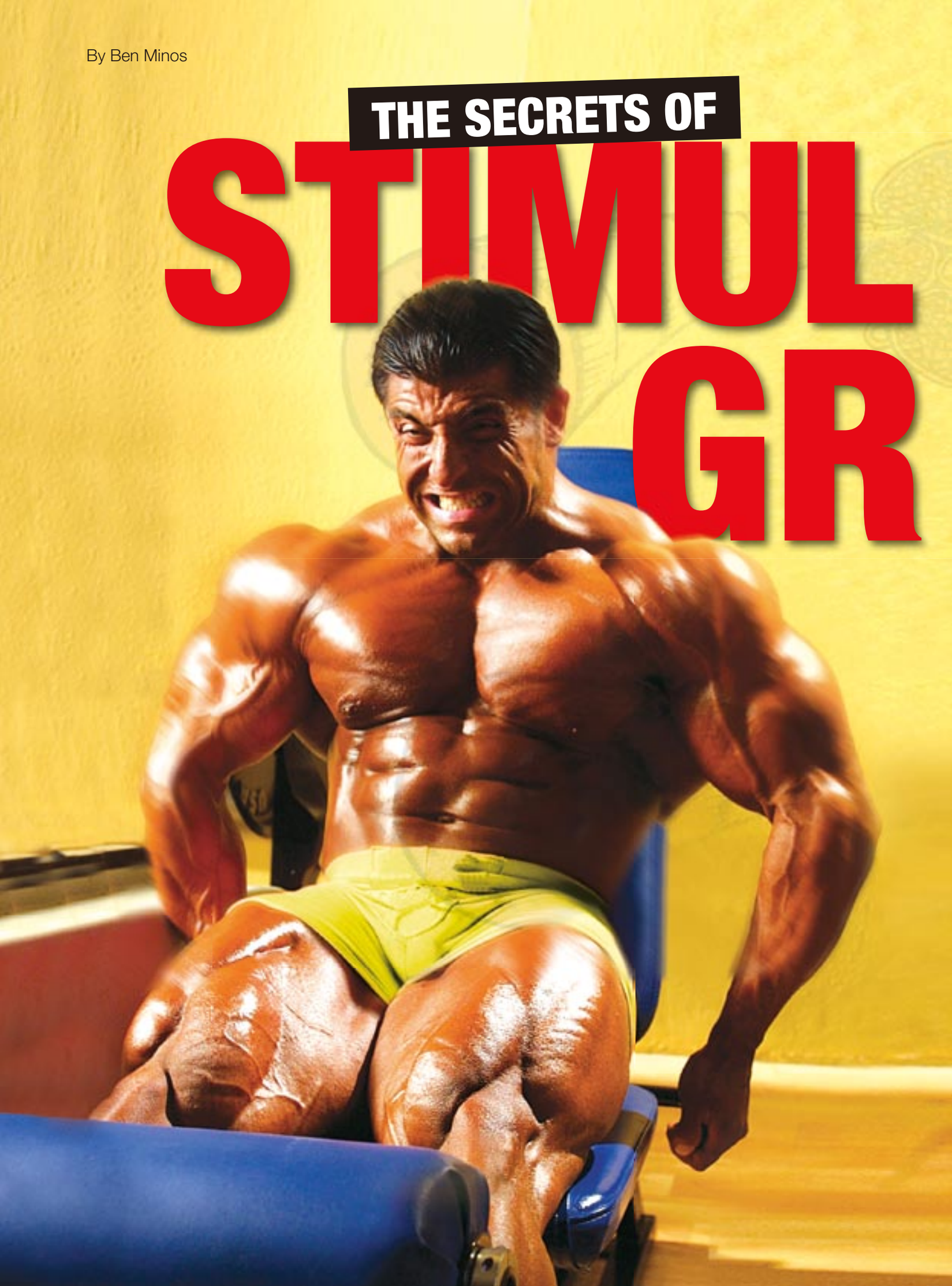
By Ben Minos

THE SECRETS OF STIMUL GR



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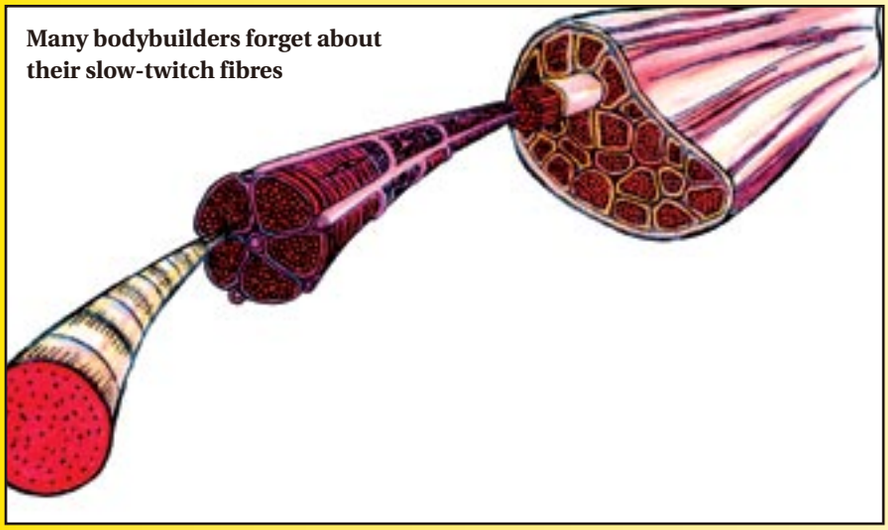
How effective would your workouts be if you knew the precise mechanism that stimulated muscle growth?

Imagine you could maximise every rep and every set of every workout to get the most potent stimulus to shock your body into explosive growth. Over the next couple of months we will look at the different theories on what actually stimulates muscle hypertrophy, and separate those that are scientifically sound from those that are not. With this knowledge, you'll then be armed with the latest scientific information to ensure that you are maximising your muscle growth each and every time you hit the gym.

Is there one best theory of growth?

Talk to a dozen gurus about the single best program for stimulating muscle growth and all of them will give you a different answer. HIT guys will preach that you can stimulate maximal growth with as little as one set to failure. Others say it's not just the intensity of the load but the amount of work that's performed with it that counts. Others will say that it's the time under tension that's important. Who do you listen to? Is there such a thing as a perfect workout?

Well, let me disappoint you from the start and say that we don't actually know the exact mechanism behind muscle growth stimulation. That's not to say that we haven't been looking. Considering everything that we know about the process and the steps involved, and it is considerable (there are big, muscular physiques walking the earth after all) the actual stimulus



Many bodybuilders forget about their slow-twitch fibres

for these pathways is relatively unknown. All that we really know is that the genes responsible for muscle growth respond to mechanical stress. That's the fancy, scientific way of saying that you need to lift weights to get big.

