The Most Complete Post-Workout Solution - The Science Behind Post-Factor™

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Post-workout is a precious time where nutrition can have more of an impact than during other times of the day. Although the requirement for precise nutrient timing is still quite a controversial concept, there is good scientific reason to value your post-exercise nutrition.

It is well known that resistance exercise stimulates a process called muscle protein synthesis (MPS), which is the mechanism by which muscles grow. However, going on at the same time is a process called muscle protein breakdown (MPB), which is a process to reduce muscle size. The relative rate of these two processes is what determines whether the muscles are growing or shrinking (Figure 1). Resistance exercise alone creates a fairly low-grade increase in MPS, whereas MPB is substantially increased during and immediately postexercise. When exercise is complete, the rate of MPB far exceeds the rate of MPS, which implies that even after the most successful of workouts, in the absence of any nutrition at all, the net effect of the muscle is to shrink.

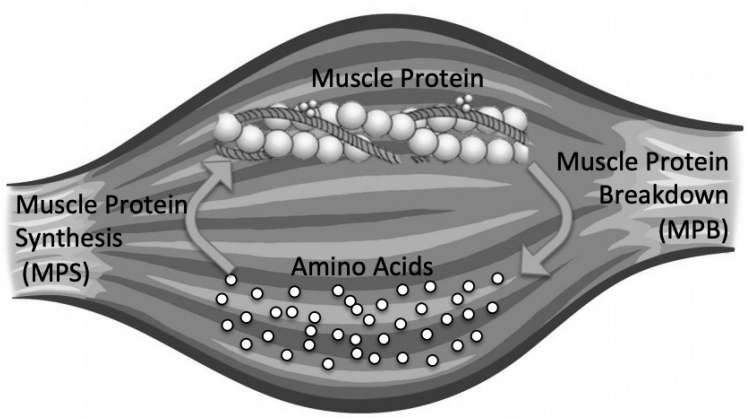

Figure 1. MPS is the synthesis of muscle proteins that leads to muscle hypertrophy. MPB is the breakdown of muscle protein that leads to muscle atrophy. The relative rates of these two processes ultimately determine whether the muscle grows or shrinks.

The only reason why resistance exercise has the capability of growing muscle is through the increased sensitivity the muscle acquires from exercise to the ingestion of nutrients. Since the 1990's it's been clear that exercise and nutrient consumption interact synergistically to provide a greater anabolic response than either one of them alone via the combination of increasing MPS and reducing MPB. This synergistic effect is the bases for nutrient timing post-exercise.

Due to the enhanced sensitivity to nutrients after exercise, the practice of

consuming those nutrients in close proximity to exercise has been shown to maximize muscle repair and optimize strength and hypertrophy related adaptations. The key is consuming the correct combination of nutrients and other ingredients to optimize these effects.

Post-Factor™ contains the perfect formulation of ingredients for your post-workout recovery period. It not only has the ingredients necessary to optimize the post-exercise muscle growth, but it also is hard at work preventing further muscle damage, and muscle soreness that can sometimes be detrimental and unbearable between 24 to 96 hours post-training. The unique formulation of Post-Factor™ is a complete all-in-one product that contains major driving ingredients that addresses every possible angle of muscle health and recovery from exercise.

Muscle Building Macronutrients Post-Exercise

While the muscles and other tissues in the body are in an energy-depleted state, immediately post exercise, ingested macronutrients will preferentially refuel those tissues for maximal recovery. The combination of both protein and carbohydrates has synergistic effects on amplifying the rates of MPS and reducing the rates of MPB post exercise.

Hydrolyzed Whey Protein Isolate

The rapid appearance of amino acids in the blood stream is the primary stimulus that regulates the rate of MPS from nutrition. With the muscles in a highly nutritive-sensitive state, the rapid appearance of amino acids in the blood causes a drastic influx of amino acids into the muscle cells, which in turn stimulates the increase in protein synthesis. Particularly during the post-exercise phase, the sensitivity to increase MPS from protein ingestion is significantly enhanced. The available research indeed concludes that the highest rate of MPS is elicited from the combination of resistance exercise followed by protein ingestion, significantly greater than either exercise or nutrition alone (Figure 2).

