NO INCREASES IN POST-EXERICSE FAT UTILIZATION WITHOUT ACUTE INCREASES IN GH. (FULL ARTICLE)

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Rest period duration can increase GH and enhance fat utiization. The articles will review the influence the effects of GH on fat metabolism.

How much rest should a bodybuilder take between sets?
It all depends on your training goals.
If you are looking to get stronger: the best rest periods is 3 to 5
minutes between sets. The Discovery Channel once did a documentary on the 2000
Olympic Gold Medal Olympic weightlifter Winner Naim Suleymanoglu from Bulgaria otherwise known as “Pocket
Hercules.” He became the second lifter (of only seven)
to clean and jerk three times his bodyweight in history. Amazingly, he smokes about
50 cigarettes a day and sometimes between sets he would catch a quick smoke
during those 5 minute rest periods! This is unheard of in the bodybuilding
world! If you are a bodybuilder, to increase muscle mass training consists of
the rest periods of 1 or so between sets.
Often when competition dates approach and bodybuilders want to get
leaner; you will see bodybuilders taking even less rest periods between
sets. Bodybuilders somehow mysteriously
knew that increasing exercise intensity by reducing rest periods did something
to increase fat metabolism there was no research as to how this was being
accomplished. It’s as if this was mysteriously passed down from generation to
generation of bodybuilders without the science to back it up. Frank Zane 3X Mr. Olympia had unbelievable
definition for a bodybuilder in the 70’s.
When asked how he achieved his definition he said,

“That
comes from experience. When you really get into your workout, the last month
before a contest, the concentration is so keen (no talking, and almost no rest)
going through maximum effort each set. It's sort of like everything disappears
except what you are into at the time.”

Higher Intensity Exercise Results in Greater Fat Loss

Bodybuilders have always known that increasing exercise intensity increases fat burning but the mechanism was not really clear. Perhaps the most compelling evidence on the effects of high-intensity exercise came in 1994 in the journal Metabolism. This study tracked two groups of people undergoing different modes of exercise. Group 1 did zone aerobic training for a period of 20 weeks, while Group 2 did 15 weeks of a high-intensity interval program. The researchers wanted to see how each program would affect body fatness and metabolism. The results showed that the aerobic group burned 48% more calories than the interval group over the course of the study. However, despite the huge caloric disadvantage, the interval group had a ninefold greater loss in subcutaneous fat. Additionally, resting levels of 3-hydroxyacyl coenzyme A dehydrogenase (HADH), an enzymatic marker of fat-burning, were significantly elevated in the interval group11. Many bodybuilders often perform aerobic exercise before a show but would performing interval training be better for fat loss?
It has been shown that there is a rise in lipolysis during the5. post-exercise periodSomething is going on in the post-exercise period that was causing the high intensity group to burn more fat. The trigger for this increase in post exercise metabolism fat loss seems to point toward GH.

GH Increases are Dependent on Training Intensity

The most powerful, non pharmacological stimuli for GH secretion are sleep and exercise. Exercise is a powerful stimulator of GH secretion, and the size of the increase in exercise GH is related to the exercise intensity1. A single 30-s treadmill sprint to exercise failure produces a near-maximal GH response with GH levels remaining elevated for at least 60 min postexercise2.
As serum GH was still approximately ten times higher than baseline after 1 h of recovery after maximal sprint exercises, it is suggested that the exercise-induced increase in GH could have important physiological effects in building mass, including increased protein synthesis and sparing of protein breakdown leading to increased muscle mass. Although this study looked at sprints to maximal failure, studies which have utilized squats and deadlifts to failure have elicited similar GH responses, the point I am trying to get across is that as training intensity increases..so does GH! In a recent study published in the European Journal of Applied Physiology, Bill Kraemer a world renowned exercise endocrinologist wrote, “The importance of greater GH response to exercise cannot be understated in terms of muscle signaling pathways.
GH plays an important role in protein synthesis via interactions with the GH receptor on the cell membrane and subsequently increases in translation efficiency.”20 The anabolic actions of GH cannot be emphasized enough for increase protein synthesis.

