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The Think Muscle Newsletter publishes the latest news and research on exercise physiology, dietary supplements, performance enhancement, lifestyle management, health & nutrition, and bodybuilding & fitness. The newsletter is dedicated to providing accurate and unbiased scientifically based information.

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Muscle Memory: Scientists May Have Unwittingly Uncovered Its Mystery

By Bryan Haycock

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Anyone who has lifted weights, on and off, for several years is familiar with the concept of "muscle memory". Muscle memory in this context refers to the observation that when a person begins lifting weights after a prolonged lay off, it is much easier to return to their previous levels of size and strength than it was to get there the first time around. Even when significant atrophy (muscle shrinking) has taken place during the layoff, previously hypertrophied muscle returns to its previous size more quickly than usual.

A recent study looking at fiber type conversions during muscle hypertrophy may have uncovered a possible mechanism for this phenomenon. For those of you not crazy about scientific lingo bear with me. Towards the end you will see what I'm getting at with this study. In this study the distribution of myosin heavy chain (MHC) isoforms, fiber type composition, and fiber size of the vastus lateralis muscle were analyzed in a group of adult sedentary men before and after 3 months of resistance training and then again, after 3 months of detraining. Following the period of resistance training, MHC IIX content decreased from just over 9% to 2.0%, with a corresponding increase in MHC IIA (42% to 49%). Following detraining the amount of MHC IIX reached values that were higher than before and during resistance training, over 17%! As expected, significant hypertrophy was observed for the type II fibers after resistance training, and even remained larger than baseline after 3 months of detraining.

Myosin heavy chain isoforms, or MHCs, refer to the types of contractile protein you see in a given muscle fiber. MHCs determine how the muscle fiber functions. MHCs are what make a fiber "fast twitch", "slow twitch", or something in-between. Certain MHCs are known to undergo a change in response to resistance exercise. In this case, fibers that contain MHC IIX are fibers that aren't really sure what kind of fiber they are until they are called to action. Once recruited, they become MHC IIAs. So, fibers containg MHC IIX proteins serve as a reservoir of sorts for muscle hypertrophy because the can transform themselves into fibers containing MHC IIX which grow easily in response to training.

Like any great study, these researchers found what they expected as well as a little extra that they didn't. I think this study caught my attention because it showed a long-term

alteration in skeletal muscle following resistance training. It has been this long-term change that has been the focus of my own training philosophy, which incorporates what I call “strategic deconditioning”. This study showed that resistance training decreases the amount of MHC IIX while reciprocally increasing MHC IIA content. This was expected and has previously observed with changes in fiber type after resistance training. What they didn’t expect was that detraining following heavy-load resistance training seems to cause what they refer to as an “overshoot” or doubling in the percentage of MHC IIX isoforms, significantly higher than that measured at baseline. What does this mean? It could mean that there are more fibers available for hypertrophy (growth) after a lay off from training than there are before you start training. This could very well explain the “muscle memory” effect many of us have experienced ourselves. It may also have implications for natural bodybuilders looking to overcome long-standing plateaus.

There are a few questions that this study did not answer. For instance, they waited until 3 months after they stopped training before they took final measurements. It would have been nice if they had taken measurements regularly so that the optimal period of detraining could be identified corresponding to peak MHC IIX levels. Because it takes 3-4 weeks for these contractile muscle proteins to turn over, it would take longer than one month and probably less time than 6 months (previous research). Still the optimal time remains to be elucidated.

Also, how would these guys respond to the same training regimen after the detraining period? Would their quads grow to their previous trained size, or even further? How long would it take? These questions, if answered, may add a new twist to typical training regimens. It may very well be that extended breaks from training may actually allow greater growth over a 12-month period than if training is uninterrupted. For serious athletes and bodybuilders, this would be important information and could significantly extend their competitive careers.

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"Natural Bodybuilding": A Modern Oxymoron? (Part 1 of 3)

By Rick Collins and Krista Scott-Dixon

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Excessive drug use by strength athletes at the competitive level is widespread. Hardcore bodybuilders today are using sophisticated arrays of anabolic steroids along with human growth hormone, insulin, thyroid preparations, and intravenous diuretics, often in staggering dosages. The obvious health dangers associated with such practices have spawned a backlash movement called “*natural bodybuilding*.” But while avoiding these potentially hazardous drug practices is a sensible idea, and one that we strongly recommend, the concept of hardcore “natural bodybuilding” today is virtually an oxymoron and seriously flawed.