Rapid amino acid appearance in the blood has been shown to be superior than a slow delivery of amino acids in regards to stimulating protein synthesis. Thus, the consumption of a fast absorbing high-quality protein is the best method to ensure rapid amino acid availability in the blood. Whey protein is known for it’s fast digestibility

and absorption rates. Hydrolyzed whey protein takes it a step further and predigests the protein to elicit even faster and more uniform absorption kinetics to ensure only the highest possible increase in MPS.

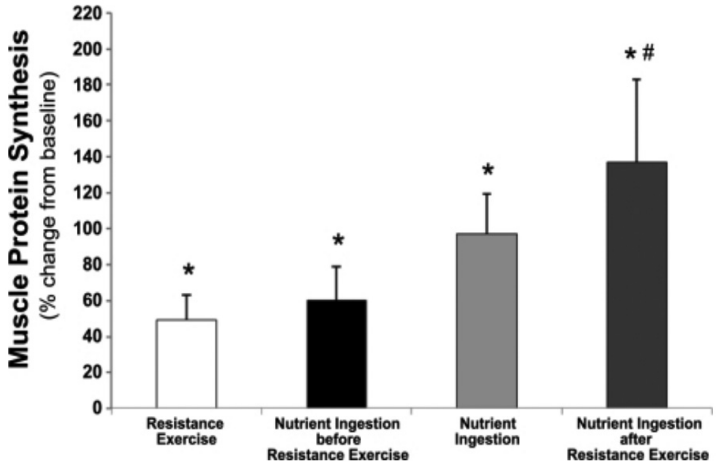

Figure 2. The increase in muscle protein synthesis in response to various anabolic stimuli. The combination of nutrient ingestion after resistance exercise elicits the greatest increase in protein synthesis.

Indeed, the muscle sensitivity to nutrients post exercise can last for up to 24 hours or in some cases longer. Consequently, there is a spreading belief that post-exercise nutrition is not critical. However, the overwhelming evidence indicates that total protein quantity is the strongest determinant for overall muscle development. Therefore, considering that MPS reaches a maximum rate when ingesting between 20-30 grams of protein, to maximize the full 24-hour post-exercise period, it is recommended to consume protein as soon as possible and then subsequently every 3-4 hours.

Another reason for precise nutritive timing, is independent of protein, but rather, involves carbohydrate recovery.

Carbohydrates

Exercise typically leaves fuel resources relatively scarce. As much as it would be aesthetically pleasing that most of this energy came from fat metabolism, the reality is that the bulk majority of the energy burned from high-intensity exercise comes from carbohydrate metabolism. It is common after exercise to feel sluggish and fatigued. This is largely due to the depleted energy state of the muscles and liver. The research is very consistent that the timing of carbohydrate consumption after exercise plays a

significant role in recovery, even more so than protein timing.

Both the muscle and the liver are highly sensitive to carbohydrate loading after they have been depleted from exercise. If the goal is to build muscle from high-intensity resistance training, then a healthy supply of carbohydrates is absolutely necessary. The term "anabolic window" actually stems from carbohydrate consumption. Post-exercise muscle glycogen synthesis occurs more rapidly when carbohydrates are consumed immediately after exercise compared to waiting several hours. In fact, delaying supplementation for even two hours can reduce the rate of muscle glucose uptake and glycogen synthesis by up to 50%, despite equal carbohydrates amounts, blood glucose levels, and insulin levels. Therefore, post-exercise is the most important time for the consumption of carbohydrates to boost carbohydrate reserves and improve future performance.

The second major contribution that carbohydrates make in the post-exercise phase is on the rate of MPB. As previously mentioned, MPB is highest after exercise and more dominate than the increase in MPS, causing a net muscle shrinking effect. This is largely due to the energy status of the cell. When energy levels are low, an enzyme called AMPK is activated that keeps MPB rates high. Protein ingestion actually plays a relatively minor role in improving the energy status of the cell and thus is poor at attenuating MPB. The ingestion of carbohydrates on the other hand is well known to increase the release of insulin. The anabolic effects of insulin can antagonize AMPK and reduce MPB back to basal levels and can even contribute to the increase in MPS. The incorporation of a fast acting complex carbohydrate source such as maltodextrin is ideal to cause the sudden rise in blood glucose necessary to stimulate insulin and its anabolic effects on muscle. Insulin is also known to improve amino acid delivery contributing to a greater degree of muscle growth.