Take Your Amino Acids Before Exercise

There is debate as whether for the best anabolic gains should take amino acids (BCAA’s) before or after exercise. Some studies have shown its better to take BCAAs before while others have determined it does not matter when. He is my rationale as to why it may be more important to take them before exercise. In a recent paper written by protein synthesis guru’s Arny Ferranado and Robert Wolfe, it mentioned an interesting study involving GH and protein synthesis. Subjects were randomly assigned to receive daily subcutaneous injections of placebo (saline) or GH. Each subject was studied in the fasted state, followed by an infusion of the same commercial amino acid formula. The results clearly demonstrated no difference in fasted net protein balance between the placebo and GH groups. The principal effect of GH was realized when combined with amino acids, as there was a clear anabolic effect22. Based on the study, only when GH is in the presence of amino acids is their anabolic effect. See me point? Back in 1998, Dr. Kraemer did an interesting study where they looked at post-exercise GH responses in response to weight trainers that took a protein based supplement before exercise for three consecutive days and compared them to those that ingested just water. Serum GH concentrations significantly increased immediately postexercise and returned to resting concentrations by 60 min of recovery in both groups. On day 1, GH concentrations at 0, 15, and 30 min postexercise were significantly higher in the group consuming the protein supplement compared to placebo33.
Finally, several amino acids have been shown to increase serum GH concentrations, including the BCAA leucine.
It make sense to take amino acids just before a GH peak that occurs with exercise to facilitate the greatest anabolic effect compared to post exercise when hormone are declining.

The GH Preferentially Burns Abdominal Adipose Tissue

An interesting phenomenon about GH is that it stimulates adipose tissue fat mobilization after a delay of approximately 2 hours3. During sleep, the peaks in GH result in maximal levels of free fatty acids about 120 minutes later9. Additionally, GH increases circulating levels of glycerol and free fatty acids in GH deficient men after a lag time of 2-3 hours12. So if you are trying to get ripped up, is one little peak in GH during your workout going to make that big of a difference in your physique? Your damn right it does…Researchers took subjects and gave them a dose of GH but kept it in the physiological range; a single GH spike increased fat mobilization in femoral (thigh) and abdominal adipose tissue, the greatest increases being more prominent in the abdomen. The more pronounced effect of fat mobilization in abdominal adipose tissue may be the reason why GH deficient men look like they are pregnant and hold most of their fat in their stomach. The lipolytic response is two- to threefold more pronounce in the abdomen; the effects of GH will lead to preferential loss of abdominal subcutaneous fat10.
When obese men are administered GH the fat seems to just melt off. For example, thirty men, with abdominal/visceral obesity were treated with recombinant human GH in a 9-month randomized, double-blind, placebo-controlled trial. The mean total bodyfat dropped by 9%, moreover, the volume of visceral adipose tissue (stomach) decreased by 17%, whereas no changes were seen in the placebo group.

No Increase in Post Exercise Fat Utilization without Acute Exercise Increases in GH

Since there is a delay in GH’s effect on fat metabolism, back in 2005 researchers wanted to see exactly what acute increases in GH did too fat metabolism after exercise so they gathered some test subjects and had them cycle @ 70% of their peak exercise capacity. Post exercise fat metabolism was directly related to the acute rises in GH that occurred during the exercise protocol6. Based on the study, the best way to increase your fat metabolism post exercise is to increase your GH. It is well established that prolonged rest periods (3-5 minutes) result in very small rises in GH compared to taking short rest periods which leads to large increases in GH. Is there any metabolic advantage of the large increases in GH that occur with short rest periods for increasing fat metabolism? According to a new study, the acute increases in GH may are essential for increasing post exercise fat utilization. Here was the study design. Researchers had subjects exercise for 1 hour, one group served as a control group while one group of subjects received a infusion of Octreotide (a potent inhibitor of growth hormone) which as an injectable formulation for the treatment of acromegaly (GH excess). The control group had a fourfold rise in GH while the group receiving Octreotide had a blunted GH response during exercise. Researchers found that post exercise fat utilization in subcutaneous adipose tissue were increased due to GH while it remained unchanged in the group receiving the drug that blunted GH responses during exercise4. Researchers suspect the reason GH peaks about 2 hours after an intense bout of exercise is that glycogen needs to be replenished during that time so high levels of GH increase fat mobilization sparing glucose to be incorporated into glycogen. So if you are looking to get ripped up, in addition to diet, large increases in GH from high intensity exercise may facilitate this process.