Now that the laboratory geniuses have figured that one out, the race is on to find the best way to make that happen. The truth is there may be more than one way to pull the trigger of that gun.

Talk to a dozen gurus about the single best program for stimulating growth and you'll get different answers

Training to failure

Is it essential to push the muscles to failure on your working sets? Is this the stimulus that really triggers your muscles to grow?

Some experts believe that unless you've pushed the muscle to at least concentric failure on your set, then you haven't really performed a set at all. It is really those last couple of reps of your set that are the most beneficial and it is these that are responsible for stimulating growth.

If the number of lifts you perform in a set is not maximal, then the mechanical work performed during that set is diminished. This means that if a motor unit is not stimulated and subsequently fatigued, then it is simply not trained. And if a motor unit isn't fatigued, then your body has no reason to adapt and grow.

Let's have a look at what happens during your typical set to failure. After the first few seconds of your set, some of the recruited motor units become fatigued, so new motor units are then recruited in order to continue. As they also become fatigued, your body tries to recruit more of the motor unit pool in order to cope with the workload demands. Then, once all the available motor units have been activated, fatigue will set in and you'll reach muscular failure.

Just say your set lasts only six seconds. It will only be the motor units with an endurance time of under six seconds (your fast twitch fibres) that will get exhausted. All the fibres that are actually quite resistant to fatigue (some types of fast twitch and the slow twitch fibres) don't get maximally stimulated at all. Fast twitch fibres, even though they have been stated to have more potential for growth, are not the most important for the bodybuilder.