To summarize, the inclusion of both protein and carbohydrates are widely accepted in by the scientific community to elicit the greatest anabolic response to exercise through both an increase in MPS and a decrease in MPB. Furthermore, recovering glycogen reserves plays a prominent role maintaining exercise performance moving forward. However, these two macronutrients alone will not expedite the quickest possible recovery to regenerate muscle most effectively. Additional supporting ingredients in Post-Factor™ addresses further muscle recovery needs.

Accelerating Recovery

Strenuous resistance exercise can elicit a significant amount of muscle damage. Fundamentally, this is required to achieve muscle adaptation from exercise. Without any muscle damage, there would be a lack of stimulation for muscle growth. However, too much muscle damage doesn't lead to a greater stimulation of muscle growth. In fact, in order to ensure the maximal stimulation possible, it is common to cause more muscle damage than necessary. Unfortunately, this isn't always advantageous. During high-intensity exercise, mitochondria naturally produce significant amounts of reactive oxygen species (ROS). The production of ROS during exercise provides a great benefit to improve strength and power for that given exercise. However, high amounts of ROS that lingers after exercise leads to oxidative stress, which has detrimental properties on the structural integrity of the muscle cell, causing additional muscle damage. ROS is not the only culprit to non-beneficial muscle damage. High-intensity or high volume exercise creates an influx of inflammatory markers, plasma proteins, and fluids, that combined, may also exacerbate the initial muscle damage.

Collectively, the accumulative damage that ensues leads to something called a secondary injury that hinders and delays muscle recovery and growth. It is believed that the concept of the secondary injury is what is the major contribution to the phenomenon called "the delayed onset muscle soreness (DOMS)", where instead of growth and recovery, muscle damage and pain increases for up to 48 hours postexercise. By attenuating the effects of the secondary injury the added "Muscle Recovery Complex" in Post-Factor™, including ActiGin®, CherryPURE® and LCLT, ensures recovery time and muscle growth can be enhanced.

ActiGin®

As a unique combination of the natural extracts of *Panax notoginseng* and *Rosa roxburghii*, ActiGin® is a patented ingredient with many benefits. One of the greatest features of ActiGin® is its ability to reduce lipid peroxidation within 3 hours post-exercise. Lipid peroxidation occurs when ROS act on the cell membranes and cause their destruction. Such cell membrane destruction includes impairing cell signaling, insulin sensitivity, and overall muscle metabolism. Consequently, the ingestion of ActiGin® post-exercise has been shown to improve glycogen synthesis after a carbohydrate rich meal, by improving the sensitivity of insulin.

In addition to maintaining the structural integrity of the muscle cells, clinical research has demonstrated that ActiGin® can also decrease oxidative muscle damage within the cell and attenuate the elevation of inflammatory markers. 50 mg of ActiGin® ingestion was shown to reduce the markers of muscle damage by 69% after 4 days.

CherryPURE®

Specific polyphenols like anthocyanins have powerful antioxidant and anti-inflammatory capabilities. Such anthocyanins can be found in fruits like blueberries, cranberries and beetroot juice, but none quite as concentrated as they are found in tart cherries. CherryPURE® is a branded freeze-dried powder made from the skins of Montmorency tart cherries and has been extensively researched in the areas of muscle recovery and inflammation. CherryPURE® is therefore referred as the ultimate natural muscle rejuvenator.

The research-backed dose of 480 mg of CherryPURE® contains the amount of anthocyanins would be found in over a pint of tart cherry juice. The clinical research shows that supplementing with CherryPURE® tends to attenuate the rise of secondary injury that occurs 24 hours post-exercise while also accelerating the recovery process over 48 hours (Figure 3A). This specifically includes reducing the perception of DOMS by attenuating the exerciseinduced muscle pain and strength losses over 4 days. Research shows that CherryPURE® significantly lowers the perception of soreness at 60 minutes, 24 hours and 48 hours post-exercise (Figure 3B) and also diminishes loss of muscle strength at 24 and 48 hours (Figure 3C).