GH has Direct and Indirect Actions on Fat Burning

The fat burning properties of GH are well documented. Studies in fat cells and in human and animal models have shown that in addition to its direct lipolytic (fat burning) effect on adipose tissue (demonstrated by stimulation of basal fat lipolysis)17,18,19. GH can also increase fat loss by blocking fat storage. 11ß-HSD1 converts the inactive glucocorticoid, cortisone, to active cortisol in adipose tissue; 11ß-HSD1 is highly expressed in human adipose tissue31, and overexpression in adipocytes in a rodent model leads to a centrally obese. It has shown that exogenous GH is able to inhibit 11ß-HSD1 activity in patients with simple obesity which means GH blocks cortisol from binding to the adipose tissue receptor limiting fat storage32.
Small pulses of GH designed to mimic physiologic pulses, have been shown to induce a dose-dependent stimulation of fat oxidation and increase circulating levels of FFA and glycerol10. In normal subjects, the onset of exercise leads to a 3-fold increase in the rate of fat oxidation and a rapid increase in uptake of free fatty acids into skeletal muscle where fat is burned as a fuel source13. It seems GH’s biggest impact on fat metabolism is during the post- exercise period. For example, fat oxidation was studied in GH deficient subjects during and following discontinuation of long-term GH replacement.

Discontinuation of GH was not associated with any change in fat oxidation at rest, but resulted in a marked reduction in fat oxidation and fatty acid release into the circulation during and following exhaustive exercise14. In a similar study, GH deficient adults who were receiving long-term GH replacement on 2 separate days, once with and once without a bolus of GH administered intravenously at the start of exercise. The protocol resulted in an increment in circulating GH levels during exercise that was indistinguishable from that seen in healthy normal subjects. Under resting conditions there was no effect of GH, while during and following 45 minutes of exercise at lactate threshold there was a greater fat oxidation following GH administration15.

GH and Catecholamines: The Fat Burning Combo

Adipose tissue lipolysis increases during exercise. The major stimulus for the enhanced lipolysis seems to be circulating catecholamines in combination with a low insulin concentration. Just all about all the major fat burners and thermogenics increase catecholamines for fat loss. These supplements essentially mimic the actions of norepinephrine and epinephrine in a direct and indirect manner. Directly, agonists activate beta adrenoreceptors (β-AR) and indirectly, they facilitate the release of epinephrine and/or norepinephrine (catecholamines). Catecholamines activate cAMP production and stimulate fat metabolism through β-AR stimulation and inhibit the process through α2-AR activation8. Fat cell responsiveness to catecholamines depends on the ratio and functional balance between β - and α 2- receptors located on fat cells, which are influenced by sex, anatomical location of the fat depot, and obesity9. The lipolytic effects of epinephrine, which exhibits the highest affinity for the α 2-AR9. So how does GH influence catecholamines? GH enhances the actions of catecholamines. One study reported that when GH is added to fat cells, the addition of GH increased the fat cells response to epinephrine (a powerful fat burning hormone)18. Further studies have reported that GH results in an up-regulation of ß-adrenergic receptor density on fat cells29,30. Although both catecholamines and GH work together, GH still outperforms catecholamines in terms of post-exercise fat utilization.