Modern Bodybuilding as a Concept

Physical enhancement through exercise probably began as a means toward better strength and fitness in prehistoric times. Strengthening the skeletal muscles meant increasing one's physical abilities and chances of survival. At some point, however, the notion arose that improved physical *appearance* could be achieved through such efforts. In conjunction with proper diet, these exercises – performed against vigorous resistance – could improve the size and shape of the muscles. Engaging in specific exercises targeting the various muscles of the body could enhance the overall physical form. A so-called "physical culture" developed in dedication to these pursuits, with goals largely unrelated to traditional athletic goals. The object of the efforts: bigger muscles simply for the sake of having them … and showing them. As simply explained by Charles Gaines in his book Pumping Iron (page 105), "the nature of bodybuilding competition is aesthetic rather than athletic."

Around the turn of the last century, contests comparing the physiques of the competitors were being staged in America. The era of modern competitive bodybuilding formally began in 1939, when the American Athletic Union assumed the regulation of physique contests by sponsoring state and regional competitions and eventually a national one: the Mr. America contest. Today, the Mr. Olympia contest is the top professional competition for elite level bodybuilders.

Through the years, with the development of more sophisticated training methods and equipment and more scientific dietary and supplementation practices, there has been a gradual progression of professional bodybuilding standards of muscle size and conditioning. Even at the amateur competition level, the mass and definition of today's high-placing athletes would have been incomprehensible just two decades ago. In gyms across the country now, it is not uncommon to see numerous hardcore noncompetitive bodybuilders weighing in excess of 230 pounds – a situation that did not exist a few years ago. It is highly likely that the standards of success in bodybuilding will continue to rise.

While successful bodybuilding involves the use of proper exercise and nutrition, it also relies on genetic factors generally beyond human control. Individuals born with favorable muscle shapes and strong propensities for the acquisition of muscle mass are more likely to excel in the sport. But whatever one's natural aptitude, the ultimate goal of bodybuilding training is to overrule nature by sheer force of human will. The typical hardgainer engages in daily combat against the genetic limitations of the body, forcing it to abort its natural directives, abandoning, for example, the fourteen-inch arm that nature intended and adopting the eighteen-inch arm that the human desires. The female lifter sheds the bodyfat with which her body prefers to envelop itself and adopts instead an aesthetic based on hardness and power.

Modern Bodybuilding in Practice

The mechanics of modern bodybuilding involve the repetition (“reps”) of contrived resistance-based movements over and over. Rep after rep, set and set, the hardcore bodybuilder subjects the muscles to sustained levels of stress non-existent anywhere else. Cams, pulleys and other complex machinery, invented to attack muscle kinetics from unique and unusual angles, are commonplace in gyms across the world. In some gyms, a backlash against the more “high tech” machines has resulted in a "back-to-basics" movement. Now personal trainers use free weights and Olympic-lifting-derived moves in aerobics classes, and encourage people in spinning classes to pretend they are actually sweating over real hills (the irony of jaded urbanites getting back to nature on their spinning bikes or on the "hill option" of their treadmills is inescapable). Yet despite claims of what is "natural" at present, the fact remains that bodybuilding involves a systematized manipulation of the physical body with a desire to transform it from its "raw" state.

The systematized manipulation of the body is further achieved through dietary methods. The typical bodybuilder’s diet is a highly regulated mix of ingredients, including far more protein and calories than are advisable for the general public. Most dietitians recommend less than 70 grams of protein per day. Hardcore bodybuilders consume at least one to one and a half grams per pound of body weight per day, with ordinary intakes of 200 or 300 grams per day or more. In fact, many bodybuilders actually count their grams of protein and otherwise carefully manipulate their daily food intake, rendering the entire concept of eating more one of function than of enjoyment. Many bodybuilders space their meals not according to natural hunger, but in order to achieve maximal protein absorption and assimilation.