Bodybuilders actually have a high proportion of slow twitch fibres that are fatigue resistant, i.e., they display slow twitch properties. Maximal stimulation of these fatigue resistant fibres becomes the most important factor for the bodybuilder. Unless you have a set that lasts long enough to stimulate all of the fibre types, both fast and slow, and unless that set is taken to absolute failure, then you haven't recruited and fatigued all of the available motor unit pool.

If you haven't pushed the set to failure, you still have motor units that haven't been stimulated and as stated before, if a motor unit is not fatigued, then it is not trained. And if a motor unit is not trained, then the subsequent muscle fibres are not stimulated for growth.

This is the main principle behind the so-called high intensity approach to training. If the most important stimulus for growth is pushing the set to failure, then once this has been achieved, no further stimulation is necessary.

Even though the theory is compelling, is it the most important stimulus that triggers your muscles into explosive growth?

Unfortunately, there are a number of factors involved in the fatiguing of a muscle, and it has been estimated that even on a single set to failure, you may only be activating a meagre 30 per cent of the available motor unit pool. So much for maximal stimulation through one set. This can of course be overcome in a few ways, by incorporating such techniques as super setting, forced reps, drop setting, rest/pause, X reps etc. Another way is to perform more exercises per session to ensure you hit the muscle from a number of different angles to maximise motor unit stimulation. Advocates of this approach usually incorporate one or more of the above techniques into their programs to increase their effectiveness.

Training to failure is one of the more popular theories on hypertrophy advocated in the media, and one that has devotees the world over, especially in bodybuilding circles. But there is

Good form is an important component for growth optimisation

another theory behind muscle growth, and this one is the generally accepted theory in scientific circles.

The energetics theory of hypertrophy

At any given instant, each muscle cell in your body possesses only a fixed quantity of energy. This energy then has to be distributed between protein metabolism and mechanical work.

Your body is always in constant protein turnover, meaning it is always breaking down old proteins and replacing them with new ones. This process of course requires energy. Performing mechanical work, or muscle contractions however, also requires energy. During your workout, while you are performing a set, the body is naturally going to divert all of its resources into producing mechanical work. This then leads to an acute shortage of cellular energy for protein metabolism. This 'starvation' of energy that occurs during strenuous activity is thought to be the trigger for the subsequent 'binge' (called supercompensation) that takes place during your rest period between workouts.

It's much like a crash diet experience: you lose some weight, then after you come off the diet, you end up heavier than before? Think of this on a smaller scale happening to your muscles as a result of your workouts.

This follows a similar and more positive line of thinking that bodybuilders have been preaching for years. Your workout needs to perform enough work to cause sufficient breakdown of muscle tissue and then your body needs to repair itself during your rest and recovery days. Does the saying 'you don't grow at the gym, you grow during rest' sound familiar?

So, the trigger for growth and the subsequent amount of supercompensation that needs to take place is dependant upon how much 'work' is performed during your workouts.

Quite simply, the more work you perform, the more muscle breakdown, the more compensatory growth takes place to deal with this increased stress. That's why the volume of work as well as progressive overload from workout to workout is so important for continued success.

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This theory doesn't discount the all-important factor of intensity however. It is definitely acknowledged that there must be some 'critical threshold' that must be achieved in order to provide a potent enough stimulus for all of this to occur.

A resistance that optimises intensity as well as allowing for adequate training volume will ensure greater fibre recruitment

The weight needs to be big enough to cause a significant shortage of energy (muscle breakdown), but small enough so that enough work can be performed at this weight.

Too big a weight and only a small number of reps can be performed; too little a weight and a lot of work can be performed without any significant damage caused. Although we don't know what this critical threshold is exactly, it is generally accepted that it is somewhere in the vicinity of around 70 per cent of your 1RM. This would be around your 10-12 repetition max for most people.

Therefore, it's not only the force that the muscle produces (intensity) but also the amount of work performed (volume) that is crucial. Maximising both intensity and volume are critical for growth!