In 2000 researchers studied the response of GH and catecholamines during and following exercise of varying intensity and related these responses to changes in fat oxidation. During exercise, neither glucose utilization, which was directly proportional to exercise intensity, nor fat oxidation, which remained constant, was influenced by either GH or catecholamines during exercise. Fat oxidation following exercise was related to exercise intensity and while it correlated to both the peak GH and peak epinephrine response; after further analysis only the peak GH response was found to be the greatest predictor of post exercise fat utilization16. There is evidence, therefore, that endogenous GH secretion exerts an immediate as well as a delayed effect to increase fatty acid availability following exercise.

What Influences Resting GH?

At rest, GH secretion is characterized by episodic bursts over a 24-hour period and is influenced by age, gender, nutrition, sleep, body composition, regional distribution of bodyfat, stress, fitness

level, sex hormones (testosterone and estrogen), insulin, and IGF-1 levels. Of the factors listed above that influence GH secretion, if you had to choose the two most important predictors of your 24-hour GH release which would they be? Researchers examined the 10 physiological factors regulating GH secretion at rest during men and found that the 2 physiological factors that had the greatest impact on resting GH secretion are: abdominal visceral fat and fasting insulin levels. In the study, abdominal fat was the strongest predictor of 24-hr GH release among the ten variables studied, followed closely by fasting insulin levels. An inverse relationship between abdominal fat and 24-h GH release (the bigger your stomach, the lower GH secretion you have) was demonstrated in both the young and old men. It's interesting that although with age there is a reduction in GH secretion, however having a big gut suppresses GH greater than the aging process.
Having a big gut not only suppresses GH secretion but also serum IGF-I concentrations which is a powerful muscle builder 22, 23, 24. It seems that adhering to diets that are low in carbs or are low glycemic would result in greater insulin control which would enhance the actions of GH.

Excess Fat Blunts the GH Response to Exercise

Some researchers have found that obese individuals have lower resting GH and higher cortisol levels than normal weight subjects, additionally obese subjects have a blunted GH response to exercise compared to normal subjects26, 27. What better excuse to lose the gut than to realize that with increased weight gain there is a lowered GH response not only at rest but also in response to exercise. In the J. Clin. Endocrinology and Metabolism it was reported that not only do obese men have a blunted GH response to exercise but also have a blunted respiratory quotient (RQ) (RQ is a measure of fat oxidation), increased cortisol production, and a smaller post-exercise rate of metabolism compared to lean individuals28. In contrast to obese men, lean individuals demonstrated significant increase in GH during exercise and a clear shift toward an enhanced fat utilization after intense exercise accompanied by a 28% higher rate of oxygen consumption post exercise (higher metabolic rate).
Getting too fat in the offseason makes it all the harder to get back in competition shape.

The Lactic Acid Myth.

For many years researchers have long thought that lactic acid is a stimulator of GH secretion.
In Dr. Colker’s section of Extreme Muscle Enhancement last month there was an excellent article on tourniquet training, he mentioned how lactic acid is not a stimulator of GH.
He mentions the tourniquet training study in which they investigated the effect of partial vascular occlusion versus no occlusion with resistance exercise. Lactate increased in both trials but there was not significantly different from each other at any time point; however GH increased by fourfold from pre- to postexercise in the vascular occlusion session but did not change significantly during the resistance exercise session. Lactate was the same in both trials yet GH increased 4-fold

in the vascular occlusion trial. Upon
further research, here are some other studies to back that GH is not stimulated
by GH. Artificial manipulation of blood
lactate levels using sodium lactate infusions (lactic acid) have been shown to
have no consistent effect on GH concentration24, 25. High intensity exercise does stimulate GH
however lactic acid is not the major stimulus.
Instead, it is possible that a mechanism that stimulates anaerobic
metabolism might result in an increase in blood lactate concentrations whilst
also providing another signal for GH release.

Key
Points

Acute increases in GH
that occur during exercise lead to increases in post-exercise fat
utilization.
Interval training
leads to greater fat loss than aerobic exercise
GH has synergistic
actions with catecholamines.
Lactic acid is not a
stimulator of GH; infusions of lactate do not raise GH concentrations.

1.

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