Another component of the physical manipulation of the bodybuilder’s body is the ingestion of supplements. Most serious bodybuilders ingest large dosages (“megadoses”) of many vitamins and minerals. These quantities vastly exceed the amounts that could be ingested by normal eating. Additionally, it is common practice to consume a variety of herbs and over-the-counter products designed for enhanced sports performance, such as creatine monohydrate. Many of these items would be found in greatly diminished amounts -- or not at all -- in the normal contemporary diet.

Next Issue: Part 2: What Is "Natural"?

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About the Authors

Rick Collins, JD, is a New York criminal defense lawyer, partner in the firm of Collins, McDonald & Gann (http://www.cmgesq.com), and former competitive bodybuilder and certified personal trainer. He has written extensively on issues related to bodybuilding and anabolic steroids, has represented or advised numerous athletes investigated or charged in such cases, and maintains an educational web site at http://www.steroidlaw.com/.

Krista Scott-Dixon, M.A., is a Ph.D. candidate at York University in Toronto. She maintains a website devoted to women's weight training at http://www.stumptuous.com/weights.html and has written on gender and training for Mesomorphosis (http://www.mesomorphosis.com). When not slaving over her dissertation she is reading labels in health food stores or making her gym trainees beg for mercy.

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Supplement Update: Guggulipid

By Rehan Jalali

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To begin the discussion about guggulipid, we must first talk about thyroid hormone. Thyroid hormones are very important for normal growth and development. Thyroid hormones maintain metabolic stability by regulating oxygen requirements, body weight, and intermediary metabolism (1). Thyroid hormones have effects in almost all tissues of the body. Thyroid hormones exert effects on thermogenesis and temperature regulation. This can explain some of the effects they have on energy metabolism. Thyroid hormones can actually stimulate protein synthesis, which is a big plus for bodybuilders and other athletes. Thyroid hormones have also been implicated in lowering cholesterol. Now let's get to the most important effect of thyroid hormone on athletes. Thyroid hormones can enhance lipolysis (fat burning) in adipose (fat) tissue. More lipolysis… more fat loss. Capish!

The two main thyroid hormones that have any relevance are T4 (thyroxine) and T3 (3,5,3' triiodothyronine). T4 is also inactive thyroid while T3 is active thyroid. T4 can convert into T3 in the liver by the enzyme 5' deiodinase, which in turn can help maintain a healthy metabolism and cause fat loss to occur. Okay, let's move on and talk about the benefits of Guggulipid.

Guggulipid (also known as Guggulsterones) has been around for hundreds of years in ayruvedic medicine. Ayruvedic medicine is a naturalistic approach to medicine that has been practiced in India for centuries. There have been several research studies done on this herb showing very positive benefits. Keep reading, the interesting part is coming up! One study entitled Clinical Trials On Guggulipid: A Hypolipidaemic Agent published in The Journal of Association of Physicians in India in 1989 (2) showed that guggulipid had a very strong effect in decreasing triglycerides (fats) as well as LDL (bad cholesterol) levels while increasing HDL (good cholesterol) levels in human subjects. It has these functional effects because it may cause an increase in thyroid hormone levels (both T4 and T3). There are several other studies that have shown similar effects of guggulipid as a fat reducing compound (3,4). Another use for guggulipid seems to be in the treatment of joint inflammation and helping to decrease joint discomfort (5). This natural compound has also been shown to be very safe and completely non-toxic in humans. This is all very good news for athletes. When choosing a guggulipid product, make sure it is a standardized guggulsterone of type E and Z from the plant commiphora mukul. Based on the research behind this supplement and the "real world" results I have seen, this supplement is a must for any athlete trying to lose bodyfat. An efficacious dose is 25 mg guggulsterones 3-4 times daily.

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1. Muscle Memory: Scientists May Have Unwittingly Uncovered Its Mystery by Bryan Haycock
[ ] It was good.
[ ] It was okay.
[ ] I didn't like it.
[ ] I'm not interested.

2. "Natural Bodybuilding": A Modern Oxymoron? by Rick Collins and Krista Scott-Dixonr
[ ] It was good.
[ ] It was okay.
[ ] I didn't like it.
[ ] I'm not interested.

3. Supplement Update: Guggulipid by Rehan Jalali
[ ] It was good.
[ ] It was okay.
[ ] I didn't like it.
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Best regards,

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