As stated in the last section, if the number of lifts performed in a set is not maximal, then the mechanical work diminishes somewhat. However, if the amount of work is relatively close to maximal values, then the difference is not really crucial. Let's say you lift a weight 10 times, but you could've really reached 12. There isn't really that much of a difference as far as degradation and stimulation goes! This is also compensated for by shortening rest times between sets. That's why bodybuilders have shorter rest periods than the more traditional strength type of lifting sports such as powerlifting.

This is the more traditional approach to bodybuilding, where volume is just as an important factor as intensity. Bodybuilders will generally perform a lot more volume per session than strength athletes who focus mainly on the intensity side of the equation.

The take home message for all of you out there? If you are not pushing the set to absolute failure and beyond (i.e., HIT style), then you are going to have to perform more work in order to stimulate those fibres and perform enough work to squeeze out an adaptive response (i.e., increase the volume).

Time under tension

Time under tension theory states that the number of individual reps that you perform is not of great importance, after all, your muscles can't count. Rather it's the time that the muscle stays under tension that's the more important factor.

You'll obviously still need to be lifting some respectable weights, but just as long as you are able to perform enough work and keep the muscle under tension for at least 20 seconds and up to around 60 seconds, then you'll see growth over time. As you can see, this is quite a high range and the intensity of the load would vary quite a bit.

Don't believe anyone who preaches that they have the one magic answer to the great hypertrophy problem

Let's have a look at two examples. Just say you were squatting 100kg. On one set you completed five reps with a 2-0-2-1 cadence, which means that you took two seconds to lower yourself, no pause in the bottom position, two

Adopting a multifaceted approach to training is optimal for growth

seconds to drive up and one second pause at the top. With each rep taking five seconds, this adds up to a total time under tension of 25 seconds.

Then, on another set, you perform squats again with 100kg, but this time, you completed 12 reps with a 1-0-1-0 cadence, that's a one second descent, no pause, one second ascent, no pause at the top. This set would take you 24 seconds, a similar time under tension.

Now, this theory states that if the weight is the same, and the time under tension is the same, then the training effect will be the same. Now, without discussing the science behind it, I hope that you can appreciate that the training effect of the above two examples would be dramatically different from each other.

There looks to be more importance to stimulating hypertrophy, than just keeping the muscle under tension for some designated time period. When approached from a different angle, however, this theory can be construed in a slightly different manner.

At the end of the day, it is really stating what the above theories have already told us: you just need to lift a heavy enough weight, but be able to perform enough repetitions with it to make any significant difference to your body.

So what really triggers muscle growth?

The main triggers for muscle growth from all of the above theories can be summed up as follows:

1. Intensity of the load: you need to choose a weight that will cause activation of a large amount of the motor unit pool, but light enough to allow for sufficient work to be performed with it.
2. Achieve muscular failure: this allows maximal activation of the available motor unit pool and ensures you are maximally stimulating as many muscle fibres as possible to induce a training effect.
3. Total amount of mechanical work: you need to perform enough reps per workout to induce sufficient breakdown to allow a large 'rebound' effect during your rest periods.

The main trigger to stimulate hypertrophy therefore becomes using a weight above a certain critical threshold, say around 70 per cent of your 1RM, trying to activate as many muscle fibres as possible, and then ensuring that the set lasts long enough so that you have fatigued these fibres and performed enough work to elicit a training response.

You can provide this stimulus by performing fewer sets at a high intensity, or more sets at a moderate intensity. You can also use set extending techniques to push past short-term fatigue such as drop sets, rest/pause and forced reps. Not only will this ensure that you are tapping into more of the motor unit pool, but this will again increase protein degradation beyond what the body is used to and again stimulate super-compensation.

All of the above theories stimulate growth, so you should still get results regardless of the theory you subscribe to. Just don't believe anyone who preaches that they have the one magic answer to the great hypertrophy problem.

Next month, we'll explore other factors that contribute to stimulating muscle growth and how you can achieve maximum effectiveness in your workouts. We'll uncover some of the lesser-known theories that, on their own, may not be the most potent stimuli, but when teamed up with the theories covered in this issue, make for formidable growth. **IM**