whey, Creatine, and Glutamine

By Will Brink

Many people associate protein supplementation with bodybuilders or professional athletes seeking rapid gains in muscle mass and strength. As we age, however, remaining active and independent also requires strong, healthy muscles, especially since aging increases susceptibility to loss of muscle mass and muscle atrophy.

Fortunately, health-conscious adults are discovering the benefits of a combination of nutrients that can help them get the most from an active lifestyle as they get older. In order to help offset the age-related loss in muscle, whey protein offers a rich source of essential amino acids that are rapidly absorbed and utilized, helping to maintain healthy muscle. Utilizing whey protein as a meal replacement provides critical proteins without the carbohydrates and fats that may contribute to unwanted weight gain.

Two other nutrients complement the muscle-building effects of whey: creatine supports muscle strength and prevents muscle wasting with aging, while the amino acid glutamine helps preserve lean tissue mass and supports immune system health.

Together, these nutrients in combination powerfully support aging muscles, functional strength, and the aging immune system, all of which are critical factors for an active, independent life.

WHEY PROTEIN

Whey is a protein complex derived from milk with a diverse range of health benefits.^{1,2} Whey protein has long been a staple supplement for athletes, and is now gaining popularity among a wider population of health-conscious adults, and for good reason: it is a great protein with a wide variety of benefits, ranging from promoting muscle health to immune modulation to protection against cardiovascular disease and cancer.^{1,2}

Whey protein is a rich source of the essential amino acids in higher concentrations compared with vegetable sources such as soy. Compared with other protein sources, whey contains a high concentration of branched-chain amino acids, which are important for tissue growth and repair. Additionally, whey is rich in the sulfur-containing amino acids, which enhance the body's antioxidant protection through intracellular conversion to glutathione.² Other constituents of whey include beta-lactoglobulin, lactoferrin, and immunoglobulins, which hold important benefits for immune support.¹

Whey's amino acids are rapidly absorbed and utilized, quickly elevating plasma amino acids and thus contributing to the preservation of muscle mass. Studies show that whey protein helps augment the effects of resistance exercise training, particularly when it is consumed shortly before or after exercise training.³ In one study, 36 men followed a weight-training program for 12 weeks while supplementing with whey protein, a multi-ingredient whey protein supplement, or maltodextrin placebo. At the study's end, men who supplemented with whey in combination with resistance training showed improvements in one or more measures of muscle strength as well as lean tissue mass, compared to placebo recipients.⁴

Whey's benefits for skeletal muscle go beyond those provided by its essential amino acid content, promoting greater muscle accrual than that which occurs from ingesting the essential amino acids alone. As a rule, higher biological value proteins such as whey are superior for maintaining muscle mass compared with lower-quality proteins, which may be of particular importance to older individuals. In fact, data suggest "fast" digesting proteins such as whey may be superior to other proteins for preserving lean body mass in older individuals.⁵ This suggests that whey holds practical applications in supporting muscle anabolism (tissue-building) in older individuals.⁶

One of whey's major effects is its ability to raise levels of glutathione,¹ a powerful intracellular antioxidant. The importance of



glutathione for good health cannot be overstated. Glutathione is arguably the most important water-soluble antioxidant found in the body, participating in crucial detoxification reactions in the liver. Glutathione is known to be essential to immunity, body antioxidative capacity, and general well-being, and decreased levels of glutathione are associated with a long list of ailments such as neurodegenerative disease, cirrhosis, and the aging process itself.⁷ Boosting glutathione levels through whey supplementation may thus be beneficial for aging populations looking to avert disease and stay healthy and active.

A growing body of research suggests that whey protein may offer protection against some of the most prevalent diseases afflicting older adults. In animal and human studies, whey protein shows promise in the prevention and management of cancer.^{1,2} Whey may offer benefits for cardiovascular health by modulating blood pressure and promoting healthy blood lipid profiles.² Supplementing with whey protein may be particularly important for those with immune health concerns as studies point to its ability to help fight numerous bacterial infections as well as provide support for individuals fighting hepatitis C and HIV infections. Finally, human research has found that whey protein improves cognitive ability and helps improve coping ability in highly stressed individuals, possibly by providing tryptophan, the precursor to serotonin.¹

Whey's benefits thus extend far beyond healthy muscles to overall effects in promoting a healthy body and mind.

CREATINE COMPLEMENTS WHEY'S EFFECTS

The scientific and medical communities have recently been devoting significant attention to creatine, and they are discovering that it not only offers benefits for active and athletic populations—but it may be particularly helpful for preserving muscle mass and strength in aging populations.

Creatine monohydrate has longed been used by athletes for its ability to increase muscular force and power, reduce fatigue, and help increase muscle mass.⁸ Creatine supplementation works by increasing intramuscular and intracerebral stores of creatine and phosphocreatine, which helps prevent ATP depletion, stimulate protein synthesis, and reduce protein breakdown.

Research suggests that whey and creatine may offer synergistic benefits for enhancing the effects of resistance training. One study compared the effects of whey alone with whey plus creatine or placebo (maltodextrin) in combination with a resistance exercise training program. Men who supplemented with whey and creatine demonstrated greater gains in lean tissue mass and bench press strength, compared with men who supplemented with whey alone or with placebo.⁴



As adults grow older they become increasingly susceptible to muscular atrophy and loss of strength, a condition known as sarcopenia. This devastating decline in muscle mass and function can slowly rob aging individuals of the ability to perform tasks of daily living, while placing them at risk of falls and other potentially dangerous injuries. Creatine supplementation may hold important applications in preserving muscle mass and strength in aging adults.

The muscle atrophy that commonly occurs in older adults comes predominantly from a loss of fast-twitch muscle fibers that are recruited during high-intensity movements like weight-lifting and sprinting. These are the muscle fibers most dramatically affected by creatine supplementation.