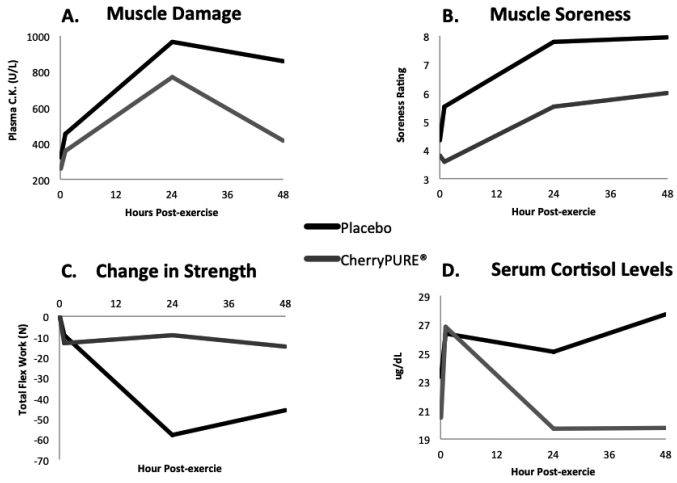

Figure 3. The effects of CherryPURE® supplementati on compared to placebo over a 48 hour time frame on **A.** Muscle damage **B.** Muscle Soreness **C.** Change in Strength **D.** Serum corti sol levels.

In the placebo control trial, exercising without CherryPURE® was shown to leave muscles damaged for over 48 hours. In conjunction with the sustained and more pronounced muscle damage is the rise of the stress hormone called cortisol that functions to continue to breakdown muscle. Chronically elevated cortisol is not advantageous for muscle growth and evidence shows that exercise can result in elevated cortisol levels for up to 24 hours post-exercise. Luckily, CherryPURE® supplementation swiftly returns cortisol levels back to basal values within the first 24 hours indicating that in the absence of the dramatic secondary injury, muscle breakdown can be kept at a minimum and allow for maximal rates of muscle growth (Figure 3C).

L-Carnitine-L-Tartrate (LCLT)

One of carnitine's most promising areas of research is its role in accelerating recovery from exercise-induced muscle injury. It has been found that supplemental carnitine is effective in attenuating signs of tissue damage and muscle soreness. In exercise-induced muscle damage, L-carnitine supplementation has been found to reduce postexercise serum markers of muscle damage, suggesting a quicker muscle recovery from damage.

In a study with ten resistance-trained men consuming a placebo or 2g of LCLT for 3 weeks, exercise-induced increases in plasma markers of muscle damage, and oxidative stress were either significantly attenuated by LCLT or returned to resting values sooner with LCLT compared to placebo. When observed visually with an MRI scan the amount of muscle damage was quantified to be 41-45% as great with LCLT supplementation compared to the damage from the placebo trial. These data indicate that LCLT supplementation is effective in assisting recovery from high-repetition exercise and resulting in 59% less muscle damage.

Antioxidants

Post-Factor™ is finished with 100% of the daily value of the anti-oxidants vitamin C and vitamin E. Together these anti-oxidants complete the need to resolve oxidative stress in the body post-exercise. In addition, to protecting against the generation of ROS, these vitamins play a prominent role in boosting the immune system to ensure optimal recovery and future health.

Conclusion

The post-exercise recovery phase is not to be belittled. There are many avenues to muscle recovery that needs attention. Augmenting MPS, reducing MPB, protecting against ROS, reducing inflammation, preventing further damage and DOMS, and restoring energy reserves are some of the most important things to consider after each grueling training session. Instead of trying to focus on each of those items individually, a single serving of Post-Factor™ contains the research backed doses and ratios of the ingredients required for each of those purposes. The inclusion of the Muscle Recovery Complex™ increases the efficiency of muscle recovery when compared to either carbohydrates or protein alone. Backed by science, Post-Factor™ is vital to optimizing postexercise muscle recovery. This includes not only maximizing muscle hypertrophy, but also minimizing muscle soreness and optimizing muscle recovery time.

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