Numerous studies have demonstrated that creatine supplementation increases strength and lean body mass in older adults who are participating in resistance exercise training.⁹⁻¹¹ One group concluded, “creatine supplementation may be a useful therapeutic strategy for older adults to attenuate loss in muscle strength and performance of functional living tasks.”¹⁰ This may have important implications for helping aging adults maintain functionality in performing everyday tasks.

One recent study found creatine may improve the functional strength of older women. Thirty women between 58 and 71 years old women performed a variety of tests to assess their baseline strength and endurance. The participants then received either placebo or creatine monohydrate (300 mg/kilogram of body mass) and were retested seven days later. The group receiving the creatine monohydrate had significant improvements over the placebo group in measures of strength, lower body functional tests, and fat-free body mass, leading the researchers to conclude, “short-term creatine supplementation resulted in an increase in strength, power, and lower-body motor functional performance in older women without any adverse side effects.”¹²

A growing body of research has shown creatine (in the form of creatine monohydrate) may benefit individuals with conditions affecting the neuromuscular system, such as Parkinson's disease, Huntington's disease, and Duchenne muscular dystrophy.⁸ Other conditions that may benefit from creatine supplementation include chronic fatigue and fibromyalgia.^{13,14} Additionally, creatine supplementation may enhance the release of growth hormone following exercise, helping individuals capture the benefits of youthful growth hormone levels.¹⁵

Creatine monohydrate thus has a wide range of potential benefits to aging populations, athletes, and those with various medical conditions. Its benefits may be enhanced by combination with whey protein as well as another nutrient—the amino acid

glutamine.

WHAT YOU NEED TO KNOW: WHEY, CREATINE, AND GLUTAMINE

- Staying active and healthy with aging requires strong, healthy muscles. Unfortunately, aging adults are increasingly susceptible to losing muscle mass as they grow older.
- Whey protein helps enhance the muscle-building effects of exercise while boosting levels of the antioxidant glutathione.
- Creatine helps increase strength and lean tissue mass in aging adults.
- Glutamine helps preserve lean tissue mass while boosting growth hormone levels and supporting immune system health.
- Together, whey protein, creatine, and glutamine combine with exercise to help support the strong, healthy muscles needed for an active lifestyle.

GLUTAMINE SUPPORTS MUSCLE MAINTENANCE

Glutamine is required for countless functions in the human body, including maintaining muscle tissue and supporting immune system function.¹⁶ Glutamine is a *conditionally essential* amino acid, meaning that the body requires dietary or supplemental glutamine during stressful circumstances such as prolonged exercise, surgery, or infectious disease.¹⁷ Compelling evidence suggests that glutamine may be especially important for adults seeking to preserve lean tissue mass.

Glutamine is the most abundant amino acid in the body, and is highly concentrated in the skeletal muscles that make movement possible. Maintaining healthy skeletal muscle is essential to overall good health and mobility. Important research shows that glutamine can help maintain healthy muscle mass in people who are susceptible to loss of lean body mass, such as those undergoing surgery. One study showed that supplementing individuals who had major surgery with glutamine prevented the decline in muscle glutamine levels and muscle protein synthesis that can occur following such a procedure. These findings strongly suggest that glutamine can prevent the loss of muscle tissue during recovery from surgery and have important implications for all those seeking to preserve lean muscle mass.¹⁸

Glutamine may offer benefits for muscle health by increasing growth hormone levels. Since youthful levels of growth hormone are associated with tissue building and repair, nutritional scientists have long sought methods of naturally enhancing growth hormone levels. In one study, scientists administered 2,000 mg of glutamine dissolved in a beverage to nine healthy adult subjects. Eight out of the nine subjects responded to the oral glutamine intake with a four-fold increase in growth hormone output.¹⁹ These results bode well for athletes and active aging populations seeking to optimize their growth hormone levels.

Glutamine may hold important benefits for individuals who participate in exercise training programs. Evidence suggests that glutamine may help replenish muscle glycogen stores after intense exercise.²⁰ Glycogen serves as a readily available form of fuel to power muscle action and, as most athletes know, optimizing glycogen levels is important when you want to perform well.

Scientists administered glutamine to six healthy volunteers who had just completed 90 minutes of intense exercise. Such vigorous activity depletes muscle glycogen stores. Glutamine administration increased muscle glutamine stores and increased glycogen storage after the intense bout of exercise. While scientists are continuing to explore glutamine's mechanism of action in increasing glycogen stores, this might just be one more benefit of this amino acid for athletes and aging populations who wish to remain active and healthy.

In addition to its benefits for muscle wellness, glutamine is also crucial for immune health, and may be especially crucial in those who exercise vigorously. Intense exercise is known to reduce glutamine stores, making less glutamine available for supporting healthy immune system function and leaving individuals susceptible to infections.²¹ Scientists have proposed that supplementing with glutamine may help prevent the depression of immune function that can occur in those who participate in vigorous exercise programs.²¹⁻²⁵

Glutamine thus holds important benefits for preserving muscle mass with aging, supporting healthy growth hormone levels, optimizing muscle glycogen levels, and preventing exercise-induced immune suppression. These effects have important applications for athletes and aging populations who realize muscle is essential for healthy living and long-term functionality with advancing age.



CONCLUSION

The combination of whey, creatine, and glutamine powerfully supports aging muscles, functional strength, and the aging immune system, all of which are critical factors for an active, independent life. Utilizing whey protein as a meal replacement provides critical proteins without the carbohydrates and fats that may contribute to unwanted weight gain.

If you have any questions on the scientific content of this article, please call a Life Extension Health Advisor at 1-800-226-2370.

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